

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

STANDARD TREATMENT GUIDELINES AND NATIONAL ESSENTIAL MEDICINES LIST FOR TANZANIA MAINLAND

SEVENTH EDITION 2026



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FOREWORD

In line with the 2014 World Health Assembly resolution 67.22 and the 2008 African Union resolution 141 on Access to Essential Medicines, the Government of Tanzania, with great pride and deep commitment to the health and well-being of our people, presents the Revised Standard Treatment Guidelines and the National Essential Medicines List 2026. This edition represents a significant milestone in our ongoing effort to strengthen the delivery of equitable, high-quality, evidence-based health care services across all levels of the healthcare system. This commitment is well enshrined in Article 14 of the 1977 Constitution of the United Republic of Tanzania, which states that everyone has the right to life and to receive protection of their life from society, in accordance with the law. Access to safe, effective, and affordable medicines guided by clear, context-appropriate clinical standards is fundamental to achieving Universal Health Insurance (UHI) and improving health outcomes for all Tanzanians.

Aligned with the 2009 Public Health Act, Tanzania has made notable progress over the years in reducing maternal and child morbidity and mortality, combating communicable and non-communicable diseases, and addressing emerging and re-emerging public health threats. According to the 2007 National Health Policy Paragraph 5.41b(v) and 5.4.3c(i) and Tanzania Vision 2050, the Government of Tanzania, working with its partners, is mandated to provide stewardship in ensuring an affordable, adequate and safe supply of quality medicine and nutrition products to all health facilities and the community in need. In light of the above, and given evolving disease patterns, emerging scientific evidence, antimicrobial resistance, and persistent health system gaps, the regular review of the Standard Treatment Guidelines and National Essential Medicine List (STG/NEMLIT) is important. Periodic updates ensure alignment with the Essential Medicines List, promote the rational use of medicines, enhance the quality and standardisation of care, improve cost-effectiveness, and ensure that treatment recommendations remain responsive to national priorities and the changing health needs of the population.

This 2026 revision has been undertaken through an inclusive, consultative and transparent process engaging stakeholders from the Ministry of Health and its Institutions, the Prime Minister's Office, the Regional Administration and Local Government, Frontline healthcare workers from primary to tertiary health care facilities, both public and private, Professional associations, Academic institutions and implementing partners. Different levels of evidence, from local to regional epidemiological data, pharmacoeconomic analyses, and the 24th World Health Organisation (WHO) Model List of Essential Medicines, have guided the review process and the selection of National Essential Medicines, ensuring relevance to the Tanzanian context, disease burden, and available resources.

The revised Standard Treatment Guidelines provide clear, practical clinical pathways for the diagnosis, treatment and referral of priority conditions encountered in our health facilities. These Guidelines are designed to support health care providers at the primary and tertiary levels of the health care system in making informed clinical decisions that enhance patient outcomes. The accompanying National Essential Medicines List reflects our commitment to rational use of medicines, prioritising those interventions that are scientifically proven, cost-effective and aligned with national health priorities. Further, the document will guide the procurement and supply of medicines at the Medical Stores Department (MSD), the prescribing and dispensing of medicines in public health facilities, and the reimbursement of medicines by the National Health Insurance Fund (NHIF).

We realise that the successful implementation of STG/NEMLIT depends on the collective efforts of all health sector stakeholders. Mentorship, supervision, supply chain management, monitoring and evaluation will be vital to translating STG/NEMLIT into quality of care at the point of service. We call upon all health care professionals and policymakers to champion the adoption and rational use of these tools within their respective spheres of influence.

Finally, we extend our heartfelt appreciation to all individuals and institutions who contributed their expertise, time, insight, and financial support to the development of this seventh edition, 2026. Your dedication has helped shape a resource that will guide clinical practice over the next three years. Together, let us continue to strive for a healthier Tanzania where every person has access to the care they need, when and where they need it.

Lastly, in exercising the powers conferred on me by the President of the United Republic of Tanzania through Government Notice No. 686 19th December of 2025, I hereby declare that the Standard Treatment Guidelines and the National Essential Medicines List – 7th Edition 2026 are endorsed for public use.



Hon. Mohamed O. Mchengerwa (MP)
MINISTER OF HEALTH

ACKNOWLEDGEMENTS

This document was developed through a broad, inclusive, and consultative process involving diverse stakeholders across the health sector. Such a participatory approach promotes shared ownership of the Standard Treatment Guidelines and National Essential Medicines List for Tanzania (STG and NEMLIT) and enhances commitment to its effective implementation. The review process began in October 2024 with the identification of key stakeholders, who were provided with a structured tool to systematically gather their recommendations. These recommendations were based on their experience with the use, awareness, and implementation of the STG/NEMLIT, as well as their assessment of its effectiveness, relevance, and areas requiring improvement.

The Ministry of Health conducted a survey to gather recommendations for the review of the Standard Treatment Guidelines and National Essential Medicines List for Tanzania (STG and NEMLIT). A wide range of stakeholders participated in this process, including healthcare facilities from Dodoma, Geita, Iringa, Kigoma, Mbeya, Ruvuma, Mtwara, Tabora, Manyara, and Dar es Salaam, representing primary, secondary, and tertiary levels of care. These facilities actively contributed valuable recommendations to inform the review.
Additional stakeholders included institutions, programmes, and departments operating under the Ministry of Health, as well as academic institutions, professional associations, and development partners.
I extend my sincere appreciation to all healthcare workers and stakeholders who contributed their time, expertise, and valuable recommendations. Their inputs were carefully consolidated and used to strengthen and enrich this document.

In a further step, Lead reviewers for the individual chapters were nominated. We sincerely thank all professional associations that participated in the review through their peer reviewers, thereby making the process fully participatory and technically robust. I acknowledge the valuable contributions of the Medical Association of Tanzania (MAT), Association of Physicians of Tanzania (APHYTA), Association of Gynecologists and Obstetricians of Tanzania (AGOTA), Emergency Medicine Association of Tanzania (EMAT), Nephrology Society of Tanzania (NESOT), Pediatric Association of Tanzania (PAT), Pharmaceutical Society of Tanzania (PST), Tanzania Cardiac Society (TCS), Tanzania Dental Association (TDA), Tanzania Diabetes Association, Tanzania Ear Nose & Throat Society (TENTS), Tanzania Gastroenterology and Endoscopy Society (TGES), Tanzania Oncology Society (TOS), Tanzania Ophthalmology Society, Tanzania Orthopedic Association (TOA), Tanzania Society for Dermatovenereology (TASOD), Tanzania Radiology Society (TARASO), Tanzania Psychological Association (TPA), Tanzania Association of Urological Surgeons, Tanzania Neuroscience Association, Tanzania Society of Haematology (TASH), Society of Anesthesiologist of Tanzania (SATA), Tanzania Surgical Associations (TSA) and Pharmaceutical Society of Tanzania (PST) for their technical input and commitment throughout the review process.

We also extend our sincere appreciation to the institutions operating under the Ministry of Health, including the Tanzania Medicines and Medical Devices Authority (TMDA), the National Health Insurance Fund (NHIF), and the Medical Stores Department (MSD), for their active participation and valuable contributions throughout this review process.
We further acknowledge the programmes operating under the Ministry of Health, including the National Malaria Control Programme (NMCP), the National AIDS, STIs and Hepatitis Control Programme (NASHCOP), the Neglected Tropical Diseases Control Programme (NTDCP), the Immunization and Vaccine Development Programme (IVD), and the National Tuberculosis and Leprosy Programme (NTLP), for their technical input and continued collaboration.
Special appreciation is also extended to the Department of Preventive Services (DPS), the Department of Curative Services (DCS), the Department of Diagnostic Services (DDS), and the Government Chemist Laboratory Authority (GCLA) for their valuable technical contributions, expertise, and commitment throughout the review process.

I sincerely thank the National Medicines and Therapeutics Committee (NMTC), all Lead Reviewers from their respective professional associations, the stakeholders who participated in the survey and the Secretariat that coordinated the entire review process; their names are annexed. Finally, I gratefully acknowledge the financial support provided by the Global Fund, UNICEF, NextGen Ugavi Bora Afya Bora (UBAB), Africa Academy for Public Health (AAPH) Results for Development (R4D), and Medical Stores Department (MSD) whose support was instrumental in the successful completion of this review.



Dr. Grace E. Magembe
PERMANENT SECRETARY

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ACRONYMS AND ABBREVIATIONS

3D-CRT	Three-dimensional Conformal Radio-Therapy
ACS	Acute Coronary Syndrome
ACS	Acute Chest Syndrome
ACT	Artemisinin based Combination Therapy
ADA	Adenosine Deaminase
ADH	Anti-Diuretic Acid
aHUS	atypical Hemolytic Uremic Syndrome
AIS	Acute Ischemic Stoke
ALU	Artemether Lumefantrine
AMI	Acute Myocardial Infarction
AMPLE	Allergies, Medications, Past medical history, Last meal and Events leading to presentation
AMR	Anti-microbial Resistance.
APR	Abdominoperineal resection
AWaRE	Access, Watch, Reserve
BEP	Bleomycin, Etoposide, Cisplatin
bhCG	beta human Chorionic Gonadotropin
BMD	Bone Mineral Density
BP	Blood Pressure
BSO	Bilateral salpingo-oophorectomy
BUN	Blood Urea Nitrogen
C/T/L	Cervical, Thoracic, Lumbar
CAH	Congenital Adrenal Hyperplasia
CAP	Community Acquired Pneumonia
CAPEOX	Capecitabine + Oxaliplatin
CAVE	Cavus, Adductus, Varus, Equinus
CEF	Cyclophosphamide Epirubicin Fluorouracil
CKD	Chronic Kidney Disease
cN0/cN+	Clinical node-negative/node-positive
COL1A1	Collagen Type I Alpha 1 Chain gene
COL1A2	Collagen Type I Alpha 2 Chain gene
COL3A1	Collagen Type III Alpha 1 Chain gene
COL5A1	Collagen Type V Alpha 1 Chain gene
COL5A2	Collagen Type V Alpha 2 Chain gene
CPP	Cerebral perfusion pressure
CR	Complete response
CRP	C Reactive Protein
CVA	Cerebral Vascular Accident
CVD	Cardiovascular Disease
CVP	Central Venous Pressure
DIND	Delayed Ischaemic Neurologic Deficit
DKA	Diabetic Keto Acidosis
DME	Diabetic Macular Edema
DMO	District Medical Officer
DNS	Dextrose Normal Saline
DR-TB	Drug Resistance Tuberculosis
DSD	Disorder of Sexual Development
DSM-5	Diagnostic and Statistical Manual of Mental Disorders vol.5
DST	Drug Susceptibility Test
DTLC	District Tuberculosis and Leprosy Coordinator
DWMR	Diffusion Weighted Magnetic Resonance
EBRT	External beam radiotherapy
ECE	Extranodal extension
ECT	Electroconvulsive Therapy
EITB	Enzyme-linked Immune Transfer Blot
EMA-CO	Etoposide, Methotrexate, Actinomycin-D, Cyclophosphamide, Vincristine
EMA-EP	Etoposide, Methotrexate, Actinomycin D, Cisplatin
EMD	Emergence Medical Department
ENL	Erythema Nodosum Leprosum
EP	Etoposide + Cisplatin
ERCP	Endoscopic Retrograde Cholangiopancreatography
ESA	Erythropoietin Stimulating Agent
ESR	Erythrocyte Sedimentation Rate
EVD	External Ventricular Drainage
FAO	Foot Abduction Orthosis
FAST	Facial drooping, Arm weakness, Speech difficulties and Time
FAST	Focus Assessment with Sonography for Trauma

FBN1	Fibrillin-1 gene
FEIBA	Factor Eight By-passing Agent
FIGO	The International Federation of Gynecology and Obstetrics
FNA	Fine Needle Aspiration
FOLFIRI	5-Fluorouracil + Folinic acid + Irinotecan
FOLFOX	5-Fluorouracil + Folinic acid + Oxaliplatin
G6PD	Glucose 6 Phosphatase Dehydrogenase
GB	Gall Bladder
GCS	Glasco comma scale
GUS	Genital Ulcer Syndrome
HBA	Haemoglobin Adult
HBS	Sickle Haemoglobin
HD	Haemo-Dialysis
HDN	Haemolytic Disease of New Bone
HDR	High-dose-rate brachytherapy
HDU	High Dependency Unit
HEENT	Head, Eye, Ear, Nose and Throat
HHS	Hyperglycemic Hyperosmolar Syndrome
HRCT	High Resolution Computer Tomograph
HVL	HIV Viral Load
IBD	Inflammatory Bowel Syndrome
IC	Intracavitary brachytherapy
ICE	Ifosfamide, Carboplatin, Etoposide
ICH	Intra Cerebral Haemorrhage
ICP	Intracranial Pressure
IFLND	Inguinofemoral lymph node dissection
ILAE	International League Against Epilepsy
IMCI	Integrated Management of Childhood Illness
IMRT	Intensity-modulated radiotherapy
IOP	Intraocular Pressure
IPTP	Intermittent preventive treatment in pregnancy
IRIS	Immune Reconstitution Syndrome
IS	Interstitial brachytherapy
ITI	Immune Tolerance Induction
ITP	Idiopathic Thrombocytopenia Purpura
IV	Intravenous
JIA	Juvenile Idiopathic Arthritis
LAMM	Labyrinthine Aplasia, Microtia and Microdontia
LAP	Lower Abdominal Syndrome
LAR	Low anterior resection
LFT	Liver Function Test
LKW	Last Known Well
LLINs	Long Lasting Insecticide Nets
LLQ	Left Lower Quadrant
LMWH	Low Molecular Weight Heparin
LN	Lymph node
LND	Lymph Node Dissection
LPR	Laryngopharyngeal Reflux
LVI	Lymphovascular Invasion
LVSI	Lymphovascular space invasion
MAP	Mean Arterial Pressure
MDMA	3,4-MethyleneDioxy-MethAmphetamine
MDR-TB	Multi-Drug Resistance Tuberculosis
MoH	Ministry of Health
mRDT	malaria Rapid Diagnostics Test
MSM	Men who have Sex with Men
MTD	Maximum Tolerated Dose
mTOR	mammalian Target of Rapamycin
MUAC	Mid-Upper Arm Circumference
NaSHCOP	National AIDS, STI and Hepatis Control Programme.
NEMLIT	National Essential Medicines List
NGT	Naso Gastric Tube
NIV	Non-Invasive Ventilation
ODS	Osmotic Demyelination Syndrome
OI	Opportunistic Infection
OPG	Orthopantomography
OT	Occupational Therapy
PAD	Peripheral Artery Disease

PCV	Pneumococcal Conjugate Vaccine
PDMPs	Plasma-derived medicinal products
PEFR	Peak Expiratory Flow Rate
PEP	Post Exposure Prophylaxis
PI	Protease Inhibitor
PID	Pelvic Inflammatory Disease
PLND	Pelvic lymph node dissection
PLOD1	Procollagen-Lysine, 2-Oxoglutarate 5-Dioxygenase 1 gene (also called Lysyl Hydroxylase 1 gene)
pMDI	Pressurized Metered Dose Inhaler
PMO-RALG	Prime Minister's Office, Regional Administrative and Local Government
PNI	Perineural Invasion
PO	Per Oral
PPS	Parapharyngeal Space
PPSV	Pneumococcal Polysaccharide Vaccine
PrEP	Pre-Exposure Prophylaxis
PS	Performance status
PSA	Prostate Specific Antigen
PT	Physio Therapy
PUVA	Psoralens + Ultraviolet radiation
RAM	Resistance Associated Mutation
RBG	Random Blood Glucose
RICE	Rest, Ice, Compression, And Elevation
RR	Rifampicin Resistance
RRT	Renal Replacement Therapy
RT	Radiotherapy
RTLC	Regional Tuberculosis and Leprosy Coordinator
rtPA	recombinant tissue Plasminogen Activator
RVF	Rectovaginal fistula
SAH	Subarachnoid Haemorrhage
SBCC	Social Behavioral Change
SC	Subcutaneous
SLE	Systemic Lupus Erythematosus
SMBG	Self-Monitoring Blood Glucose
SMFE	Systemic Marrow Fat Embolism
SpO2	Oxygen Saturation
SSRI	Selective Serotonin Reuptake Inhibitor
SSS	Scrotal Swelling Syndrome
STG	Standard Treatment Guidelines
TAH	Total abdominal hysterectomy
TBI	Traumatic Brain Injury
TFT	Thyroid Function Test
TIA	Transient Ischaemic Attack
TIP	Paclitaxel, Ifosfamide, Cisplatin
TIVA	Total Intravenous Anaesthesia
TM	Tympanic Membrane
TMD	Temporomandibular Disorders
TME	Total mesorectal excision
TMJ	Temporomandibular Joint
TMP	Tympanic Membrane Perforation
TNM	Tumor Nodes and Metastases
TP/TE	Paclitaxel/Cisplatin alternating with Paclitaxel/Etoposide
TPT	Tuberculosis Preventive Therapy
TURP	Transurethral Resection of the Prostate
UDS	Urethral Discharge Syndrome
UDS	Urine Drug Screen
UHI	Universal Health Insurance
VAP	Ventilator-Associated Pneumonia
VBT	Vaginal brachytherapy
VDS	Vaginal Discharge Syndrome
VTE	Venous Thrombo-Embolism
VVF	Vesicovaginal fistula
VWF	Von Willebrand Factor
WfH	Weight for Height
WFNS	World Federation Neurological Surgeon
WHZ	Weight for Height Z score
WLE	Wide local excision
WPW	Wolff-Parkinson-White Syndrome

PART I

THE NATIONAL ESSENTIAL MEDICINES LIST (NEMLIT)

Background Information

The National Essential Medicines List (NEMLIT) identifies the medicines considered essential for managing priority health conditions at all levels of the healthcare system. NEMLIT is grounded in the World Health Organization's (WHO) concept of essential medicines—those that address the population's most critical health needs, are consistently available within a functioning health system, and meet standards of quality while remaining affordable to both individuals and the community. This approach relies on a careful, evidence-based selection process that evaluates safety, efficacy, and comparative cost-effectiveness. Limiting the list to essential medicines helps strengthen supply chains, promote rational use, and reduce overall healthcare costs.

Updates on the of Antibiotics categorization.
The previous edition of the Standard Treatment Guidelines introduced the classification of antibiotics into Access, Watch, and Reserve (AWaRe) categories to promote optimal antibiotic use and address antimicrobial resistance (AMR).
The National AWaRe List 2025 was developed using Tanzania's AMR, antimicrobial use (AMU), and antimicrobial consumption (AMC) surveillance data from 2020–2023, together with research evidence from 2014–2024. The list classifies 70 antibiotics, compared with 54 in the 2020 list, and is incorporated into the seventh edition of the STG/NEMLIT to guide rational antibiotic use, support antimicrobial stewardship, mitigate AMR, and improve patient outcomes.

Access antibiotics: First- or second-line treatment options for common infections with relatively lower resistance potential. They should be widely available and account for more than 60% of total antibiotic use.
Watch antibiotics: Antibiotics with a higher resistance potential that should be used cautiously and for specific indications. Their use should account for ≤28% of total antibiotic use.
Reserve antibiotics: Last-resort antibiotics for confirmed or strongly suspected multidrug-resistant infections. Their use should, whenever feasible, be guided by culture and antimicrobial susceptibility testing and account for ≤12% of total antibiotic use.
The AWaRe classification provides a framework for monitoring antibiotic use, improving access to essential antibiotics, promoting appropriate prescribing and preserving the effectiveness of critical antimicrobial agents.

Prescribing of Medicines with Regard to the Level of Service Provision and Professional Expertise.

As observed in Sixth Edition of the STG/NEMLIT 2021, the NEMLIT has been assigned with levels of healthcare facilities and level of expertise, which guides the stocking and prescribing of medicines to facilitate ordering from Medical Stored Department (MSD) and reimbursement by the National Health Insurance Funds (NHIF).

These guidelines indicate three levels of the healthcare system, which includes Primary, Secondary and Tertiary level of care. The Primary level comprises Dispensaries denoted by letter (A), Health Centers denoted by letter (B) and Council/District Hospitals denoted by letter (C), while the Secondary level includes Regional Referral Hospitals denoted by letter (D) and the Tertiary level, which consists of Zonal, Special and National Hospitals denoted by letter (S).

Additionally, these guidelines recognize the prescriber's level of expertise in relation to medicine prescribing, regardless of the level of the healthcare facility. This means that a prescriber may, based on their professional qualification, prescribe medicines appropriate to their level of expertise even when working in a facility classified at a level lower than his /her level of expertise, provided that approval has been granted by the Ministry following verification confirming the presence of the expert at that facility (the approval procedure is outlined in the Note:2 box below). For example, if a specialist is stationed at a dispensary, he or she may be authorized to prescribe Level S medicines in accordance with the guidelines.

Under these guidelines, prescribing authority is aligned with the level of professional expertise. Specialists, denoted by (A, B, C, D & S), are authorized to prescribe all medicines listed in the STG/NEMLIT. Medical Officers, indicated by (A, B, C & D), may prescribe medicines assigned to those levels, while Assistant Medical Officers, denoted by (A, B & C), are permitted to prescribe medicines within those categories. Clinical Officers, indicated by (A & B), are limited to prescribing medicines classified under Levels A and B, and Assistant Clinical Officers, denoted by (A), are authorized to prescribe only medicines categorized under Level A. Table 1 below summarizes the prescribing and stocking of medicines as per facility and expertise level.

Table 1: Summary on Restrictions for Prescribing of Medicines Listed in the NEMLIT as per Facility and Prescribing levels

Healthcare system tiers	Facility Type	Facility Levels	Professional Qualification	Prescribing levels
Tertiary level facilities	Zonal, Special and National Hospitals	**S**	Specialist	**A, B, C, D, S**
Secondary level facilities	Regional Referral Hospital	**D**	Medical Officer (MO)	**A, B, C, D**
Primary level facilities	Council/District Hospital	**C**	Assistant Medical Officer (AMO)	**A, B, C**
	Health Centre	**B**	Clinical Officer (CO)	**A & B**
	Dispensary	**A**	Assistant Clinical Officer (ACO)	**A**

Important Notes.

- All medicines indicated for the treatment of various diseases in the Standard Treatment Guidelines (STG) are included in the NEMLIT.
- This NEMLIT contains dosage forms and strengths including levels of medicines to be stocked and prescribed at different levels of healthcare systems from primary to tertiary.
- The dosage forms and strengths included in this NEMLIT are representative and are not intended to be exhaustive. Unless otherwise specified, all other global approved dosage forms and strengths of the molecules included in this NEMLIT are recognized under these guidelines and may be used where clinically appropriate, in accordance with national regulatory requirements and accepted standards of clinical practice.
- During the reimbursement of medicines in both public and private health facilities, the NHIF shall adhere to the molecules listed in the NEMLIT, regardless of formulation or strength taking note of (c) above.
- All public sector health facilities shall adhere to the NEMLIT when procuring medicines from Medical Stores Department (MSD) and other sources. Taking note of (c) above.
- Some medicines in the NEMLIT designated for higher facility levels may also be indicated for use at lower levels for the treatment of specific disease conditions. For example, Azithromycin is categorized at Level B but may be prescribed in Level A facilities for the treatment of STIs only.
- The NEMLIT shall serve as the baseline for developing a separate list of selected priority medicines for measuring the availability of health commodities in health facilities. The priority list shall also include selected medical devices, diagnostic products, and dental commodities.
- For fixed-dose combinations (FDCs) containing molecules with different prescribing levels, the FDC shall be assigned the prescribing level of the molecule with the highest level
- **In the event that a health facility has a prescriber whose professional qualification is above the level of the facility, the following procedure shall apply for approval to stock and prescribe medicines:**

    1. The District Medical Officer (DMO) shall scrutinize and compile a list of health facilities with prescribers whose qualifications are above the designated facility level.
    2. The list shall include the name of the council, name and level of the health facility, names of prescribers, professional qualifications, and valid practicing license numbers (including the Medical Council of Tanganyika license number).
    3. The request, together with the list, shall be submitted to the Ministry of Health through the Prime Minister's Office – Regional Administration and Local Government (PMO-RALG) for approval.
    4. Upon approval, the Ministry shall notify the respective health facilities through the appropriate administrative channel, authorizing them to stock and prescribe medicines according to the level of expertise available at the facility.
    5. The Ministry shall also inform the Medical Stores Department (MSD) and the National Health Insurance Fund (NHIF) to facilitate medicine ordering and reimbursement of prescribed medicines.
    6. If the approved prescriber is transferred or ceases to work at the authorized facility, the District Medical Officer shall notify the Ministry of Health through the appropriate administrative channel.

For further enquiries or recommendations during the implementation of these guidelines, please contact the Ministry of Health for clarification.

Note: The dosage forms and strengths included in this NEMLIT are representative and are not intended to be exhaustive. Unless otherwise specified, all other global approved dosage forms and strengths of the molecules included in this NEMLIT are recognized under these guidelines and may be used where clinically appropriate, in accordance with national regulatory requirements and accepted standards of clinical practice

Name of Medicine	Dosage forms and Strengths	Level
1.0 Anaesthetics, Preoperative Medicines and Medical Gases		
1.1 General Anaesthetics and Oxygen		
1.1.1 Inhalational Medicines		
Isoflurane	Liquid for inhalation, 250mL	**B**
Oxygen	Cylinder (medical gas) for inhalation	**B**
Sevoflurane	Inhalation	**S**
1.1.2 Injectable Medicines and Other Pre-Medication		
Atropine	Injection 1mg (as sulfate in 1mL ampoule)	**A**
Calcium chloride	Injection: 100 mg/mL (10%)	**D**
Clonidine	Injection 500mcg/mL	**S**
Dexmedetomidine	Injection 100mcg/mL	**S**
Ephedrine injection	Injection 30mg/mL	**B**
Etomidate	Injection 20mg/mL	**S**
Flumazenil	Injection 0.2mg (IV)	**D**
Glycopyrrolate	Tablet 1mg, 2mg Injection 200mcg/mL in 1mL, 600mcg in 3mL	**S**
Ketamine	Injection (hydrochloride), 10mg/mL in 20mL	**B**
Labetalol	Tablet 100mg, Injection 10mg/mL	**C**
Lipid emulsion	Solution: 20%	**S**
Midazolam	Injection 1mg/mL, 5mg/mL	**D**
Norepinephrine	Injection: 1mg/ml,2mg/mL	**S**
Ondansetron	Injection 2mg/mL	**D**
Phenylephrine	Injection: 10mg/mL	**S**
Propofol	Injection 10mg/mL, 20mg/mL	**D**
Remifentanil	Powder for injection: 1 mg/2 mL; 2 mg/5 mL; 5 mg/10 mL vial	**S**
Sodium citrate	Solution 0.3 moles	**B**
Thiopental	Injection (sodium salt), in 20mL	**C**
1.2 Local Anaesthetics		
Bupivacaine	Injection 0.5% (hydrochloride) in 7.5% dextrose spinal	**B**
Bupivacaine	Injection 2.5mg/mL, 5mg/mL, 7.5mg/mL	**B**
Ropivacaine	Injection 2 mg/mL, 5 mg/mL, 7.5 mg/mL, 10 mg/mL	**D**

Name of Medicine	Dosage forms and Strengths	Level
Lidocaine	Injection hydrochloride 1%, 2%;	**A**
	Gel 2% & 5%; Spray 10%;	**B**
	patches 5%	**D**
Lidocaine in Dextrose	Injection (hydrochloride), 5% in 7.5% dextrose	**B**
Lidocaine + epinephrine (adrenaline)	Injection (hydrochloride) 2% with epinephrine (adrenaline) 1:100,000 in 2mL ampoule for dental use	**A**
1.3 Muscle Relaxants and Cholinesterase Inhibitors		
Atracurium	Injection 50mg/5mL	**S**
Baclofen	Intrathecal injection: 500 micrograms/mL in ampoule. Oral liquid: 10 mg/5ml. Tablet: 10 mg.	**S**
Botulinum toxin A injection	Powder for injection: 50 units, 100 units and 200 units	**S**
Neostigmine	Injection (hydrochloride or hydrogen tartarate),1mg/mL in 1ml, 2.5mg/mL in 1mL ampoule	**B**
Pancuronium	Injection (bromide) 4mg/mL in 2mL ampoule	**C**
Rocuronium	Injection 50mg/5mL	**S**
Sugammadex	Injection: 100mg/mL	**S**
Suxamethonium	Powder for injection (bromide or chloride) 50mg/mL in 2mL vial	**B**
Tizanidine	Tablet/Capsule: 2mg; 4mg	**S**
2.0 Medicines for Pain and Palliative Care		
2.1 Non-opioids and Non-steroidal Anti-inflammatory Medicines (NSAIMs)		
Aceclofenac	Tablet: 100mg	**B**
Acetylsalicylic acid	Tablet 300mg	**A**
Bromfenac	Eye drops; 0.09%	**D**
Dexketoprofen	Tablet: 25mg	**S**
Diclofenac	Injection 25mg/mL; Recto caps 100mg (slow release); Gel.	**A**
Diclofenac	Tablet (Sodium/Potassium salt) 50mg, 100mg;	**C**
Diclofenac + Paracetamol + Chlorzoxazone	Tablet: Diclofenac 50mg + Paracetamol 325mg + Chlorzoxazone250mg	**D**
Ibuprofen	Tablet 200mg; 400mg; Syrup 100mg/5ml	**A**
Indomethacin	Capsule: 25 mg	**A**
Ketoprofen	Tablet/Capsule: 50mg, 75mg, 200mg; Gel 2.5% w/w	**S**
Ketorolac	Injection Tromethamine) 30 mg/mL, Tablets 10mg, 20mg, Eye Drops 0.5%	**D**
Mefenamic Acid	Tablet 500mg	**B**
Meloxicam	Tablet 7.5mg; 15mg	**D**
Naproxen	Naproxen 500mg	**A**
Paracetamol + Ibuprofen	Tablet: 500 mg +400 mg	**A**
Tramadol+ Paracetamol	Tablet: 37.5 mg + 325 mg; 50 mg + 500 mg	**D**

Name of Medicine	Dosage forms and Strengths	Level
Paracetamol	Tablet 500mg; Syrup 125mg/5mL, suppositories 125mg, 250mg	A
	10 mg/mL Solution for Infusion	D
Piroxicam	Tablet 20mg	A
Colchicine	Tablet: 0.5 mg	D
Sulfasalazine	Tablets 500mg	D
Mesalazine	Tablet: 400mg, 500mg, 800mg	S
Sucralfate	enemas (rectal preparation): 2g/20ml, 2g/50mls, 2g/100mls, 3g/100mls	S
2.2 Opioid Analgesics/Antagonists		
Fentanyl	Injection 100mcg/2mL; Patches	S
Methadone	Tablet: 5mg; 10mg (as hydrochloride); Oral liquid: 5mg/5mL; 10mg/5mL (as hydrochloride); Concentrate for oral liquid: 5mg/mL; 10mg/mL (as hydrochloride)	C
Morphine	Tablet 10mg (morphine hydrochloride or morphine sulfate); Granules (slow-release: to mix with water) 20mg-200mg (morphine sulfate); Oral liquid: (10mg morphine hydrochloride or morphine sulfate)/5mL; Injection: 10mg (morphine hydrochloride or morphine sulfate) in 1mL ampoule	C
Naloxone	Injection: 0.4mg/mL in 1mL ampoule (hydrochloride)	B
Pethidine	Injection (hydrochloride) 50mg/mL in 1mL and 2mL ampoule	B
Tramadol	Tablet 50mg; Injection: 50mg/mL in 2mL	B
2.3 Medicines for Other Common Symptoms in Palliative Care		
Amitriptyline	Tablet (hydrochloride) 25mg; 75mg	A
Haloperidol	Injection: 5mg/1mL ampoule; Tablet 5mg	B
Hydrocortisone	Powder for injection (as sodium succinate) 100mg in vial	A
Imipramine	Tablet: 25mg	C
Loperamide	Tablet: 2mg	B
3.0 Anti-allergies and Medicines Used in Anaphylaxis		
Betahistine	Tablet: 8 mg, 16 mg, 24 mg (as dihydrochloride)	D
Bilastine	Tablet 20 mg	D
Cetirizine	Oral solution: 5mg/5mL Tablet: (hydrochloride) 10mg	A
	Eye drops: 0.24%	C
Chlorpheniramine	Injection (maleate 10mg/mL in 1mL ampoule); Elixir (maleate) 2mg/5mL; Tablet (maleate) 4mg	A
Desloratadine	Tablet: 5 mg film-coated	S
Dexamethasone	Injection: 4mg/mL in 1mL ampoule (as disodium phosphate salt);	B
Epinephrine (Adrenaline)	Injection: 1mg (as hydrochloride or hydrogen tartrate) in 1mL ampoule, inhalation 125mcg	A

Name of Medicine	Dosage forms and Strengths	Level
Loratadine	Syrup 5mg/5mL; Tablet 10mg	C
Promethazine	Injection (hydrochloride) 25mg/mL in 2mL; Syrup 5 mg/5mL; Tablet (hydrochloride) 25mg	A
4.0 Antidotes and Other Substances Used in Poisonings		
4.1 Antidotes (Non-specific)		
Charcoal, activated	Tablet/granules for oral suspension: 50g	A
4.2 Antidotes (Specific)		
Acetylcysteine	Injection: 200mg/mL in 10mL ampoules	C
Atropine	Injection 1mg (as sulfate in 1mL ampoule)	A
Calcium disodium EDTA (ethylene diamine tetra-acetic acid)	Injection: 200 mg/mL	D
Calcium gluconate	Injection 100mg/mL in 10mL	A
D-penicillamine	Tablet: 250mg	D
Deferoxamine	Injection: 500mg (mesylate) in vial	D
Dimercaprol	Injectable: 50mg/mL in 2mL ampoule	D
Ethylenediamine tetra-acetic acid (EDTA)	Injection: 200mg/mL in 5mL	D
Flumazenil	Injection:100mcg/mL in 5mL	D
Magnesium oxide	Tablet: 140 mg; 400 mg; 500; 600 mg	A
Magnesium sulfate	Injection 500mg/mL in 10mL vial (5g)	A
Methionine	Injection: 15 mg/mL	S
Methylene blue	Injection: 5 mg/mL	C
Pralidoxime	Injection: 600mg	S
Sodium bicarbonate	Injection: 4.2%; 5%; 7.5%; 8.4% Tablets: 325 mg; 650 mg	D
Succimer	Capsule: 100mg (2,3-Dimercaptosuccinic acid)	D
Sugammadex	Injection 100mg/mL	S
5.0 Anticonvulsants and Antiepileptics		
Carbamazepine	Syrup 100mg/5mL; Tablet 100mg; 200mg	A
Clonazepam	Tablet 0.5mg, 2mg	D
	Injection: 1mg/ml	S
Diazepam	Tablet 5mg, Rectal 2.5mg, 5mg, 7.5mg, 10mg	C
	Injection 5mg/mL in ampoule 2mL	A
Lamotrigine	Tablet: 100mg, 200mg	S
Levetiracetam	Injection 5mg/mL, 10mg/mL, 15mg/mL, 100mg/mL, Tablet 250mg, 500mg, 750mg, 1000mg	S
Lorazepam	Injection: 2mg/mL in ampoule; 4mg/mL in ampoule, Tablet 1mg/2mg	C

Name of Medicine	Dosage forms and Strengths	Level
Phenobarbitone	Injection (as sodium salt), 100mg in 2mL ampoule;	**A**
	Tablet (as sodium) 30mg, 100mg	**A**
Phenytoin	Suspension (as sodium salt) 30mg/5mL; Tablet/Capsule (as sodium salt) 50mg, 100mg, Injection 100mg/2mL	**C**
Pregabalin	Tablet/Capsule 75mg, 100mg; 150mg	**D**
Gabapentin	Tablet/Capsule 100mg, 300mg, 400mg,	**D**
Sodium Valproate	Injection 100mg/ml, Tablet 200mg, 500mg	**C**
6.0 Anti-Infective Medicines		
6.1 Anthelminthics		
6.1.1. Intestinal anthelminthics		
Albendazole	Suspension 100mg/5mL in 30mL bottle; Tablet 200mg, 400mg, chewable	**A**
Mebendazole	Suspension 100mg/5mL in 30mL bottle; Tablet 100mg, chewable	**A**
6.1.2 Ant filariasis		
Ivermectin	Tablet 3mg, 6mg	**A**
Diethylcarbamazine	Tablet 50mg; 100mg	**A**
6.1.3 Anti-schistosomiasis and Other Anti-trematode Medicines		
Praziquantel	Tablet 600mg	**A**
6.2 Antibacterial		
6.2.1 Access Group Antibiotics		
Ampicillin	Powder for injection (as sodium salt) 250mg, 500mg in vial	**A**
Ampicillin + cloxacillin	Capsule 250/250mg, injection 250mg ,500mg	**B**
Ampicillin + Sulbactam	Powder for injection (ampicillin 1g/sulbactam 0.5g), (ampicillin 2g/sulbactam 1g), (ampicillin 10g/sulbactam 5g)	**C**
Amoxicillin	Capsule (as trihydrate) 250mg; Dispersible tablet 250mg, 125mg	**A**
Amoxicillin + Clavulanic acid	Powder for suspension (as trihydrate) 125mg+ 31.25mg (as potassium salt) in 5mL AND 250mg amoxicillin + 62.5mg clavulanic acid/5mL; Tablet (as trihydrate) 500mg + 125mg clavulanic acid (as potassium salt)	**B**
	Powder for injection 500mg (as sodium), + 100mg (as potassium salt) in vial	**C**
Benzathine benzylpenicillin	Powder for injection 1.44g (2,400,000 IU) in vial	**A**
Benzylpenicillin	Powder for injection (as sodium or potassium salt) 3g (5,000,000 IU) in vial	**A**
Cefalexin	Capsule 250mg (as monohydrate); Powder for reconstitution 125/5mi; 250mg/mL	**B**
Cefazolin	Injection 500 mg/mL	**B** (For surgical prophylaxis) / **C** (for all other indications)
Chloramphenicol	Oily injection (as sodium succinate) 0.5 g/mL in 2 mL ampoule; Powder for injection 1 g; Oral suspension 125 mg/5 mL; Injection (as phosphate) 150 mg/mL in 2 mL ampoule	**B**

Name of Medicine	Dosage forms and Strengths	Level
Cloxacillin	Powder for injection (as sodium salt) 250mg; 500mg in vial	**B**
Doxycycline	Capsule (as hydrochloride), 100mg	**A**
Flucloxacillin + Amoxicillin	Tablet 500mg (as fixed dose combination) ;	**C**
Flucloxacillin	Injection (sodium): 250 mg Oral solution: 125mg/5mL Capsule: 250 mg	**C**
Metronidazole	Suspension as (benzoate) 200mg/5mL in 100mL; Tablet 200mg	**A**
	Injection (I.V) 5mg/mL in 100mL bottle;	**B**
Nitrofurantoin	Tablet: 100mg	**A**
Phenoxymethylpenicillin	Powder for suspension 125mg/5mL; (as potassium salt), Tablet 250mg	**A**
Sulfamethoxazole + Trimethoprim (Cotrimoxazole)	Suspension (Sulphamethoxazole 200 mg/5 mL + Trimethoprim 40 mg/5 mL) in 100 mL bottle; Tablet 480 mg; Injection 480 mg	**A**
Trimethoprim	Tablet 100 mg, 200 mg	**D**
6.2.2 Watch Group Antibiotics		
Azithromycin	Capsule/Tablet (as dihydrate) 250 mg, 500 mg; Oral liquid 200 mg/5 mL	**B** (Level **A** for STI only)
Clarithromycin	Tablet 250 mg, 500 mg	**C**
Cefepime	Injection 1000mg	**D**
Ceftriaxone	Injection 250 mg, 500 mg, 1 g vial	**B** (Level **A** for STI only)
Ceftriaxone + Sulbactam	Injection 1.5 g vial	**D**
Ciprofloxacin	Tablet (as hydrochloride) 250 mg, 500 mg	**A**
	Solution for IV infusion 2 mg/mL in 100 mL	**C**
Erythromycin	Powder for suspension (as ethyl succinate), 125mg/5mL in 100mL bottle; Tablet (as stearate or ethyl succinate), 250mg, film Coated	**A**
Gentamicin	Injection (as sulfate) 40 mg/mL in 2 mL ampoule; 20 mg/mL in 2 mL ampoule	**A**
Piperacillin + Tazobactam	Powder for injection 2 g + 250 mg vial; 4 g + 500 mg vial	**S**
Streptomycin	Powder for injection 1 g vial	**A**
Ceftazidime	Powder for injection (as pentahydrate) 250 mg vial	**D**
Cefixime	Capsule 200 mg, 400 mg	**S** (Level **A** for STI and Typhoid only)
Cefotaxime	Powder for injection 500 mg, 1 g, 2 g vial;	**C**
Cefuroxime	Powder for injection 250 mg, 750 mg, 1.5 g vial; Oral suspension 125 mg/5 mL, 250 mg/5 mL; Tablet 250 mg, 500 mg	**D**
6.2.3 Reserve Group Antibiotics		
Amikacin	Injection 250mg/mL (as sulfate)	**S**
Clindamycin	Capsule 150 mg (as hydrochloride); Injection (as phosphate) 150 mg/mL in 2 mL ampoule	**S**

Name of Medicine	Dosage forms and Strengths	Level
Colistin	Powder for injection: 1 million IU (as colistemethate sodium) (equivalent to 34 mg colistin base activity) in vial. Powder for nebulizer solution: 1–2MIU via nebulizer	**S**
Dapsone	Tablet 50mg, 100 mg	**S** (Level **A** for ant leprosy)
Imipenem + Cilastatin	Powder for injection 500 mg + 500 mg vial	**S**
Meropenem	Injection 500 mg, 1000 mg	**S**
Vancomycin	Capsule 125 mg, 250 mg (as hydrochloride); Powder for injection 250 mg vial	**S**
Clofazimine	Capsule 50 mg, 100 mg	**A**
Rifampicin	Tablet 150 mg, 300 mg	**A**
Ethambutol	Tablet (as hydrochloride) 150 mg, 400 mg	**A**
Isoniazid	Tablet: 100 mg, 300 mg	**A**
Pyrazinamide	Tablet 400 mg, 500 mg	**A**
Rifampicin + Isoniazid	Capsule/Tablet 150 mg + 75 mg; 50 mg + 150 mg	**A**
Rifampicin + Isoniazid + Pyrazinamide	Tablet 75 mg + 50 mg + 150 mg	**A**
Rifampicin + Isoniazid + Pyrazinamide + Ethambutol	Tablet 150 mg + 75 mg + 400 mg + 275 mg	**A**
Isoniazid + Rifapentine	Tablet 300 mg + 300 mg	**A**
Cycloserine	Tablet 250 mg	**S**
Bedaquiline	Tablet 100 mg	**S**
Delamanid	Tablet 50 mg	**S**
Levofloxacin	Tablet 250 mg	**S**
Pretomanid	Tablet 200 mg	**S**
Linezolid	Injection for intravenous administration: 2mg/mL in 300mL bag; Tablet 400mg; 600mg	**S**
Moxifloxacin	Tablet 400mg	**S**
6.3 Antifungal Medicines		
Amphotericin B Deoxycholate	Powder for injection 5mg/ml	**S**
Liposomal Amphotericin B	Injection 5mg/ml	**S**
Benzoic acid Compound (Whitfield's)	3% salicylic acid and 6% benzoic acid ointment	**A**
Sulfur ointment/cream	sulfur ointment/cream	
Clotrimazole	Clotrimazole Vaginal cream (nitrate) 1%, 10%; Clotrimazole Pessaries 100mg; 500mg; Topical cream/Ointment Oral drops: 10 mg/mL	**A**
Fluconazole	IV infusion 2mg/mL in vial	**C**
	Tablet/Capsule 150mg, 200mg	**A**

Name of Medicine	Dosage forms and Strengths	Level
Flucytosine	Isotonic infusion solution containing flucytosine (1%) and 0.805% sodium chloride	**S**
	Tablet 250mg, 500mg	**S**
Griseofulvin	Tablet: 500mg	**A**
Itraconazole	Capsule/tablet: 100 mg, 200 mg Oral liquid: 10 mg/mL Cream: 1%	**D**
Miconazole	Vaginal Pessaries, Topical cream/ointment	**C**
	Oral gel 2%	**A**
Nystatin	oral Suspension: 100,000 I.U/mL	**A**
Terbinafine	Tablet 250mg; Topical cream	**C**
Luliconazole	Cream: 1%	**C**
Ketoconazole	Shampoo: 1%, 2% Cream: 2%	**C**
6.4 Antiviral Medicines		
6.4.1 Anti-Herpes Medicines		
Acyclovir	Cream 5%; Tablet 200mg, 400mg,	**B**
	Injection 500mg/Vial	**D**
Valganciclovir	Tablet 450mg	**S**
6.4.2 Antiretrovirals (ARVs)		
6.4.2.1 Nucleoside/Nucleotide Reverse Transcriptase Inhibitors		
Abacavir (ABC)	Tablet: 300mg (as sulfate)	**A**
Lamivudine (3TC)	Oral Liquid 50mg/mL; Tablet: 150mg	**A**
Emtricitabine	Tablet 200mg	**A**
Tenofovir disoproxil fumarate (TDF)	Tablet: 300mg	**A**
Zidovudine (AZT)	Capsule 250mg; Oral liquid 50mg/5mL	**A**
Tenofovir alafenamide (TAF) / Lamivudine / Dolutegravir	Tablet: 25mg + 300mg + 50mg	**A**
Tenofovir disoproxil fumarate / Lamivudine / Dolutegravir	Tablet: 300mg + 300mg + 50mg	**A**
6.4.2.2 Non-nucleoside Transcriptase Inhibitors		
Efavirenz (EFV)	Tablet: 200mg; 600mg	**A**
Nevirapine (NVP)	Oral liquid:50mg/5mL; Tablet 50mg (dispersible); 200mg	**A**
6.4.2.3 Protease Inhibitors		
Atazanavir	Tablet 100mg; 300mg (as sulfate)	**A**
Atazanavir + Ritonavir (ATV/r)	Tablet: 300mg (as sulfate) + 100mg	**A**
Lopinavir + Ritonavir (LPV/r)	Capsule 40mg + 10mg; Oral liquid 400mg + 100mg/5mL; Tablet 100mg + 25mg; 200mg + 50mg	**A**
Darunavir + Ritonavir (DRV/r)		
Ritonavir	Oral liquid 400mg/5mL; Tablet 25mg; 100mg	**A**
Darunavir	Tablet 75mg, 400mg, 600mg, 800mg	**A**

Name of Medicine	Dosage forms and Strengths	Level
6.4.2.4 Integrase Inhibitors and capsid inhibitor		
Raltegravir	Tablet 25mg, 100mg, 400mg	**A**
Lenacapavir	Injection: 463.5mg/1.5 mL, Tablet 300mg	**C**
Dolutegravir	Tablet:10mg; 50mg	**A**
6.4.2.5 Fixed Dose Combinations		
Abacavir/Lamivudine	Dispersible Tablet 60/30mg; Dispersible tablet; 120/60mg; Tablet 600/300mg Scored	**A**
Abacavir/Lamivudine/Dolutegravir (pALD)	Dispersible Tablet 60/30/5 mg	**A**
Tenofovir /Emtricitabine	Tablet 300/200mg	**A**
Tenofovir/Lamivudine/Efavirenz	Tablet 300/300/400mg	**A**
Tenofovir/Lamivudine/Dolutegravir	Dispersible tablet 60/30mg;Tablet 300/300/50mg	**A**
Zidovudine/Lamivudine	Tablet 300/150mg	**A**
6.4.2.6 Medicines for Prevention of Opportunistic Infections		
Isoniazid	Tablet 300mg	**A**
6.4.3 Antihepatitic Medicines		
6.4.3.1 Medicines for Hepatitis-B		
Entecavir	Tablet: 0.5mg	**S**
Tenofovir disoproxil fumarate (TDF)	Tablet: 300mg	**D**
Tenofovir alafenamide fumarate (TAF)	Tablet: 10mg, 25mg	**D**
6.4.3.2 Medicines for Hepatitis-C		
Sofosbuvir + Daclatasvir	Tablet 400mg + 60mg	**C**
Sofosbuvir + Velpatasvir	Tablet 400mg + 100mg	**C**
6.5 Antiprotozoal Medicines		
6.5.1 Ant amoebic and Ant giardiasis Medicines		
Metronidazole	Suspension: 200mg/5mL; Tablet 200mg	**A**
Tinidazole	Tablet 500mg	**B**
Diloxanide	Tablet: 500mg (as furoate)	**C**
Nitazoxanide	Tablet: 500 mg; Suspension: 100 mg/5 mL	**D**
6.5.2 Anti-malarial Medicines		
Artemether/Lumefantrine (ALU)	Tablet 20mg/120mg	**A**
Artemether	Injection 80mg/mL ampoules	**A**
Artesunate	Injection: 30mg, 60mg,120mg	**A**
Dihydroartemisinin + Piperaquine	Tablet 20mg+160mg, 40mg+320mg,	**C**
Primaquine	Tablet (as phosphates) 2.5mg, 7.5mg, 15mg	**A**
Artesunate + Amodiaquine	Tablet 25mg+ 67.5, 50mg+ 135mg, 100mg + 270mg	**B**

Name of Medicine	Dosage forms and Strengths	Level
6.5.3 Malaria Prophylaxis		
Sulfadoxine + Pyrimethamine	Tablet 500mg + 25mg	**A**
Mefloquine	250mg, 500mg, 750mg	**C**
Atovaquone + Proguanil	62.5mg + 25mg, 250mg +100mg	**C**
6.5.4 Antipneumocystosis and ant toxoplasmosis medicines		
Sulfadiazine	Tablet: 500 mg	**A**
Pyrimethamine	Tablet: 25 mg	**A**
Folinic acid	Tablets: 5 mg, 10 mg, 15 mg, and 25 mg Injection: 10 mg/mL, 20 mg/ml.	**S**
7.0 Antimigraine Medicines		
7.1 Medicines for Treatment of Acute Attack		
Ibuprofen	Tablet 200mg; 400mg	**A**
Celecoxib	Capsule: 100mg; 200mg	**C**
Etoricoxib	Tablet: 30 mg; 60 mg; 90 mg; 120 mg	**S**
Ergotamine tartarate	Tablet 1mg, 2mg	**C**
Sumatriptan	Tablet 25mg, 50mg, 100mg: Injection: 6 mg/0.5 mL; Nasal Spray: 20 mg/0.1 mL	**S**
7.2 Medicines for Prophylaxis		
Propranolol	Tablet 40mg as hydrochloride)	**A**
8. Antineoplastics, Immunosuppressives and Immunomodulators		
5-fluorouracil	Injection: 250mg; 500mg; 000mg;	**S**
Abiraterone acetate	Tablet: 250mg; 500 mg	**S**
enzalutamide	Tablets/Capsule: 40 mg; 80 mg	**S**
Dactinomycin	Powder for injection: 500 micrograms in vial	**S**
Alfuzosin	Tablet: 10mg	**D**
Allopurinol	Tablet: 100mg; 300mg	**B**
Anastrozole	Tablet: 1mg	**S**
Antithymocyte globulin (ATG) (rabbit)	Injection: 25mg/mL in 5mL	**S**
Azacitidine	Injection: 25mg/mL	**S** (With control)
Azathioprine	Tablet 50mg, 75mg, 100mg	**S**
6-Mercaptopurine	Tablet: 50 mg oral suspension: 20 mg/mL	**S**
Basiliximab	Injection 20mg	**S**
Bevacizumab	Injection: 25mg/ml	**S**
Atezolizumab	Injection: 60 mg/ml; 125 mg/ml	**S**

Name of Medicine	Dosage forms and Strengths	Level
Cetuximab	Injection: 2 mg/mL	**S**
Ranibizumab	Solution for Intravitreal injection: 0.3mg, 0.5mg	**S**
Aflibercept	Injection: 2mg/0.05ml	**S**
Bicalutamide	Tablet 150mg, 50mg	**S**
Bleomycin	Powder for injection: 15 IU (as sulfate) in vial	**S**
Bortezomib	Injection: 3.5mg/vial	**S**
Capecitabine	Tablet 500mg	**S**
Carboplatin	Injection: 10mg/mL	**S**
Chlorambucil	Tablet: 2mg	**S**
Cisplatin	Powder for injection: 50 mg; 10mg in vial.	**S**
Pemetrexed	Injection: 25 mg/ml	**S**
Cyclophosphamide	Powder for injection: 500 mg; 1 g; 2 g in vial. Tablet/capsule: 25 mg; 50 mg.	**S**
Cyclosporine	Injection: 50 mg/mL in 1-mL ampoule; Capsule: 25 mg; 50mg; 100mg	**S**
Cytarabine	Injection 100mg/ml	**S**
Azacitidine	Powder for injection: 100 mg single-dose vial. Tablets: 200 mg; 300 mg	**S**
Leflunomide	Tablet: 10mg; 20mg	**S**
Dacarbazine	Powder for injection: 100 mg in vial; 200mg/; 500mg	**S**
Danazol	Capsule 100mg	**S** Special for Haematology
Docetaxel	Concentrate for infusion 120mg; 80mg	**S**
Doxorubicin	Injection: 10mg; 20mg, 50mg	**S**
Epirubicin	Injection: 2 mg/mL	**S**
Fludarabine	lyophilized powder for Injection: 50mg/2ml Tablet: 10 mg	**S**
Liposomal Doxorubicin	Injection: 2mg/ml, 5mg/ml	**S**
Dutasteride	Tablet: 0.5mg	**S**
Etoposide	Capsule: 100 mg; Injection 100 mg/mL; Injection 50mg/5mL	**S**
Procarbazine	Capsule: 50 mg; 100 mg	**S**
Everolimus	Tablet 0.25, 0.5mg	**S**
Febuxostat	Tablet 40mg; 80mg	**S**
Filgrastim	Injection: 5mcg	**S**
Pegfilgrastim	Injection: 6 mg/0.6 mL	**S**
Finasteride	Tablet: 5mg	**D**
Gemcitabine	Injection: 200mg; 500mg; 1000mg	**S**

Name of Medicine	Dosage forms and Strengths	Level
Vinorelbine	Injection: 10 mg per mL Capsules:20 mg, 30 mg, and 80 mg	**S**
Goserelin	Injection 3.6mg, 10.8mg	**S**
Hydroxychloroquine	Tablet 200mg	**S**
Hydroxyurea	Capsule: 500mg	**D**
Ifosfamide	Injection 1g/20mL	**S**
Imatinib	Tablet 400mg	**S**
Cabozantinib	Tablet: 20 mg: 40 mg: 60 mg	**S**
Axitinib	Tablet 1mg, 3mg,5 mg	**S**
Pazopanib	Tablet 200mg, 400mg	**S**
sunitinib	Capsule: 12.5 mg, 25 mg, 37.5 mg, and 50 mg	**S**
Dabrafenib	Capsule: 50mg, 75mg, 150mg	**S**
Trametinib	Tablet: 0.5mg, 1mg, 2mg	**S**
Erlotinib	Tablet: 25mg, 100mg, 150mg	**S**
Gefitinib	Tablet: 250mg	**S**
Crizotinib	Capsule: 200mg, 250mg	**S**
Tofacitinib	Tablet: 5mg, 10mg	**S**
Irinotecan	Injection: 180mg/mL	**S**
Lenalidomide	Tablet: 25mg	**S**
Folinic acid	Tablets: 5 mg, 10 mg, 15 mg, and 25 mg Injection: 10 mg/mL, 20 mg/mL.	**S**
Mesna	Injection: 100mg/mL; Tablet 400mg	**S**
Methotrexate	Concentrated injection: 1000 mg/10 mL. Injection: 50 mg/2 mL. Powder for injection: 50 mg (as sodium) in vial. Tablet: 2.5 mg (as sodium), 10 mg	**S**
Mycophenolate Sodium	Tablet: 360mg	**S**
Mycophenolate Mofetil	Tablet 500mg	**S**
Oxaliplatin	Powder for injection: 50mg; 100mg in vial;	**S**
Paclitaxel	Injection 260mg vial	**S**
Rituximab	Injection 375 mg	**S**
Adalimumab	Injection 40mg/0.8mL, 10mg / 0.2mL	**S**
Tocilizumab	Injection: 20 mg/mL	
Sirolimus	Tablet 1mg, 2mg	**S**
Sorafenib	Tablet: 200mg	**S**
Interleukin-2	Injection: 22,000,000 I. U	**S**
Interferon alfa	Injection: 22,500,000 I.U/1.5ml	**S**
Lenvatinib	Capsule: 4 mg; 10 mg.	**S**

Name of Medicine	Dosage forms and Strengths	Level
Tacrolimus	Tablet: 0.5mg; 1mg; 2mg Ointment: 0.1%, 0.03%	**S**
Tamsulosin	Tablet 0.4mg	**D**
Tamoxifen	Tablet 20mg	**S**
Letrozole	Tablet: 2.5 mg.	**S**
Temozolomide	Tablet 200mg	**S**
Thalidomide	Tablet: 200mg	**S**
Trastuzumab	Injection: 440mg; 150mg; 600mg; 500mg	**S**
Pembrolizumab	Injection: 25mg/ml, 50 mg/ml	**S**
Nivolumab	Injection: 10mg/mL	**S**
Ipilimumab	Injection: 5mg/ml	**S**
Pertuzumab	Injection 30 mg/mL	**S**
Vinblastine	Injection: 10mg	**S**
Vincristine	Powder for injection: 2 mg; 5 mg (sulfate) in vial.	**S**
Zoledronic acid	Injection: 4mg; 5mg	**S**
Venetoclax	Tablet 10 mg; 50 mg; 100 mg	**S**
Ulinastatin	Powder for injection: 100,000 IU vial	**S**
9.0 Hormones and Antihormones		
9.1 Adrenal Hormones and Synthetic Substitutes		
Betamethasone	Injection 4mg/mL	**D**
Dexamethasone	Tablet 0.5mg; 4mg	**D**
	Injection (as sodium phosphate) 10mg/mL	**B**
Hydrocortisone	Powder for Solution for Injection/Infusion: 100 mg (as sodium succinate)	**A**
Methylprednisolone	1000 mg powder and solvent for solution for injection/infusion; Tablet 4mg; 8mg;	**D**
Metyrapone	Tablet: 250mg	**S**
Finerenone	Tablet: 10 mg, 20 mg, and 40 mg.	**S**
Prednisolone	Tablet 5mg	**A**
9.2 Oestrogens		
Estradiol	Tablet 1 mg, 2mg; Injection: 2mg/mL, 10mg/mL	**S**
9.3 Ovulation Inducers		
Clomiphene	Table:50mg	**C**
Menotropin (follicle stimulating hormone + luteinizing hormone)	Injection: 75 I.U, 150I.U	**S**
Human chorionic gonadotrophins	Powder for Injection: 5,000 I.U, 10,000 I. U	**S**
Cetrorelix	Powder for Injection: 0.25mg/ml, 3mg/ml (as acetate)	**S**
Lutropin hormone	Powder for Injection: 75 I. U	**S**

Name of Medicine	Dosage forms and Strengths	Level
9.4 Progesterone		
Dydrogesterone	10mg tablet	**S**
Etonogestrel	Implant 68mg	**A**
Levonorgestrel	Tablet 30mcg, 70mcg, 750mcg	**A**
	Implant 75mg	**A**
Medroxyprogesterone	Injection acetate (depot) 150mg	**A**
Norethisterone	Tablet 5mg	**C**
9.5 Androgens		
Testosterone	Injection: 30 mg/1.5mL;100mg/mL; 200mg/mL; Cream	**D**
9.6 Contraceptives		
Ethinyloestradiol + Norgestrel	Tablet: 30mcg + 300mcg	**A**
Ethinyloestradiol + Levonorgestrel	Tablet: 30mcg + 150mcg	**A**
Ethinyloestradiol + Desogestrel	Tablet: 30mcg + 150mcg	**A**
Levonorgestrel intrauterine system (LNG-IUS)	Intrauterine device / system 52mg (levonorgestrel)	**B**
9.7 Thyroid, Parathyroid Hormones and Antagonists		
Carbimazole	Tablet 5mg	**C**
Potassium Iodide	Solution: Iodine 2mg + Potassium Iodide 4mg/g in water (prepare from raw material)	**B**
Levothyroxine	Tablet: 0.05g (sodium salt)	**D**
Iodized oil	Iodized oil Capsule with nipple: 240mg/0.5Ml; 480mg/mL	**A**
Propylthiouracil	Tablet 50mg	**D**
9.8 Gonadotropin-Releasing Hormone (GnRH) Analogues / Agonists		
Leuprolide	Injection 1 mg/mL	**S**
9.9 Posterior Pituitary Hormones and Analogues		
Vasopressin	Solution for injection: 20I.U/ml	**S**
Desmopressin	Tablets: 0.1 mg, 0.2 mg. Injection: 4 mcg/Ml Nasal Spray: 0.01% (delivers 10 mcg per spray)	**S**
Octreotide	Powder and solvent for prolonged release (LAR), suspension for intramuscular injection 10mg, 20mg, 30mg per vial	**S** (Special permission
10. Ant parkinsonism Medicines and Anti prolactinoma		
Benzhexol	Tablet (hydrochloride) 5mg	**B**
Bromocriptine	Tablet: 2.5mg	**C**
Cabergoline	Tablet 0.5mg, 1mg	**S**
Levodopa + Carbidopa	Tablet: 100 mg + 10 mg; 100 mg + 25 mg; 250 mg + 25 mg.	**D**
Selegiline	Tablet 5mg	**S**
Entacapone	Tablet 200mg	**S**

Name of Medicine	Dosage forms and Strengths	Level
11. Medicines Affecting the Blood		
11.1 Anti- anaemia Medicines		
Erythropoietin	Injection: 2000 unit/ml; 4000 units/mL	**D**
Darbepoetin alfa	Vials (Solution for Injection): 25 mcg/Ml; 40 mcg/mL; 60 mcg/mL; 100 mcg/mL; 200 mcg/mL	**S**
Iron Sucrose	Injection: 20mg/ml	**D**
Ferrous	Tablet: 200mg (sulfate or as fumarate)	**A**
Ferrous salts	Oral liquid: equivalent to 9 mg/mL elemental iron; equivalent to 25 mg/mL elemental iron. Tablet: equivalent to 60 mg – 65 mg elemental iron.	**A**
Ferrous salt + folic acid	Tablet: equivalent to 60 mg elemental iron + 400 micrograms folic acid. Tablet: equivalent to 60 mg elemental iron + 2.8 mg folic acid	**A**
Folic acid	Tablet 5mg	**A**
Hydroxocobalamin (Vitamin B_{12})	Injection: 1mg/mL	**C**
Methyl cobalamin	Tablet: 500 mcg Injection: 500mcg/mL	**C**
11.2 Medicines Affecting Coagulation		
Etamsylate	Tablet: 500mg	**C**
Low molecular Weight Heparin	Injection 40mg/ml, 60mg/ml, 80mg/ml, 100mg/mL	**D**
Phytomenadione (Vitamin K_1)	Injection: 0.5 mg/mL, 2mg/mL in 2mL ampoule	**B**
Protamine sulfate	Injection 10mg/mL in 5mL ampoule	**B**
Rivaroxaban	Tablet 15mg, 20mg	**S**
Apixaban	Tablet 2.5mg, 5mg	**S**
Unfractionated Heparin	Injection (sodium salt) 1,000 IU/mL in 5mL ampoule	**C** (Under expert supervision)
Heparin	Gel: 500I.U/gm, 1000 I.U/gm	**S**
Tranexamic acid	Injection 100mg/mL in 5mL ampoule; Syrup 500mg/5mL in 300mL bottle; Tablet 500mg	**C**
Warfarin	Tablet: 1mg; 2mg; 5mg (sodium salt)	**C**
12.0 Blood Products of Human Origin and Plasma Substitute		
12.1 Blood and Blood Components		
Fresh Frozen Plasma (FFP)	Fresh Frozen Plasma (FFP) Bags	**D**
Platelets	Platelets	**D**
Red blood cells.	Packed red blood cells.	**D**
Whole blood	Whole blood	**B**
12.2 Plasma-Derived Medicines		
12.2.1 Human Immunoglobulins		
Human Immunoglobulin G	Injection; 50mg/ml, 100mg/ml, 200mg/ml	**S**
Immunoglobulin Intravenous (IGIV))	Injection: 50 mg/mL; 100 mg/mL	**S**

Name of Medicine	Dosage forms and Strengths	Level
12.2.2 Blood Coagulation Factors		
Eltrombopag	Tablet 25mg	**S**
Coagulation Factor VIII	Powder for injection 250IU, 500 IU, 1000 IU, 1500 IU, 2000 IU, 3000 IU per vial	**S**
Coagulation Factor IX	Powder for injection 250IU, 500 IU, 1000 IU, 2000 IU, 3000 IU per vial	**S**
12.3 Plasma Substitutes		
Albumin	Solution for intravenous infusion: 5%; 20%, 25%	**S**
13.0 Cardiovascular Medicines		
13.1 Antianginal Medicines		
Bisoprolol	Tablet: 1.25 mg; 5 mg; 10mg	**S**
Glyceryl trinitrate	Spray (sublingual): 400 micrograms/metered dose Tablet (sublingual): 300 micrograms; 400 micrograms; 500 micrograms; 600 micrograms Extended-Release Capsules: 2.5 mg; 6.5 mg; 9 mg	**C**
	Injectable Concentrate: 5 mg/mL	**S**
Isosorbide Dinitrate	Tablet 10mg, 20mg	**C**
Labetalol	Tablet 100mg, 200mg; Injection 5mg/mL	**C**
Nifedipine	Slow-release Capsule/Tablet 10mg; 20mg	**A**
Propranolol	Tablet 40mg	**A**
Ranolazine	Tablet: 375 mg; 500 mg; 750 mg; 1000 mg	**S**
Midodrine	Tablet 2.5mg; 5mg; 10mg	**S**
13.2 Antiarrhythmic Medicines		
Adenosine	Injection: 3mg/ml	**S**
Amiodarone	Injection: 50 mg/mL (hydrochloride) in 3 mL ampoule. Tablet: 100 mg; 200 mg; 400 mg (hydrochloride).	**S**
Sotalol	Tablet: 80 mg; 120 mg; 160 mg; 240 mg Oral solution 5mg/ml Injection: 15mg/mL	**S** with control
Verapamil	Injection: 2.5mg/mL, 2mL ampoule Tablet: 40 mg; 80mg	**S**
13.3 Antihypertensive Medicines		
Amlodipine	Tablet 5mg, 10mg	**B**
S-Amlodipine	Tablet 2.5mg, 5mg, 10mg	**D**
Atenolol	Tablet 50mg	**B**
Candesartan	Tablet: 8 mg, 16mg	**S**
Captopril	Tablet 12.5mg, 25mg	**B**
Clonidine	Injection 500mcg/mL; Tablet 0.1 mg, 0.2 mg and 0.3 mg	**S**
Diltiazem	Tablet 60mg	**D**
Doxazosin	Tablet: 2mg; 4mg	**S**

Name of Medicine	Dosage forms and Strengths	Level
Enalapril	Tablet: 2.5mg, 5mg (as hydrogen maleate)	**C**
Esmolol	Injection: 10g/mL	**S**
Hydralazine	Tablet 25mg	**B**
	20mg Powder for Injection/Infusion	**B**
Irbesartan	Tablet 150mg, 300mg; Tablet in fixed dose combination	**S**
Lisinopril	Tablet: 5mg, 10mg	**C**
Losartan	Tablet 50mg; Tablet in fixed dose combination	**B**
Nimodipine	Capsule 30mg	**S**
Methyldopa	Tablet 250mg	**A**
Metolazone	Tablet: 5mg	**S**
Metoprolol	Tablet 50mg	**C**
	Injection 1mg/mL	**S**
Carvedilol	Immediate-release (IR) tablets: 3.125 mg; 6.25 mg; 12.5 mg; 25 mg. Extended-release capsules: 10 mg; 20 mg; 40 mg; 80 mg	**C**
Telmisartan	Tablet: 40mg; 80mg; Tablet in fixed dose combination	**S**
Nicardipine	Injection 2.5 mg/mL	**S**
Sildenafil	Tabet 25mg, 50mg, 100mg	**S**
Bosentan	Tablet: 62.5 mg, 125mg	**S**
13.4 Medicines Used in Heart Failure		
Candesartan	Tablet: 8mg, 16mg Tablet: in fixed dose combination	**S**
Sacubitril + Valsartan	Tablet 24/26mg, 49/51mg, 97/103mg	**S**
Dobutamine	Injection 250mg/5mL	**S**
Dopamine	Injection 250mg	**S**
Digoxin	Injection 250mg/mL	**D**
	Tablet 0.25mg	**D**
Digoxin Immune Fab-Ovine	Injection: 40 mg per vial	**S**
Ivabradine	Tablet: 5mg; 7.5 mg Oral solution: 5 mg/5 mL	**S**
Milrinone	Injection 1 mg/mL	**S**
13.5 Diuretics		
Furosemide	Injection 10mg/mL; Tablet: 40mg	**A**
Eplerenone	Tablet 25mg, 50mg	**S**
Bendroflumethiazide	Tablet: 5mg	**A**
Hydrochlorothiazide	Tablet 25mg; 12.5mg	**D**
Chlorthalidone	Tablet: 12.5mg; 25mg; 50 mg; 100 mg	**S**

Name of Medicine	Dosage forms and Strengths	Level
Mannitol	Injectable solution: 10%; 20%	**C**
Spironolactone	Tablet 12.5mg, 25mg	**C**
Torsemide	Tablet: 2.5mg, 5mg; 10mg	**S**
Tolvaptan	Tablets: 7.5mg; 15 mg; 30 mg	**S**
13.6 Antithrombotic Medicines		
13.6.1 Anti- Platelet Medicines		
Acetylsalicylic acid	Tablet: 75mg, 100mg	**A**
Clopidogrel	Tablet: 75mg; 300mg	**D**
Cilostazol	Tablet: 50 mg; 100 mg	**S**
Prasugrel	Tablet: 10mg	**S** (With special permission)
Ticagrelor	Tablet: 60mg; 90mg	**S** (With special permission)
13.6.2 Thrombolytics		
Alteplase	Powder for injection: 50mg, 100mg vial	**S**
Tenecteplase	Injection: 10 mg/mL	**S**
Streptokinase	Powder for injection: 1.5 million IU in vial.	**S**
Defibrotide	Injection: 10 mg/mL	**S**
13.7 Lipid Lowering Medicines		
Atorvastatin	Tablet 10mg; 20mg; 40mg	**B**
Fenofibrate	Capsule 200mg	**D**
Rosuvastatin	Tablet: 10mg; 20mg	**S**
14.0 Dermatological Medicines		
14.1 Anti-infective Medicines		
Fusidic acid	Cream/Ointment: 2%	**C**
Gentian Violet	aqueous solution: 1%,	**A**
Mupirocin	Ointment 2%	**C**
Potassium permanganate	Potassium permanganate Solution: 1:4000	**A**
Povidone iodine	Solution: 10%	**A**
	Eye drops: 1.25%, 2.5%, 5%	**D**
Silver Sulfadiazine	Cream: 1%	**A**
Topical cream (combination: Gentamicin or Neomycin + corticosteroid [Clobetasol/Betamethasone/Beclomethasone] + antifungal [Miconazole/Clotrimazole])	Cream	**C**
14.2 Anti-inflammatory and Anti-pruritic Medicines		
Betamethasone	cream or ointment: 0.1% (as valerate)	**C**

Name of Medicine	Dosage forms and Strengths	Level
Calamine	Lotion 15.0% w/v	**A**
Sulfur	ointment/cream: 5%, 6%, 10%	**A**
Clobetasol propionate	Cream: 0.05%; 0.1%	**D**
Fludrocortisone	Tablets: 0.1 mg (as acetate)	**D**
Hydrocortisone	Hydrocortisone Cream or ointment: 0.5%, 1%, 2.5%	**A**
Mometasone	Ointment/Cream: 0.1% (as furoate)	**S**
Triamcinolone	Injection 40mg/mL as Acetonide	**S**
	Cream/ointment: 0.1%, 0.5%	**C**
14.3 Medicines Affecting Skin differentiation and Proliferation		
Benzoyl peroxide	Gel 2.5%, 5% and 10%	**A**
Isotretinoin	Cream 0.05%, Capsule 10mg, 20mg	**S**
Podophyllin	Solution 10-25% (prepare from raw materials)	**D**
Salicylic acid	Topical solution: 5%, 17%, 20%, 27% (prepare from raw materials) Cream/ointment/gel: 2%,3%,5%,6%,10%	**C**
Coal tar	Solution 5% (prepare from raw materials)	**C**
Silver nitrate pencil	Silver nitrate pencil	**C**
Tretinoin	Cream: 2.5%	**S**
Imiquimod	Cream: 2.5%, 3.75%, 5%	**S**
Adapalene	Gel / Cream / Lotion: 0.1% and 0.3%	**S**
14.4 Scabicides and Pediculicides		
Benzyl benzoate Emulsion	Emulsion: 25%	**A**
Permethrin	Cream: 5%. Lotion: 1%.	**D**
Malathion	Lotion: 0.5%	**D**
14.5 Sunscreen Protector		
Sunscreen protecting factor (SPF 30+)	Sun screen cream 30+	**B**
15.0 Gastro-Intestinal Medicines		
15.1 Antiulcer Medicines		
Antiacid	Antiacid Mixture containing magnesium trisilicate + aluminum hydroxide and Simethicone	**A**
Bismuth subsalicylate	Chewable tablet/caplet: 262 mg, 525 mg	**D**
Esomeprazole	Tablet 20mg; 40mg	**S**
Lansoprazole	Tablet 30mg	**C**
Magnesium trisilicate	Tablet: (250mg magnesium trisilicate + 120mg dried aluminum hydroxide)	**A**
Octreotide	Injection 50mcg; 100mcg, 200mcg, 500 mcg	**S** (Special permission)
Omeprazole	Tablet 20mg	**A**
Pantoprazole	Tablet 40mg; Powder for injection 40mg	**C**

Name of Medicine	Dosage forms and Strengths	Level
15.2 Drugs affecting Intestinal Secretion and Antispasmodics		
Cholestyramine	Powder 4g per Sachet	**S**
Hyoscine butyl bromide	Tablet 10mg	**A**
	Injection 20mg/mL; 1mL ampoule	**B**
Infliximab	Injection 100mg	**S** (Special permit)
Mebeverine	Tablet 135mg	**D**
Ursodeoxycholic acid	Tablet/capsule 300mg	**S**
15.3 Anti-emetics		
Domperidone	Tablet:10mg; oral suspension 5mg/5ml	**D**
Pyridoxine + Doxylamine	Tablet: 10mg+10mg	**B**
Metoclopramide	Tablet: 10mg; Injection: 5mg/mL; Suspension: 5mg/5mL	**B**
Promethazine	Tablet: (hydrochloride/thiolate) 25mg; Injection (as hydrochloride) 25mg/mL; Elixir 5mg/5mL (as chloral hydrate)	**A**
Ondansetron	Tablet 8mg, Injection 2mg/mL	**D**
15.4 Cathartics		
Bisacodyl	Tablet 5mg	**A**
Lactulose	Solution 3.1 - 3.7g/5mL, 200mL bottle	**C**
L-Ornithine L-Aspartate	Granules: 3 gm, 6 gm Injection: 5gm/10ml	**S**
15.5 Anti-Haemorrhoids		
Anti-Haemorrhoids	Suppositories/ointment: containing at least Local anaesthetic + astringent and anti-inflammatory	**B**
Euphobia prostrata extract	Tablet: 100mg, cream: 1%	**S**
15.6 Medicines Used in Diarrhoea		
Loperamide	Tablet/Capsule (hydrochloride): 2mg	**B**
Oral Rehydration Salts (ORS)	Low osmolality sachet to make 1 litre of solution containing Sodium chloride 2.6g, Sodium citrate 2.9g, Potassium chloride 1.5g and Glucose 20.5g)	**A**
Zinc	Tablet dispersible: 10 mg; 20 mg (elemental zinc)	**A**
16.0 Medicines Used for Diabetes and Related Disorders		
Dapagliflozin	Tablet 5mg, 10mg	**S**
Glibenclamide	Tablet 5mg	**A**
Gliclazide	Tablet 40mg; 80mg; 30mg; 60mg	**A**
Glimepiride	Tablet 1mg; 2mg	**C**
Glucagon	Powder for reconstitution: 10mg/vial	**S**
Metformin	Tablet 500mg; 750; 850MG; 1000MG; SR	**A**
Pioglitazone	Tablet: 15 mg; 30 mg; 45 mg	**D**
Phenoxybenzamine	Tablet 10 mg	**S**
Sitagliptin	Tablet 50mg; 100mg	**S**

Name of Medicine	Dosage forms and Strengths	Level
16.1 Insulins		
16.1.1 Rapid Acting Insulins		
Insulin lispro	Solution for injection (vial, cartridge, pre-filled pen) 100 IU/ml	**D**
Insulin Aspart		**D**
Insulin glulisine		**D**
16.1.2 Short Acting Insulins		
Regular insulin	Solution for injection (vial, cartridge, pre-filled pen) 100 IU/ml	**A**
16.1.3 Intermediate Acting Insulins		
Isophane insulin	Suspension for injection (vial, cartridge, pre-filled pen) 100 IU/ml	**A**
16.1.4 Long-Acting Insulins		
Insulin glargine	Solution for injection (vial, cartridge, pre-filled pen) 100 IU/ml, 300 IU/ml.	**D**
Insulin detemir	Solution for injection (vial, cartridge, pre-filled pen) 100 IU/ml	**D**
Insulin degludec	Solution for injection (vial, cartridge, pre-filled pen) 100 IU/ml, 200 IU/ml	**D**
16.1.5 Pre-mixed Insulin		
Biphasic human insulin regular NPH 30/70	Suspension for injection (vial, cartridge, pre-filled pen) 100 IU/ml	**D**
Biphasic insulin aspart	Suspension for injection (vial, cartridge, pre-filled pen) 100 IU/ml	**D**
Insulin lispro protamine + insulin lispro	Suspension for injection (vial, cartridge, pre-filled pen) 100 IU/ml (75/25 IU/ml or 50/50 IU/ml)	**D**
17.0 Immunological agents		
17.1 Sera and Immunoglobulins		
Recombinant Monoclonal anti-D Immunoglobulin	Injection 300mcg/mL	**C**
Human rabies immunoglobulin (HRIG)	injection, 150 IU/mL	**B**
Snake Venom Antiserum	Snake venom polyvalent Antiserum injection (Central African type)	**A**
Scorpion antivenom immunoglobulin	monovalent or polyvalent, appropriate to locally prevalent species: vial/ampoule.	**A**
Diphtheria antitoxin	Injection: 10,000 IU; 20,000 IU vial	**A**
Tetanus Immunoglobulin	Tetanus Immunoglobulin (human) – 250 IU/mL,250 IU/2.5mL	**A**
17.2 Vaccines		
17.2.1 For Immunization		
BCG Vaccine	Injection 20 doses vial (Bacillus Calmette Guerin)	**A**
DPT-Hep B-Hib Vaccine	Diphtheria, Tetanus, Pertussis, Hepatitis B and Haemophilus Influenza vaccine in vials of 10 doses	**A**
Hepatitis B Vaccine	Injection 10mcg/mL, 20mcg/mL, 40mcg/Ml	**B**
Human Papilloma Vaccine (HPV)	Human Papilloma Vaccine (HPV) – 0.5mL per dose	**A**
Inactivated Polio Vaccine (IPV)	Inactivated Polio Vaccine (IPV)	**A**
Measles-Rubella Vaccine	Injection: 10 doses in vial	**A**
COVID-19 Vaccine	Injection	**B**

Name of Medicine	Dosage forms and Strengths	Level
Oral Poliomyelitis Vaccine (OPV)	Oral Poliomyelitis Vaccine (Live attenuated) Oral solution 20 doses in vial	**A**
Pneumococcal Conjugate Vaccine (PCV13)	Pneumococcal Conjugate Vaccine (PCV13) -4 doses vial	**A**
Pneumococcal polysaccharide vaccine (PPSV-23)	Injection	**S**
Rotavirus Vaccine	Live attenuated monovalent /pentavalent oral suspension	**A**
Tetanus Vaccine	Tetanus Vaccine Injection 20 doses in 10mL vial	**A**
17.2.2 For Specific Groups for Individuals		
Rabies vaccine	Human Diploid Cell Rabies Freeze dried rabies vaccine	**A**
Meningitis vaccine	Injection	**C**
Yellow Fever Vaccine	0.5mL dose	**C**
Hepatitis B Immunoglobulin (HBIG)	100 IU/mL – 1ml or 2ml Vial	**B**
18.0 Muscle Relaxants (Peripherally-Acting) and Cholinesterase Inhibitors		
Neostigmine	Injection: 500microgram in 1mL ampoule; 2.5 (metilsulfate) in 1mL ampoule	**C**
Pyridostigmine	Injection: 5 mg/mL (bromide) in ampoule or vial. Tablet (scored): 60 mg (bromide).	**S**
Physostigmine	Injection: 0.4 mg/ml; 1 mg/ml	**S**
3,4-diaminopyridine	Tablet: 10mg	**S**
Suxamethonium	Injection: 50mg (chloride/mL in 2mL ampoule	**B**
19.0 Ophthalmological Preparations		
19.1 Anti-infective Agents		
Acyclovir ointment	Acyclovir Eye ointment 3%	**C**
Ciprofloxacin	Eye drops 0.3%	**C**
Chloramphenicol	Drops 0.5%, 1%; Eye ointment 1%	**A**
Chlorhexidine	Eye Drops: 0.2%	**S**
Dexamethasone +Chloramphenicol	Drops 0.1% + 0.5%	**C**
Dexamethasone +Gentamicin	Drops 0.1% + 0.3%	**C**
Econazole	Eye Drops 5%	**S**
Erythromycin	Eye ointment	**A**
Natamycin	Drops 5%	**S**
Ofloxacin	Eye Drops: 0.3%	**D**
Moxifloxacin	Eye drops: 0.5%	**S**
Oxytetracycline	Eye ointment 3%	**A**
Povidone Iodine	Eye drops, 2.5-5%	**A**
19.2 Anti-allergy, Artificial Tears and Anti-inflammatory Agents		
Dexamethasone	Eye Drops: 0.1%	**D**
Betamethasone	Eye drops; 0.1%	**D**

Name of Medicine	Dosage forms and Strengths	Level
Hydroxypropyl methylcellulose	Drops 0.70%	**C**
Carboxymethylcellulose	Eye drops: 0.5%	**C**
Methylprednisolone	Injection 40mg/mL	**D**
Prednisolone	Eye drops 0.5%, 1%	**D**
Oxymetazoline	Drops: 0.025%	**C**
Sodium cromoglycate drops	Sodium cromoglycate 2%, 4% eye drops	**C**
Olopatadine	Eye drops: 01%	**D**
19.3 Local and Topical Ocular Anaesthetic Agents		
Amethocaine	Eye drops: 0.5% or 1.0%	**D**
Tetracaine	Eye drops: 5%	**D**
Proparacaine	Eye drops: 0.5%, 1%	**D**
19.4 Miotics and Antiglaucoma		
Acetazolamide	Tablet 250mg	**D**
Brinzolamide	Eye Drops: 1%	**S**
Acetylcholine	Injection; 10 mg/ml	**S**
Betaxolol	Drops 0.25% -0.5%	**D**
Brimonidine	Drops 0.15 – 0.2%	**D**
Dorzolamide	Drops 20 mg/ml	**S**
Latanoprost	Drops 0.005%	**D**
Pilocarpine hydrochloride	Eye drops: 1%, 2%, 4% Gel: 4% Tablet: 5mg, 10mg	**D**
Prostamide bimatoprost	Drops: 0.01, 0.03%	**D**
Timolol	Drops: 0.25%, 0.5%	**D**
19.5 Mydriatics and Anti-vascular Endothelial		
Atropine	Drops 0.5%, 1% w/v; Ointment 1%	**B**
Cyclopentolate	Drops 0.5%, 1% w/v	**D**
Homatropine	Drops 2%	**S**
Tropicamide	Drops 1% w/v	**D**
Tropicamide + Phenylephrine	Drops 0.8% + 5%	**D**
Cyclopentolate + phenylephrine	Eye drops: 1%+2.5%	**D**
19.6 Other Ocular Preparations		
5 –Fluoro Uracil	Eye drops: 1%	**S**
Ganciclovir	Injection: 50 mg/mL ophthalmic gel: 0.15%	**S**
Mitomycin C	5mg/vial, 10 mg/vial	**S**
Cyclosporine	Eye drops: 0.05%	**S**

Name of Medicine	Dosage forms and Strengths	Level
Lifitegrast	Ophthalmic solution: 5%	**S**
Hyaluronidase	Powder for injection: 1500 I. U	**D**
Sodium hyaluronate	Injection: 1%	**D**
Hyaluronic acid	Injection (intra articular): 16 mg	**S**
20.0 Oxytocic's and Anti-oxytocic's		
20.1 Oxytocic's		
Mifepristone	Tablet 200mcg	**C**
Misoprostol	Tablet 200mcg (rectal, sublingual)	**A**
Oxytocin	Injection: 10 IU in 1mL ampoule	**A**
Carbetocin	Injection (heat stable) 100 µg/mL	**B**
20.2 Anti oxytocic's (tocolytics)		
Nifedipine	Immediate – release capsule: 10mg, 20mg	**A**
21.0 Dialysis Solution and Other Related Medicines		
Intraperitoneal dialysis solution	Parenteral solution (of appropriate composition)	**S**
21.1 Medicines for Overactive Bladder		
Oxybutynin	Tablet: 5mg	**S**
Tolterodine	Tablet : 1mg, 2mg, 4mg	**S**
22.0 Psychotherapeutic and Related Medicines		
22.1 Medicines used in Psychotic Disorders		
Benzhexol	Tablet: 5mg	**B**
Chlorpromazine	Injection: (hydrochloride) 25mg/mL in 2mL ampoule; Tablet (hydrochloride) 25mg, 100mg	**A**
Donepezil	Tablet 5mg, 10mg, 23mg	**S**
Memantine	Tablet 5mg, 7mg, 10mg, 14mg, 21mg, 28mg	**S**
Fluphenazine	Injection: 25mg/mL (decanoate) in 1mL ampoule	**C**
Edaravone	Injection: 1.5mg/ml Oral suspension: 105mg/5ml	**S**
Aripiprazole	Tablet: 5mg, 10mg, 15mg, 20mg, 30 mg	**S**
Haloperidol	Injection: 5mg/mL in 1mL ampoule; Tablet 1.5mg	**B**
Lorazepam	Tablet 1mg, 2mg	**C**
Olanzapine	Tablet 5mg; 10mg	**S**
Clozapine	Tablet 25mg, 100mg, 200mg	**S**
Risperidone	Tablet: 0.25 mg; 1 mg; 2 mg; 6.0 mg	**S**
Quetiapine	Tablet: 25 mg; 50 mg; 100 mg; 150 mg; 200 mg; 300 mg; 400 mg	**S**
Zuclopenthixol	Injection: 50mg/mL (Acetate)	**S**
Flupenthixol decanoate	Injection: 20 mg/mL: 100 mg/mL: 200 mg/mL	**S**

Name of Medicine	Dosage forms and Strengths	Level
22.2 Medicines Used in Mood Disorders		
22.2.1 Medicines used in Depressive disorders		
Amitriptyline	Tablet (hydrochloride) 25mg; 75mg	**A**
Sertraline	Tablet: 25mg, 50mg, 100mg	**S**
Citalopram	Tablet 20mg	**D**
Escitalopram	Tablet: 5mg, 10mg, 20mg	**S**
Fluoxetine	Capsule: 20mg	**S**
Duloxetine	Capsule: 20 mg; 30 mg; 40 mg; 60 mg	**S**
Imipramine	Tablet: 25 mg	**C**
Venlafaxine	Tablet: 25mg, 50mg, 75mg, 100mg	**S**
Methylphenidate	Tablet 10mg, 20mg, 30mg, 40mg	**S**
Modafinil	Tablet: 100 mg; 200 mg	**S**
Atomoxetine	Tablet: 10 mg, 18 mg, 25 mg, 40 mg, 60 mg, 80 mg, and 100 mg	**S**
Eszopiclone	Tablet: 1 mg, 2 mg, 3 mg	**D**
Zolpidem	Tablet/capsule: 5 mg; 6.25 mg; 7.5 mg; 10 mg; 12.5 mg	**S**
22.2.2 Medicines in Bipolar Disorders		
Carbamazepine	Tablet 100mg, 200mg	**A**
Lamotrigine	Tablet 100mg, 200mg	**S**
Sodium Valproate	Tablet 200mg, 500mg	**C**
22.3 Medicines Used for anxiety Disorders		
Diazepam	Tablet 5mg	**C**
22.4 Medicines Used for Disorders due to Psychoactive Substance use		
Buprenorphine	Sublingual Tablets: 2 mg	**S**
Bupropion	Tablet: 150 mg; 300 mg; 450 mg	**S**
Methadone	Oral liquid: 5mg/5mL; 10mg/5mL	**C**
Naltrexone	Tablet: 50mg	**S**
23.0 Medicines Acting on Respiratory Tract		
23.1 Anti-asthmatics		
Budesonide inhaler	Inhalation: 100mcg, 200mcg	**B**
Beclometasone	Inhalation: 100mcg, 200mcg (as dipropionate)	**B**
Formoterol	Inhalation: 6 mcg, 12mcg	**C**
Salmeterol	Inhalation: 25 mcg	**C**
Beclometasone + Formoterol	Inhalation: 50/6mcg, 100/6mcg, 200/6mcg	**C**

Name of Medicine	Dosage forms and Strengths	Level
Budesonide + Formoterol	Inhalation: 200mcg+ 6mcg	**C**
Fluticasone propionate	Nasal Spray 50mcg	**D**
Ipratropium Bromide Aerosol	Inhalation (aerosol): 20 microgram/metered dose; Nebulizer 250- 500mcg	**S**
Montelukast	Tablet 5mg; 10mg	**D**
Salbutamol	Tablet (as sulfate) 4mg; syrup (as sulfate) 2mg/5mL	**A**
	Nebulizer solution 2.5 mg/2.5 mL, 2.5mg/mL; 5mg/mL (as sulfate) in multi-dose bottle for use in nebulizers.; Injection 0.5mg/mL; 1mg/ml	**A**
	Inhalation 100mcg, 200mcg	**C**
Salmeterol +Fluticasone	Inhalation 25mcg+250mcg	**C**
Tiotropium	Inhalation1.25mcg/actuation; 2.5mcg/actuation	**S** (With special permit)
23.2 Antifibrotic / Respiratory		
Pirfenidone	Tablet: 200mg	**S**
23.3 Cough Preparations		
Cough syrup	Containing mucolytics/ expectorants/Antitussive	**A**
Dextromethorphan	Syrup 10mg/5ml, 15mg/5ml, 30mg/5ml	**A**
24.0 Solutions, Correcting Water Electrolyte and Acid-Base Disturbances		
Dextrose 5%;	Dextrose 5%; 500mL, 1000mL	**A**
Dextrose 10%;	Dextrose 10%; 500mL	**B**
Dextrose 25%,	Dextrose 25%, 50mL, 100mL	**B**
Dextrose 50%,	Dextrose 50%; 50mL, 100mL	**C**
Calcium polystyrene sulfonate	Powder/Granules Sachets: 5 g or 15 g sachets for oral or rectal administration	**D**
Sodium bicarbonate	Injection: 4.2%; 5%; 7.5%; 8.4% Tablets: 325 mg; 650 mg	**D**
Sodium lactate compound	Sodium lactate compound (Ringer's solution) 500mL, 1000mL.	**A**
Sodium Chloride solution	0.9% Sodium Chloride 500mL, 1000mL	**A**
Sodium Chloride 3% (hypertonic saline)	3% Sodium Chloride 500mL, 1000mL	**C**
Sodium chloride + Dextrose	Solution: 0.9%+5%; 500mL, 1000mL	**B**
Sucrose solution	Solution: 10%	**A**
Potassium chloride	Solution: 11.2% in 20 mL ampoule (equivalent to K+ 1.5 mmol/mL, Cl– 1.5 mmol/mL). Solution for dilution: 7.5% (equivalent to K+ 1 mmol/mL and Cl– 1 mmol/mL); 15% (equivalent to K+ 2 mmol/mL and Cl– 2 mmol/mL)	**C**
Water for injection	2 mL; 5 mL; 10 mL ampoules	**A**
25.0 Vitamins/Minerals		
Ascorbic acid (Vitamin C) Tablet	Ascorbic acid (Vitamin C) Tablet 100mg and 500mg	**A**
Calcium gluconate	Injection: 100mg/mL in 10mL ampoule	**A**

Name of Medicine	Dosage forms and Strengths	Level
Calcium	with vitamins	C
Calcium	with amino acids	C
Ergocalciferol (vitamin D 2)	Capsule: 1.25mg (50, 000IU); Oral solution: 0.25mg/mL (10,000IU/mL)	C
Cholecalciferol (Vitamin D3)	Tablet 400 IU, 800 IU, 1000 IU, 2000 IU, 50,000 IU	C
Glucosamine + Chondroitin sulphate	Tablet: 1500 mg +1200 mg	S
Iron	with vitamins and minerals	C
Nicotinamide (Vitamin B_3)	Tablet 50mg	C
Potassium chloride	Tablet (slow release) 600mg	C
Pyridoxine (Vitamin B6)	Tablet (hydrochloride) 25mg	B
Retinol (Vitamin A) Capsule	Gelatin Capsule: (with nipple to allow administration drop by drop) 50,000IU, 100,000IU 200, 000IU	A
Sodium Hyaluronate	Injection. 1%	S
Thiamine (Vitamin B1)	Tablet (hydrochloride) 50mg, 100mg, Injection 100mg/ml	C
Vitamin B complex	Vitamin B complex Tablet BP (contains per Tablet: nicotinamide 15mg, riboflavin 1mg, thiamine 1mg)	A
	Syrup (contains nicotinamide 15mg, riboflavin 1mg, thiamine 1mg/5mL)	A
	Injection BP in 10mL vial (contains nicotinamide 200mg, pantothenol 30mg, pyridoxine 20mg, riboflavin 20mg, thiamine 50mg per 1 mL)	B
	Tablet/Capsule containing thiamine (B1), pyridoxine (B6), and cobalamin (B12) in fixed dose combination (FDC)	C
Cytidine + Uridine	Tablet or capsule containing Cytidine 5mg + Uridine 3mg	S
Multivitamin + Carotenoids	Tablet/capsules containing multivitamin and carotenoids	D
Multivitamin + Minerals	Tablet/capsules containing multivitamin and minerals	C
Multivitamin	Injection	B
Alpha Tocopherol (Vitamin E)	Tablet/capsule: 500 mg/5 mL (alpha tocopherol acetate)	D
Zinc Sulfate	Dispersible Tablet 20mg	A
26.0 Phosphate Binders		
Calcium Carbonate	Tablet: 500mg	B
Calcium Acetate	Oral Capsules: 667 mg (provides 169 mg of elemental calcium) Oral Tablets: 667 mg Oral Solution: 667 mg/5 mL (provides 169 mg of elemental calcium per 5 mL	S
Sevelamer	Tablet: 400mg, 800mg	S
27.0 Medicines Used in Ear, Nose & Throat Diseases		
27.1 Ear Drops		
Ciprofloxacin	Ear drops; 0.3%	C
Dexamethasone + Neomycin	Ear drops: 0.1% + 0.5%	C
Lidocaine + Beclometasone + Clotrimazole + Chloramphenicol	Ear drop	D

Name of Medicine	Dosage forms and Strengths	Level
27.2 Oral Antiseptics		
Chlorhexidine gluconate	Mouthwash: 0.1% (prepare from concentrated solution); gel	**B**
Potassium permanganate	Potassium permanganate Solution: 1:4000; prepare from powder/crystals	**A**
Hydrogen peroxide	Mouthwash: 3%	**A**
Povidone iodine	Mouthwash: 0.5%, 1%	**A**
27.3 Nasal Preparations		
Ephedrine	Nasal drops 0.5% and 1%	**B**
Sodium chloride	Nasal drop: 0.9%	**A**
Mometasone	Nasal spray 50 micrograms/dose (as furoate)	**S**
Xylometazoline	Nasal spray: 0.05%	**S**
Dexamethasone + Ciprofloxacin	Nasal drops: 0.1% + 0.3%	**D**
28.0 Disinfectants and Antiseptics		
Chlorhexidine + Cetrimide	Solution concentrated containing chlorhexidine gluconate 1.5%+ 15% cetrimide	**A**
Chloroxylenol	Solution 4.9% BP	**A**
Cresol saponated solution	Solution 3% BP	**A**
Formaldehyde	Solution 36 - 37% stabilized	**B**
Glutaraldehyde	Activated solution 2%	**C**
Hydrogen peroxide	Solution 3%	**A**
Hydrogen peroxide	Solution 6%	**A**
Methylated spirit	Solution 70%	**A**
Potassium permanganate	Potassium permanganate Solution 1: 4000	**A**
Povidone-Iodine	Solution 10%	**A**
Sodium dichloroisocyanurate	Tablet, 1.67g (equal to 1g available chlorine)	**A**
Lidocaine + Chlorhexidine Gluconate + Metronidazole	Gel: (2% + 0.2% +0.75%)	**C**
29. Medicines for Notifiable and Neglected Tropical Diseases		
Methylbenzethonium chloride	Solution (Topical): 0.1–0.2%	**S**
Sodium Stibogluconate	Injection intralesional: 100mg/mL	**S**
Meglumine Antimoniate	Injection 1.5mg/5ml in 5ml ampoule	**S**
Miltefosine	Capsule 10mg, 50mg	**S**
Suramin	Injection: 100mg/mL	**S**
Pentamidine	Injection: 300mg vial	**D**
Fexinidazole	Tablet: 600mg	**D**
Eflornithine	Injection: 200mg/mL	**S**
Nifurtimox	Tablet: 120mg	**S**
Melarsoprol	5% solution (60mg/mL)	**S**
Paromomycin	Topical ointment 15%	**S**

Name of Medicine	Dosage forms and Strengths	Level
30. Medicines administered to the Neonates		
Surfactants	Beractant 100mg/4ml, 200mg/8ml Intratracheal suspension	**D**
	Poractant 120/1.5ml, 240mg/3ml Intratracheal suspension	**D**
Caffeine Citrate	Injection: 20 mg/mL	**B**
31. Therapeutic Foods		
Ready to use therapeutic food (RUTF)	Biscuit or paste with: Moisture content: 2.5% maximum Water activity: 0.6 maximum Energy content: 2176–2301 kJ (520–550 kcal) per 100 g of product. Protein content: 10–12% of total energy, equivalent to 13–17 g per 100 g or 2.5–3 g per 100 kcal. Lipid (fat) content: 45–60% of total energy, equivalent to 26–37 g per 100 g or 5–7 g per 100 kcal. n-6 fatty acids: 3–7% of total energy, corresponding to 1.7–4.3 g per 100 g or 330–780 mg per 100 kcal. n-3 fatty acids: 1–2.5% of total energy, corresponding to 580–1530 mg per 100 g or 110–280 mg per 100 kcal. Trans-fatty acids: less than 3% of total fat content, equivalent to less than 1.1 g per 100 g or less than 0.20 g per 100 kcal. Free (added) sugars: Less than 20% of total energy, equivalent to	**A**
F75 Therapeutic milk	400 g hermetic tins or sachets with 75 kcal and 0.9 g protein per 100 ml of reconstituted formula.	**A**
F100 Therapeutic milk	400 g or 800 g canisters/tins and sachets with 100 kcal and 2.9 g protein per 100 ml of reconstituted formula.	**A**
32. Other Medicines administered to the mother		
Multiple Micronutrient Supplement	Tablet containing: Vitamin A (retinol acetate) 800 micrograms retinol activity equivalent Vitamin C (ascorbic acid) 70 mg Vitamin D (cholecalciferol) 5 micrograms (200 IU) Vitamin E (alpha tocopherol succinate) 10 mg alpha tocopherol equivalent Vitamin B1 (thiamine mononitrate) 1.4 mg Vitamin B2 (riboflavin) 1.4 mg Vitamin B3 (niacinamide) 18 mg niacin equivalent Vitamin B6 (pyridoxine hydrochloride) 1.9 mg Folic acid (folic acid) 680 micrograms dietary folate equivalent (400 micrograms) Vitamin B12 (cyanocobalamin) 2.6 micrograms Iron (ferrous fumarate) 30 mg Iodine (potassium iodide) 150 micrograms Zinc (zinc oxide) 15 mg Selenium (sodium selenite) 65 micrograms Copper (cupric oxide) 2 mg	**A**
33.0 Digestive/Pancreatic enzyme preparations		
Pancreatin	Capsule (modified release): 10 000 lipase units + 8000 amylase units + 600 protease units; 25 000 lipase units + 18 000 amylase units + 1000 protease units.	**S**
34.0 Bisphosphonate (Bone resorption inhibitor)		
Ibandronate	Injection: 3 mg/3ml	**S**
Zoledronic acid	Injection: 4 mg/ 5ml	**S**

PART II

THE STANDARD TREATMENT GUIDELINE (STG)

Standard Treatment Guidelines (STGs) provide standardized guidance to health professionals on the diagnosis and management of various medical conditions. They serve as an essential tool for promoting rational use of medicines and ensuring consistent, evidence-based clinical practice across different levels of the health system. The guidelines also provide critical support to healthcare practitioners, particularly those with limited experience or those newly entering clinical practice. STGs are systematically developed recommendations intended to assist practitioners and prescribers in making appropriate decisions regarding the management of specific clinical conditions.

The guidelines include information on disease conditions, diagnostic criteria, Pharmacological Management which involve the medicines of choice and alternative treatment options, Non-Pharmacological Management, as well as key prescribing information such as dosage, duration of treatment, contraindications, side effects, warnings, medicine interactions, and referral criteria. To remain relevant and responsive to advances in medical science and evolving public health priorities, the STGs are reviewed and updated regularly. In Tanzania, the review process is conducted every three (3) years. The Seventh Edition (2026) of the Standard Treatment Guidelines has been comprehensively revised to incorporate new therapeutic interventions, updated diagnostic approaches, and guidance for the management of emerging and re-emerging diseases.

During the development process, strong emphasis was placed on the application of evidence-based medicine. Each chapter was reviewed and updated by a Lead Reviewer, a recognized expert in the respective disease area, nominated by professional associations, with assistance from a multidisciplinary team of technical experts. The STGs address the priority disease conditions in the country and are organized into twenty-seven chapters, as outlined below:

- Chapter One: Approach to patients with Emergency Conditions
- Chapter Two: Anaesthesia and Critical Care
- Chapter Three: Haematological Disease Conditions and Blood Transfusion
- Chapter Four: Notifiable Diseases
- Chapter Five: Malaria
- Chapter Six: HIV/AIDS
- Chapter Seven: TB and Leprosy
- Chapter Eight: Nervous System Disease Conditions
- Chapter Nine: Respiratory Disease Conditions
- Chapter Ten: Gastrointestinal Disease Conditions
- Chapter Eleven: Obstetrics, Gynaecology and Contraception
- Chapter Twelve: Sexually Transmitted Infections
- Chapter Thirteen Skin Disease Conditions
- Chapter Fourteen: Eye Diseases and Refractive Error Conditions
- Chapter Fifteen: Ear, Nose and Throat / Head and Neck Diseases
- Chapter Sixteen: Oral and Maxillofacial Conditions
- Chapter Seventeen: Musculoskeletal Disorders
- Chapter Eighteen: Trauma and Injuries
- Chapter Nineteen: Metabolic and Endocrine Disease Conditions
- Chapter Twenty: Cardiovascular Disease Conditions
- Chapter Twenty-One: Kidney and Urological Disorders
- Chapter Twenty-Two: Malignant Disease Conditions
- Chapter Twenty-Three: Mental Health Conditions
- Chapter Twenty-Four: Nutrition Disorders
- Chapter Twenty-Five: Poisoning
- Chapter Twenty-Six: Rheumatological Disorders
- Chapter Twenty-Seven: Approach to Common neonatal Conditions

Note

- All medicines indicated for treatment of various diseases in the STG are listed in the NEMLIT.
- The referral criteria in the STG are intended to guide the referral of patients to the next level of care when the expertise or diagnostic capacity required to manage the patient may be lacking at that level.

CHAPTER ONE

APPROACH TO PATIENTS WITH EMERGENCY CONDITIONS

1.1 The Concept of Emergency Care and Resuscitation

Emergency care and resuscitation involve rapid assessment and early intervention. The approach to Emergency care and resuscitation needs to be systematic; hence the use of the ABCs. The ABCs approach provides the framework for evaluation and treatment of severely ill patients.

Primary survey

i. Airway

- Assess the airway to establish patency of the airway. This includes: Looking for signs of airway obstruction (signs of trauma, swelling, secretions, presence of foreign body).
- Listening for abnormal sounds like a stridor and snoring.

If there are signs of airway obstruction, intervene by positioning, opening and clearing the airway. Perform a chin lift or jaw thrust maneuver to open the airway (If suspecting cervical spine injury, use the jaw thrust maneuver). Use suction to remove secretions. Airway adjuncts, such as oropharyngeal or nasopharyngeal airway can be used.

Note

- Remember to reassess the airway after performing interventions.
- Some patient may require use of advance airway devices like endotracheal intubation or surgical airway.
- Use video laryngoscopy over direct laryngoscopy helps to improve first-pass success.
- emergency intubation

ii. Breathing

Upon completing airway assessment and intervention, assess for the presence of breathing, signs of respiratory distress such as tachypnea, hypoxia, cyanosis, apnea and abnormal breath sounds. Provide oxygen when oxygen saturation is below 92% or when the patient is dyspneic. Oxygen can be administered using the nasal prong, simple face mask, non-rebreather mask or Ambu bag. Advanced interventions include mechanical ventilation.

iii. Circulation

Check for pulse (central pulse) for not more than 10 seconds. If absent, start CPR (**Refer cardiopulmonary resuscitation section 1.3**). Assess for signs of poor peripheral perfusion (shock) such as cold extremities, prolonged capillary refill, dry mucous membrane and hypotension. If there are signs of shock, establish two (2) IV large bore cannula and give IV fluids (crystalloids) bolus (2lts in adults and 20mls/kg in pediatrics). Limit fluids to individuals whom you suspect of having heart failure, renal failure or malnourished children.

iv. Disability

This involves a rapid assessment of neurological status. This includes assessment for the level of consciousness (use of AVPU or Glascow coma scale), signs of convulsions, random blood glucose level, examination of the pupils and presence of focal neurological deficit. Interventions that can be performed during the disability assessment include correction of hypoglycemia, airway protection, stopping the convulsions by administering anticonvulsant.

v. Exposure

This involves fully exposing the patient and rapid assessment of the body for signs of trauma, rashes or infection.

Secondary survey

After assessment and stabilization of ABCs during the primary survey, focus is turned into secondary survey. The secondary survey is a systematic assessment of the rest of the body to identify injuries and illnesses. Common approaches include a head-to-toe or organ –system-based assessment. It is important to note that the secondary survey is performed after the primary assessment and interventions.

When performing a secondary survey, if the patient condition changes, then you must stop immediately and redo the primary survey and necessary interventions.

Note:

All patients with compromised airway, breathing, circulation or disability must be attended in the resuscitation rooms. (Refer Triage overview section)

1.2 Triage Overview

Triage is the process of determining the priority of a patient to medical care based on the acuity (severity of condition) and capacity of the system to address the condition to optimize outcome.

Importance of Triage

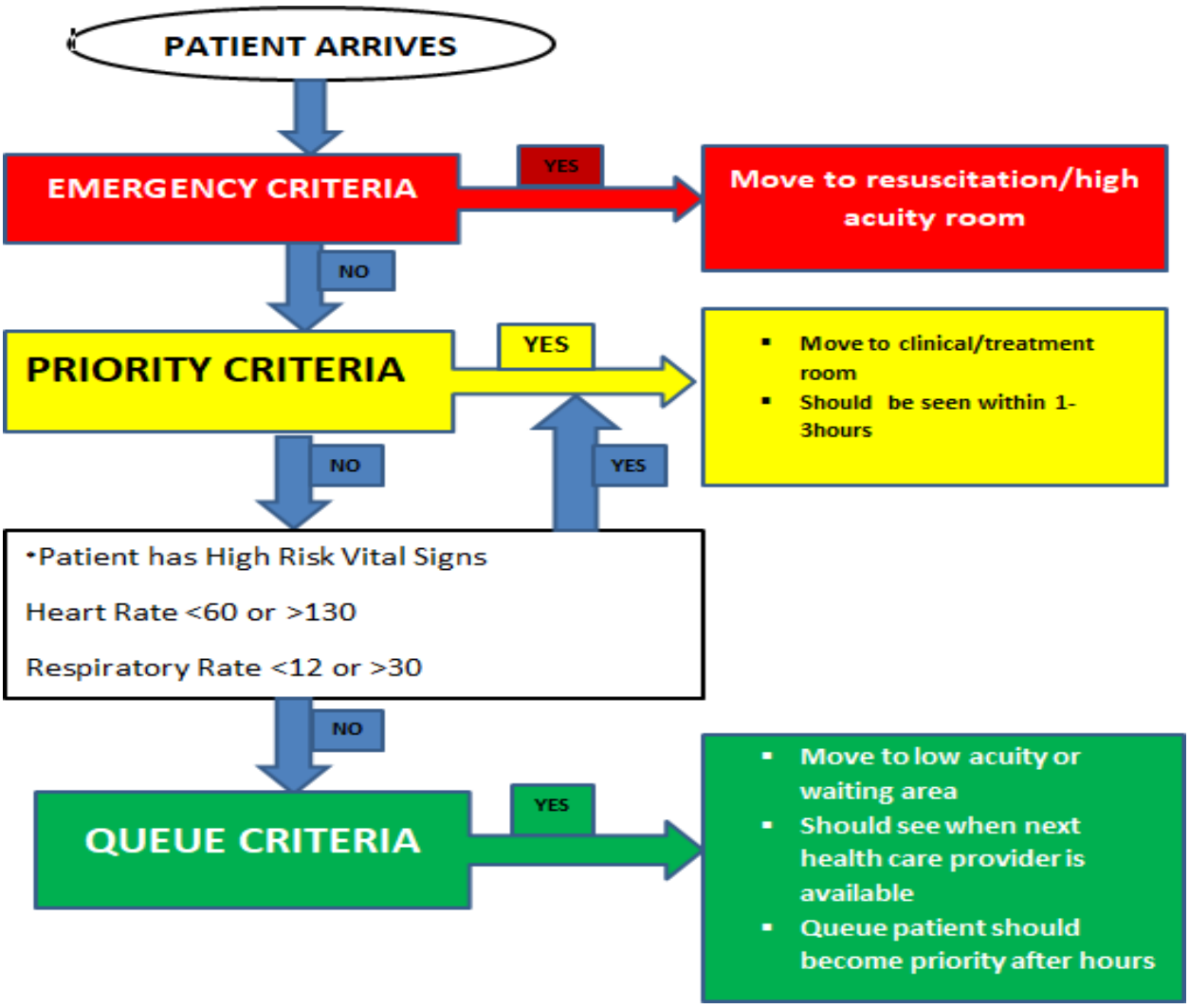
Triage enables quick identification of patients who need immediate attention and hence improves patient outcomes by avoiding potential delays. It helps in organizing, monitoring, evaluating and determining the department resources that patients might need.

Triage system

The triage system is based on recommendation of Emergency Medicine expert's basic principles of triage, which uses specific criteria to categorize patients into three main levels of acuity:

Emergency

All patients with immediate life or limb threats who are deemed salvageable, but likely to further decompensate without immediate intervention will be triaged in this level. This category can also be labeled as **RED**. **Priority:** those seriously injured/ill patients with potential to decompensate if not treated within 1 hour are triaged as priority cases. This category can also be labeled as **YELLOW.**
Queue: this level includes all the walking wounded or those with less serious injury/sickness who are unlikely to decompensa te. Patients in this category can safely wait for their turn. However, they should be monitored as their conditions may change and warrant immediate care. This category is also labeled as **GREEN.**



EMERGENCY CRITERIA (Tick here if Yes)				
	Unresponsive			Pregnant with Heavy bleeding
	Stridor			Pregnant with Severe abdominal pain
	SpO2 <90%			Pregnant with Seizures
	Respiratory distress or cyanosis			Pregnant with Severe headache
	Weak pulse or Capillary refill>3 sec			Pregnant with Visual changes
	Hear rate <50 or > 150			Pregnant with SBP≥160 or DBP ≥110
	Heavy bleeding			Pregnant with Active labour
	Active convulsions			Pregnant with Trauma
	Hypoglycemia			Age < 2years with Temp <36°C or > 39°C
	High-risk trauma*			Child <14 with severe dehydration
	Poisoning exposure or dangerous chemical			Adult with signs of meningitis
	Threatened limb*			Acute chest or abdominal pain (>50 years old)
	Snake bite			ECG with acute ischaemia
	Violent or aggressive			Other (state):____
PRIORITY CRITERIA (Tick here if yes)				
	Vomits everything or ongoing Diarrhoea (adult)			Severe pain (no red criteria)
	Unable to feed or drink			Visible acute limb deformity
	Severe pallor			Open fracture
	On-going bleeding (no emergency criteria))			Suspected dislocation
	Recent fainting			Other trauma/burns (no red criteria)
	Altered mental status (no emergency criteria))			Sexual assault
	Acute general weakness			Acute testicular/ scrotal pain or priapism
	Acute focal neurology			Unable to pass urine
	Acute visual disturbance			Wheezing (no red criteria)
	New rash worsening over hours or peeling (no emergency criteria)			Exposure requiring time- sensitive prophylaxis (example: animal bite, needle-stick injury)
	Any infant 8 days to 2 months old			Child below 14 years old with malnutrition
	Child below 14 years old with dehydration			Child below 14 years old with ongoing Diarrhoea
	Referral patient (no emergency criteria)			Other, state: _____
QUEUE CRITERIA (Tick here if Yes)				
	Patient with no Emergency or priority criteria indicated in above tables			

Figure 1. Summary of triage flow and timelines of care

1.3 Cardiac Arrest and Cardiopulmonary Resuscitation

Cardiopulmonary resuscitation is an emergency lifesaving procedure performed when there is a sudden cessation of heartbeat. It involves the combination of chest compression and artificial ventilation to preserve blood flow to the organs including the brain function. Early initiation of CPR can double or triple the chances of survival after cardiac arrest.

Note: HIGH QUALITY CPR

- Compressions:
  - Infant: heel of one hand (if alone) or thumb encircling technique (if you have assistance)
  - Child: 1 or 2 hand
  - Adult: Two hands
  - Compression rate: 100-120/min
  - Compression depth: approximately 1/3 antero-posterior diameter of the chest
  - Compression/ventilation ratio: 30:2 (adults and children), For Infants-30:2 (if alone) and 15:2 (if you have assistance), for neonates' compression/ventilation ratio 3:1
- Allow chest recoil
- Minimize interruptions
- Adequate ventilation

Clinical Presentation

- Unresponsiveness (sudden loss of consciousness)
- Absence of central pulse (carotid pulse/femoral pulse or brachial pulse in infants)
- Loss of spontaneous respiration

Investigations

While continuing with CPR, point of care (POC) tests are conducted while looking for the reversible causes of cardiac arrest (Hypovolemia, hypoxia, hypo/hyperkalemia, acidosis, hypothermia, hypoglycemia, tension pneumothorax, toxins, thrombi, cardiac tamponade). These include:

- Blood gases
- Bicarbonates
- Electrolytes- Potassium, sodium, Calcium, Chloride,
- Creatinine, POC urea
- RBG
- Bedside ultrasound- looking for pneumothorax, cardiac tamponade or thrombi
- Toxicology serum blood and urine screens (If available)
- ECG (if there is return of spontaneous circulation)
- Lactate
- Troponin

Non- Pharmacological Management

- **HAZARDS**- ensure safety and use of PPEs
- **HELLO-** Check for responsiveness, Carotid pulse (not more than 10 seconds) and breathing
- CPR starts with early recognition (unresponsiveness, loss of spontaneous breathing and absence of carotid pulse.
- In infant's CPR is initiated when the heart rate is below 60 beats/min
- Call for **HELP** and immediately start chest compression. As more members arrives to help assign different roles including airway and breathing management, time recording, documentation, AED/monitor operation and medications administration
- Open the airway by performing chin lift or jaw thrust (if suspecting C spine injury). Use airway adjuncts to open the airway.
- Give 2 breaths using bag valve mask connected to oxygen source and observe for chest rise
- Establish IV access for administration of fluids and medications; if failed, perform Intraosseous access
- After **FIVE** cycles of compression/ventilation **(2 minutes),** check for pulse and use AED/Defibrillator to analyze rhythm if there is a need to deliver shock
- If no need for shocking, continue with CPR for another **2 minutes** (FIVE cycles)
- Use **capnography ($ETCO_2$ monitoring)** during CPR to assess quality. Maintain $ETCO_2$ >10 mmHg as a marker of effective compressions
- Double sequential defibrillation (DSD) may be considered for refractory VF/pVT

Pharmacological Management

For Adults

A: epinephrine (adrenaline) (IV) 1mg, (repeat every 3-5 minutes)
AND
A: sodium chloride 0.9% (IV) 2000mls, if suspecting hypovolemia as a cause of the arrest
AND
A: dextrose 5% (IV) if needed to correct hypoglycemia
OR
B: dextrose 10%, 25% or 50% (IV) if needed to correct hypoglycemia
AND
D: sodium bicarbonate 1mmol/kg (IV) push (if needed to correct acidosis)
AND
S: esmolol IV bolus 500 mcg/kg then infusion 50–200 mcg/kg/min

For Pediatrics

A: epinephrine (adrenaline) (IV) 0.01mg/kg (repeat every 3-5 minutes)
AND
A: sodium chloride 0.9% (IV) 20mls/kg; if suspecting hypovolemia as a cause of the arrest
AND
A: dextrose 5% (IV) if needed to correct hypoglycemia

***Additional medications may be required depending on the cause of the cardiac arrest (the reversible cause)**

> **Note:** Upon achieving return of spontaneous circulation (ROSC), a definitive airway is achieved by performing endotracheal intubation for mechanical ventilation and patients must be admitted to the ICU or transferred to a facility with an ICU capacity.

1.4 Rapid Sequence Intubation (RSI)

Rapid sequence intubation (RSI) is an airway management technique that is focused on inducing immediate unresponsiveness by the use of induction agent followed by relaxation of the muscles using a neuromuscular blocking agent. RSI is the fastest and most effective method of controlling the airway.

Use this checklist to make sure all equipment is ready (Mnemonic: SOAP ME).

- **S**uction - suction apparatus, Yankauer, suction catheter
- **O**xygen - working oxygen, non-rebreather mask (NRBM), BVM
- **A**irways – Nasal Pharyngeal Airway, Oral pharyngeal airway, Endotracheal tube, Laryngeal mask airway, surgical airway kit
- **P**re-oxygenate - 15L/min via NRBM
- **M**edications / Monitor – prepare & decide on RSI drugs
- **E**quipment - stylet, bougie, laryngoscope, glidescope

ETT Size for Children: (Refer to Broselow Tape)
OR
Age in years/4 + 3 (Cuffed)
Age in years/4 + 4 (Uncuffed) ALWAYS HAVE DIFFERENT SIZE TUBES AVAILABLE

LMA size	1	1.5	2	2.5
Weight (Kg)	<5	5-10	6.5-20	20-30
Age (yrs)	<6 months	< 12 months	1-5	5-10

> **Note:** The INTUBATING TEAM should be a minimum of 3 people. Physicians performing intubation should verbalize the intubation plan to all team members. The most experienced person available should be the one performing the procedure.

Pharmacological Management
First line Choose one sedative

B: ketamine (IV) 2mg/kg (ketamine is the preferred agent for intubation for asthma and anaphylaxis)
OR
D: midazolam (IV) 0.2mg/kg; intubation doses are higher than sedation doses (15 – 20mg)
OR
D: propofol (IV) 2-2.5mg/kg onset: 10-15 seconds; suitable for patients with seizures or status epilepticus
OR
S: etomidate (IV) 0.3mg/kg (0.15mg/kg if hypotensive); not to exceed 20 mg

Second line: Choose one paralytic
Always give sedation before paralytics

B: suxamethonium (IV) 1-2mg/kg; onset of action: 30-60 seconds, duration of action: 10 minutes. (**Note:** Use with caution: may cause hyperkalemia)
OR
S: rocuronium (IV) 0.6-1.2 mg/kg; onset of action: 1-15 minutes, duration of action 30-60 minutes.
Post Intubation Care

B: pethidine (IV) 1mg/kg 4hourly (always remember to monitor the patient's pain response)
OR
C: morphine (IV) 0.05-0.1 mg/kg every 30 minutes (maximum: 10 mg per dose). Always remember to monitor the patient's pain response)
OR
S: fentanyl (IV) 1-2mcg/kg bolus; then 25-250 mcg hourly (titrate every 20 minutes)

Give continuous sedation

C: lorazepam (IV) 1-4mg bolus; then 0.01-0.1mg/kg hourly (titrate every 1 hour)
OR
D: midazolam (IV) 1-5mg bolus; (0.05-0.1 mg/kg) then 0.04-0.2mg/kg hourly (titrate every 1 hour)

Note: Remember to confirm ETT placement and NGT insertion.

1.5 Approach to Stridor

Stridor is an abnormal, high-pitched sound produced by turbulent airflow through a partially obstructed airway. Stridor is a dangerous finding and may indicate imminent airway obstruction. It can be inspiratory, expiratory or biphasic.

Clinical Presentation:

- Hypoxia
- Respiratory distress
- Altered mental status
- Inability to speak
- Inability to swallow

Differential diagnoses

Infectious causes- croup, epiglottitis, peri-tonsillar abscess, retropharyngeal abscess, non-infectious causes- Foreign body obstruction, burns, trauma, anaphylaxis, malignancy, laryngotracheomalacia, stenosis.

Note: Assess the airway (If unstable, consider surgical intervention/consult; if stable, consider imaging or direct visualization of larynx with fiberoptic scope or video laryngoscope

Investigations

Blood gases analysis, Lateral neck X-ray (for foreign body, masses or soft tissue swelling), CXR (foreign body, evidence of aspiration), CT- scan Neck, Blood Sugar, Lactate, Electrolyte analysis, and/or Serum creatinine and urea

Non-Pharmacological Management

Keep the patient calm by allowing the patient to assume their most comfortable position. Give oxygen if there are signs of increased work of breathing.

Pharmacological Management

It will depend on the underlying cause. The following medications can be used in the management of stridor;

A: epinephrine (adrenaline) (nebulization) 0.5mls/kg
AND/OR
B: dexamethasone (PO/IV/IM) 0.15- 0.6mg/kg stat (Max 10mg)

Note:

- Since stridor can be as a result of various causes, management should be focused on the underlying causes
- Administer IV fluids (if signs of shock) – refer section on the management of shock
- All patients with stridor whose cause have not yet been established must be referred to higher health facilities

1.6 Cough

Cough is a common reflex action that clears the throat of mucus, allergens, dust or other foreign irritants. A cough can be caused by several conditions, both temporary and permanent. Frequent coughing indicates the presence of a disease.

Characteristics of cough/sputum

- If cough is dry without sputum and fever, it is probable an allergic condition or mild upper respiratory illness (e.g., allergic rhinitis or allergic bronchitis)
- If cough is dry without sputum or fever and is associated with other congestive symptoms, it may be due to Congestive Cardiac Failure (CCF)

- If it is a repeated attack cough with wheezing but without fever, it is likely to be bronchial asthma
- If it is a cough with fever, rapid breathing, and chest in-drawing, it is likely pneumonia
- If it is cough with sputum that is yellowish pus-like and there is fever, it is likely acute bronchitis or pneumonia
- If it is cough with blood in sputum and/or irregular fever with loss of weight and appetite, it is suspected tuberculosis
- If it is cough with a large quantity of foul-smelling sputum, very foul-smelling it is likely a lung abscess or bronchiectasis

Non-Pharmacological Management

Ensure the patient is positioned in a comfortable and supportive posture

Pharmacological Management

Causative/precipitating factors, e.g., CCF, asthma, and allergies, must be established and treated accordingly. (**Refer respiratory disease condition chapter 9)**

Note: Refer to a high facility with expertise when a cough persists and fails to establish the cause or when associated with fever.

1.7 Approach to dyspnea (Shortness of breath)

Shortness of breath or breathlessness may result from a range of pulmonary, cardiac, and central nervous system causes. It is important to look for the underlying cause for immediate intervention.

Clinical Presentation

- Increased work of breathing
- Altered mental status
- Diaphoresis
- Additional sounds- stridors, wheezes

Differential diagnosis

- Pulmonary embolism
- Pulmonary oedema
- Myocardial infarction
- Asthma
- Anaphylaxis
- Airway obstruction
- Tension pneumothorax
- Cardiac tamponade
- Acute chest syndrome
- Pneumonia
- Pericarditis

Investigations

Blood gases, Serum Electrolytes, Serum Creatinine and Urea, Troponins, Chest X-ray, POC ECG, Bedside Ultrasound, Lactate, Troponin, Random blood glucose, CT- PA

Non-Pharmacological Management

- Obtain a thorough history and perform both primary survey (ABCs) and secondary survey, and provide necessary interventions
- Obtain Vital signs
- Position the patient
- Give Oxygen if hypoxic or increased work of breathing

Pharmacological Management

Pharmacological Management depends on the underlying cause of difficulty in breathing. (**Refer respiratory disease condition chapter 9)**

1.8 Approach to Upper Gastrointestinal Bleeding

Upper GI bleeding is any GI bleeding originating proximally to the ligament of Treitz.

Clinical Presentation

Hematemesis and coffee-ground emesis suggest a UGI source. On physical examination, vital signs may reveal

- Hypotension
- Tachycardia.
- Cool, clammy skin as a sign of shock.
- Abdominal examination may disclose tenderness, masses, ascites, or organomegaly.
- Presence of blood and its appearance on rectal examination, whether bright red, maroon, or melanotic.
- Spider angiomas, palmar erythema, jaundice, and gynecomastia, which may suggest liver disease.
- Petechiae and purpura may suggest an underlying coagulopathy

Differential diagnosis

Peptic ulcer disease, upper GI malignancy, oesophageal or gastric varices, esophagitis, Mallory- Weiss tear, Boerhaave syndrome and arteriovenous malformation

Investigations

ABO Grouping and cross-matching, Complete Blood Count, Hemoglobin Level, Blood Urea Nitrogen and Creatinine, Electrolytes, (Sodium, Potassium, Calcium Chloride), PT, PTT, INR, Liver Function Tests, Lactate levels, Obtain an ECG in patients with underlying coronary artery disease and/or Bedside Ultrasound, CXR (If suspecting perforation)

Non-Pharmacological Management

Maintain ABCs, give oxygen if needed

Pharmacological Management

Give blood if severe pallor, ongoing bleeding, Hb < 5g/dl, and Hb < 7g/dl (with active bleeding)

Adults: 2 units within 1 hour and Pediatrics: 20ml/kg 1 hour (whole blood) or 10ml/kg (pRBC), If ongoing indication for blood, start transfusion in the following ratio: 1unit pRBCs (20ml/kg

Pediatric: 1unit FFP (20mls/kg in Pediatric): 1unit PLT (20ml/kg in Pediatric)

THEN

A: sodium chloride 0.9% (IV)

OR

A: sodium lactate compound (ringer's lactate)(IV); Adults 2000mls and Pediatrics 20ml/kg

AND

C: pantoprazole (IV); Adults 80mg stat, then infusion 8mg/hour for 3days, Paediatrics1mg/kg stat (max 80mg) then infusion 1mg/kg/hour for 3days

OR

S: esomeprazole (IV) 40mg 24hourly for 3days

For patients with suspected variceal bleeding,

S: octreotide (IV) Adults 50mg slow bolus, then infusion 50mcg/hour for 5days; Paediatrics1mcg/kg/hour (maximum 50mcg/hour) for 5days

If features suggestive of cirrhosis;

B: ceftriaxone (IV) 1g 24hourly for 7days

OR

C: ciprofloxacin (IV) 400mg 12hourly for 7days

Definitive Care: Early endoscopy and Intensive care unit admission (Refer to the Gastrointestinal disease chapter)

1.9 Approach to Seizure and Status Epilepticus

Status epilepticus is a single seizure ≥5 minutes in length or two or more seizures without recovery of consciousness between seizures. Status epilepticus is a neurologic emergency, and treatment should be initiated in all patients with continuous seizure activity lasting more than 5 minutes.

Clinical Presentations

- Abrupt onset seizures
- Altered mental status
- Postictal drowsiness
- Tongue biting

Differential diagnoses

Epilepsy, meningitis, encephalitis, malaria, space-occupying lesion, alcohol withdrawal, isoniazid toxicity, intracranial hemorrhage, metabolic abnormalities- hyponatremia, eclampsia, acute hydrocephalus.

Investigations:

Blood Glucose, Electrolytes: (Sodium, Potassium, Chloride, Magnesium, and Calcium), ECG, Bedside ultrasound, Blood gases, Malaria Test, Serum creatinine and urea, Lactate levels, Pregnancy test (females), Toxicology screening and/or CT Head

Non-Pharmacological Management

- Protect the patient from injury (If possible, place in left lateral position to reduce aspiration risks), Don't place tongue depressor
- Perform both primary and secondary assessments and provide necessary interventions
- Give Oxygen if needed
- Do a bedside random blood sugar test
- Establish IV access for administration of anticonvulsants; if unable, use the rectal route
- Connect the patient to the cardiac monitor to obtain vital signs

Pharmacological Management

Active seizure 0-5minutes.

Supportive care:

IV access, monitors, maintain airway, oxygen therapy. Check the point-of-care glucose and provide:

Initial treatment:

A: dextrose 5% (IV); if glucose is ≤ 3.5mmol/L

AND

A: diazepam (IV) 0.15-0.2 mg/kg (up to 10mg); may repeat one dose or PR 0.2-0.5 mg/kg (up to 20 mg) once

OR

D: midazolam (IM) 10mg (> 40 kg), 5mg (13-40 kg), or 0.2 mg/kg. May also be given (IN) as a spray at 0.2 mg/kg, max 10mg, or buccal at 0.3mg/kg, max 10mg

OR

C: lorazepam (IV) 4mg or 0.1mg/kg; may repeat one dose

Secondary medications:

C: phenytoin (IV) 18mg/kg at ≤ 50mg/min (avoid in pregnancy)

OR

C: sodium valproate (IV) 20-40 mg/kg at 5mg/kg/min, max 3000mg (avoid in pregnancy)

OR

S: levetiracetam (IV) 60mg/kg, max 4500mg/dose, or 1500mg oral load (preferred in pregnancy)

Refractory medications:

A: phenobarbitone (IV) 15-20mg/kg at 50-75 mg/min, then continuous infusion at 0.5-4mg/kg hourly.

OR

B: ketamine (IV) loading dose 0.5-3mg/kg, followed by infusion of 0.3-4mg/kg/hr.

OR

D: midazolam (IM) 0.2mg/kg, then infusion of 0.05-2mg/kg/hr. Pediatrics 0.1mg/kg then infusion 0.06-0.4mg/kg hourly

OR

D: propofol 2-5mg/kg, then infusion of 2-10mg/kg/hr. Pediatrics 3mg/kg loading dose, then 7.5-18mg/kg hourly

Consider **INTUBATION** if the patient is still seizing

C: thiopental (IV): Adults 3-6mg/kg loading dose then 25-100mg infusion as needed; Pediatrics 2-5mg/kg loading dose

OR

D: propofol (IV): Adults 2mg/kg loading dose then 2-10mg/kg hourly

OR

D: midazolam (IV): Adults 0.2mg/kg loading dose then 0.1-0.2mg/kg hourly.

Note: Intensive care unit admission or refer to the higher health facility with ICU/HDU capacity.

1.10 Approach to Altered Mental Status

This is the acute alteration in brain function and may include alteration of arousal or awareness, thought content, memory or attention.

Clinical Presentation

Depending on the cause but may include agitation, Restlessness, Hemiparesis, visual deficit, dysphasia

Differential diagnosis

The mnemonic AEIOU TIPS is widely preferred in the emergency department when considering a broader differential. Alcohol/acidosis, Epilepsy/Electrolytes, Insulin/Inborn Errors of Metabolism, Oxygen/Overdose, Uremia, Trauma, Infection, Psychiatric/Poisoning, Stroke/Subarachnoid Hemorrhage/Shock

Investigations

POC Glucose, Rapid Malaria test, Blood gases, Serum Electrolytes, POC ECG, Bedside ultrasound, Serum Creatinine and Urea, Lactate, Complete Blood Count, Liver function tests, Head CT-scan, Chest Xray and/or Toxicology screening (If highly suspicious of intoxication)

Non- Pharmacological Management:

- If aggressive/ restless, consider restraining- mechanical or chemical (medications)
- Obtain a set of vital signs, including random blood glucose
- Perform both primary and secondary assessments and provide necessary interventions.
- Give Oxygen if Hypoxic or dyspneic
- Connect the patient to the cardiac monitor to obtain vital signs

Pharmacological Management

Treatment will depend on the cause of the altered mental status. For agitated patients, if needed to sedate, use:
A: diazepam (IV): Adults 5-10mg loading dose, maintenance 0.03-0.1mg/kg every 30 minutes to 6 hours; Pediatrics 0.1-0.15mg/kg stat, may repeat after 3-5 minutes

OR

B: haloperidol (IV): Adults 0.5-10mg (If concerned about psychiatric disorder) Child: safety and effectiveness not established

OR

B: ketamine (IV) 1-2mg/kg and 2-4mg/kg for (IM)

OR

D: midazolam (IV): Adults 5mg stat, maintenance 20-100mcg/kg/hr. infusion; Pediatrics 0.05-0.1mg/kg stat.

Note: Consult/refer to a higher center with a psychiatrist if concerned about a psychiatric disorder

1.11 Anaphylaxis

Anaphylaxis is a severe, life-threatening, generalized or systemic hypersensitivity reaction characterized by rapidly developing life-threatening airway (pharyngeal or laryngeal edema) and/or breathing (bronchospasm and tachypnea) and/or circulation (hypotension and tachycardia) problems usually associated with skin and mucosal changes.

Clinical Presentation

- Hives
- Angioedema
- Wheezes
- Difficult breathing
- Diarrhea
- Hypotension

Anaphylaxis is a clinical diagnosis and should be suspected when:

- Acute onset involving skin, mucosal tissue, with either respiratory compromise or blood pressure reduction (or syncope)
- Hypotension after exposure to a known allergy for the patient (SBP <90mmHg or >30% from baseline)
- Respiratory compromise (i.e., dyspnea, stridor, wheeze, hypoxemia)
- Exposure to a likely allergen causes involvement of the skin, mucosal, respiratory compromization or blood pressure reduction

Investigations

Blood gases, Serum Electrolytes, POC ECG, Troponin, CXR and/or POC USS

Non-Pharmacological Management

- Perform both primary and secondary assessments. If the patient has signs of severe respiratory distress, perform early intubation/surgical airway
- Give oxygen if hypoxic (spO2 below 95%) or severe respiratory distress
- Insert TWO large-bore IV cannulas or obtain intraosseous access

Pharmacological Management

For Adults

A: epinephrine (adrenaline) (IM) 0.3-0.5mg (maximum 0.5mg) every 5-15min as soon as possible.

If inadequate response, start.

A: epinephrine (adrenaline) (IV) 2-10mcg/min in 0.9% sodium chloride or Ringer Lactate

If hypotensive.

Repeat IV fluids as needed;

For Pediatrics 0.01mg/kg, every 5-15min as soon as possible.

If inadequate response, start.

A: epinephrine (adrenaline) (IV) 0.05- 1mcg/kg/min in 0.9% sodium chloride or sodium lactate compound (ringer's lactate)20mls/kg

If hypotensive.

Repeat IV fluids as needed.

OR/AND

A: hydrocortisone (IV)200mg stat

OR/AND

B: salbutamol nebulizer10mg and equal volume of water for injection (This is useful to patients with refractory bronchospasm).

OR/AND

D: methylprednisolone (IV) 1-2mg/kg/day

Note: All patients with severe and moderate symptoms which required repeated doses of epinephrine (adrenaline) or do not respond to treatment must be admitted or referred to a higher health facility. Those with mild responses who responded to IM epinephrine (adrenaline) may be discharged after 4 hours' observation at the health facility.

1.12 Cardiac Tamponade

Cardiac tamponade is the result of compression of the myocardium by fluid, gas, pus, blood, or a combination of substances. It occurs in a physiological continuum reflecting the amount of fluid, the rate of accumulation, and the nature of the heart. The result is increased pericardial pressure, which causes decreased ventricle compliance and decreased flow of blood into the right ventricle, which eventually leads to decreased cardiac output. Conditions that may predispose a patient to pericardial effusion and tamponade include trauma, radiation exposure, Tb pericarditis, renal failure (uremic pericarditis), autoimmune diseases, drugs that induce a lupus-like syndrome, hypothyroidism, or ovarian hyperstimulation syndrome.

Clinical Presentations

- Chest pain and dyspnea
- Pulsus paradoxus >10 mm Hg
- Beck's triad includes low blood pressure, elevated jugular venous distention, and decreased heart sounds.
- In the absence of hypotension and tension pneumothorax in a patient with PEA, consider the diagnosis of cardiac tamponade.

Investigations

Bedside ultrasound and ECHO, POC, ECG, Blood gases, Serum Electrolytes, Troponins, Pericardial fluid analysis- biochemistry, microbiology and cytology, Serum creatinine and urea, and/or Chest X-ray

Non- Pharmacological Management

- Perform both primary and secondary assessments and provide appropriate interventions.
- Give oxygen if hypoxic or increased work of breathing
- Connect the patient to a cardiac monitor and obtain vital signs
- Pericardiocentesis is the definitive management

Pharmacological Management

A: sodium chloride 0.9% (IV): Adults 1-2 litres; Pediatrics 20ml/kg to increase right-sided filling pressure

Note

- The definitive treatment for cardiac tamponade is pericardiocentesis. A cardiology consultation or referral is strongly recommended. In emergency settings, pericardiocentesis may be performed by a qualified and experienced medical practitioner in the emergency department.
- All patients with cardiac tamponade require inpatient management in an intensive care unit setting/HDU.

1.13 Pulmonary Edema

A life-threatening condition that occurs due to abnormal fluid build-up in the lungs, leading to impaired gaseous exchange, acute respiratory distress and may cause respiratory failure. Can be classified as cardiogenic pulmonary edema, due to increased hydrostatic pulmonary pressure (HF) and non-cardiogenic pulmonary edema, due to increased permeability (acute lung injury and allergic alveolitis).

Note: Cardiogenic and non-cardiogenic pulmonary edema have no clear-cut differences in Clinical Presentation, however identifying the specific underlying cause of pulmonary edema is significant for therapeutic and prognostic purposes.

Clinical Presentation

Shortness of breath, use of accessory muscles, diaphoresis, tachypnoea and crepitations

Investigations

Chest X-ray, Blood gases, Serum Creatinine and Urea, POC ECG, POC troponin, BNP, Serum electrolytes and/or Bedside Ultrasound

Non-Pharmacological Management

- Perform both primary and secondary assessment and provide necessary interventions
- Give high-flow oxygen therapy
- Put the patient on a cardiac monitor (if available) and obtain vital signs
- Position the patient at a 45° angle or in the sitting upright position
- Perform ECG (rule out ischemia, dysrhythmia). Perform bedside ECHO (to rule out cardiac causes-contractility, pericardial effusion)
- Perform chest ultrasound (comet tails and B lines)

Pharmacological Management

Control hypertension (Maintain SBP>90mmHg,

S: nitroglycerin (IV): Adults loading 100mcg/min titrate rapidly to 400mcg/min over 2 minutes

Note:

- Beware of pre-load sensitive condition example inferior or right ventricular myocardial infarction, and phosphodiesterase inhibitors use.
- Don't give Nitroglycerin if SBP< 90mmHg)

Reduce intravascular volume if fluid overloaded

A: furosemide (IV/IM) 0.5-1mg/kg over 20minutes (maximum 120mg) or infusion IV 5-10mg/kg (maximum 120mg).

Note: Beware of renal insufficiency and volume-depleted patients; check the size of the IVC

Ventilation

Oxygen therapy (target saturation>95%); CPAP or BiPAP (for persistent respiratory distress, hypoxia or acidosis despite high flow oxygen therapy); Intubation and mechanical ventilation (for respiratory failure despite CPAP/BiPAP)

Goal of treatment - Relieve hypoxemia (improve oxygenation); reduce pulmonary capillary pressure and improve perfusion. Admit all patients with pulmonary edema to HDU/ICU or transfer the patient to a health facility with ICU/HDU capacity

1.14 Approach to Shock

Shock is a state of acute circulatory failure leading to decreased organ perfusion, with inadequate delivery of oxygenated blood to tissues and resultant end-organ dysfunction and it is an emergency condition. Adherence to evidence-based care of the specific causes of shock can enhance a patient's chances of surviving.

Clinical Presentation

- Low blood pressure (systolic BP below 80 mmHg) is the key sign of shock
- Weak and rapid pulse
- Rapid and shallow breathing
- Restlessness and altered mental state
- Weakness
- Low urine output

Table 1.1: Types of shock & Additional Symptoms

Type of shock	Description	Additional symptoms	Initial Management
Hypovolemic	The most common type of shock. The primary cause is loss of fluid from circulation due to haemorrhage, burns, Diarrhoea etc.	Weak thread pulse, cold and clammy skin.	-Ensure patency of the airway, assess breathing and administer oxygen if indicated -Place two large bore cannula and initiate 2lts of saline/crystalloids (20mls/kg in pediatrics). Reassess after giving fluids - Assess for mental status -blood products (RBC, plasma, platelets) 1:1:1 if no improvement then refer
Cardiogenic shock	Caused by the failure of the heart to pump effectively e.g., in myocardial infarction, cardiac failure, etc., systolic blood pressure less than 80 or 90mmhg	Distended neck veins, weak or absent pulses	-Ensure patency of the airway - Assess breathing and administer oxygen if indicated -Place two large-bore cannula and AVOID giving IV fluids, if needed, give small volume (adult: 250mls-500mls and pediatrics: 5mls/kg) -Assess for mental status • Inotropes (**S:** Dobutamine 2-20mcg/kg/min or vasopressor (**S:** Dopamine 1-50mcg/kg/min) -Give blood if needed
Septic shock	Caused by an overwhelming infection, leading to vasodilatation.	Elevated body temperature	-Ensure patency of the airway • Assess breathing and administer oxygen if indicated -Place two large bore cannula and initiate 2lts of saline/crystalloids (20mls/kg in pediatrics) -Assess for mental status -Empirical antibiotic therapy within 1 hour
Neurogenic shock	Caused by trauma to the spinal cord, resulting in a sudden decrease in peripheral vascular resistance and hypotension.	Warm and dry skin -hypotension -bradycardia -hypothermia	-Ensure patency of the airway • Assess breathing and administer oxygen if indicated -Place two large bore cannula and initiate 2lts of saline/crystalloids (20mls/kg in pediatrics) -Assess for mental status • Inotropes (**S:** Dobutamine 2-20mcg/kg/min or vasopressor (**S**: Dopamine 1-50mcg/kg/min) -Give blood if needed
Anaphylactic shock	Caused by a severe allergic reaction to an allergen, or drug.	Bronchospasm, angioedema, and/or Urticaria	Refer anaphylaxis section

Investigations

The following investigations can be performed depending on the type of shock;

- Basic serum chemistry (including renal function)
- Liver function tests
- Blood culture
- POC Ultrasound- lungs, IVC, Cardiac
- Echocardiography
- CSF analysis if a patient is suspected of meningitis
- Troponins
- Blood gases
- Serum Electrolytes
- Lactate
- Hb Level

Non-Pharmacological Management

- Prompt diagnosis of the underlying cause is essential to ensure optimal treatment.
- Perform the ABCD approach. Intervene when needed
- Maintain an open airway
- Administer oxygen with a face mask and, if needed, after intubation with assisted ventilation
- Check for and manage hypoglycemia

Pharmacological Management

Treatment depends on the type of shock. Intravenous fluid therapy is important in the treatment of all types of shock except for cardiogenic shock.

A: sodium chloride 0.9% (IV): Adults give 2 litres bolus infusion. Repeat bolus until blood pressure is improved. Transfuse blood and plasma expanders in hemorrhagic shock. Paediatrics give 20ml/kg as a slow infusion.

All children with shock that is not obviously due to trauma or simple watery diarrhea should receive antibiotic cover for probable septicemia.

If the pressure doesn't improve after two boluses of IV Fluids (4lts in adults and 40mls/kg in pediatrics), administer Inotropes/vasopressors (**Refer to the Sepsis and septic shock topic section)**

Note:

- Do not administer calcium-containing fluids, e.g., Ringer Lactate, within 48 hours of administering ceftriaxone
- Do not administer IV fluids in case of cardiogenic shock, but maintain the IV line
- If the patient develops respiratory distress, discontinue fluids but maintain the IV line
- Ceftriaxone is contraindicated in neonatal jaundice

Referral: Refer the patient urgently with the escort of a nurse to high level facility to establish the cause and address all medications given in the referral letter.

1.15 Sepsis and Septic Shock

Septicemia (Sepsis) is defined as life-threatening organ dysfunction caused by a dysregulated host response to bacterial infection (commonly) and fungal or viral infections. Organ dysfunction can be represented by an increase in the Sequential [Sepsis-related] Organ Failure Assessment (SOFA) score of 2 points or more, with an in-hospital mortality greater than 10%.

Septic Shock is defined as a subset of sepsis in which particularly profound circulatory, cellular, and metabolic abnormalities are associated with a greater risk of mortality than 40%.

Clinical Presentation

- Temperature of >38oC or <360C; Heart rate of >90/min; Respiratory rate of >20/min or PaCO2 <32 mm Hg
- Above features plus evidence of organ dysfunction (hypotension, jaundice, oliguria, or altered state of consciousness from altered sensorium like drowsiness/lethargy

Investigations

Blood gases analysis, Bedside ultrasound- assessing the inferior vena cava and the lungs, POC ECG, Urine dipstick, Chest X-ray if suspecting pneumonia, Complete blood count, Qualitative or quantitative CRP or Procalcitonin in centers available, Serum Electrolytes, Creatinine and Urea, Liver function tests- liver enzymes, bilirubin, clotting time, Blood culture and antimicrobial susceptibility testing. Primary source of infection's clinical sample culture (e.g., urine, pus, sputum CSF etc.) and antimicrobial susceptibility testing and/or RNA/DNA PCR for viral pathogens (where indicated).

Diagnostic criteria

Sepsis: Q-SOFA in settings with limited laboratory infrastructures: two or more SOFA scores, namely: Respiratory rate ≥22/min, altered mentation, and Systolic blood pressure ≥100 mm Hg) ± bacteria or fungal proven blood culture and susceptibility testing are recommended to make a definitive diagnosis.

Other scoring criteria include SOFA, NEWS (National Early Warning Score), and MEDS (Mortality in Emergency Medicine Department Sepsis

Septic shock: Sepsis diagnostic criteria above and vasopressor therapy needed to elevate MAP ≥65 mmHg and lactate >2 mmol/L (18 mg/dL) despite adequate fluid resuscitation.

Non-Pharmacological Management

- Nutritional support
- Control measures focused on the primary focus of infection.
- Perform primary and secondary assessment and provide necessary interventions
- Ensure patency of the airway and give oxygen if hypoxic or increased work of breathing
- Connect the patient to the cardiac monitor and obtain vital signs

Pharmacological Management

A: sodium chloride 0.9% (IV) Adults: 2litres; Paediatrics: 20mls/kg.
OR
A: sodium lactate compound (ringer's lactate)(IV): Adults 2litres; Paediatrics 20mls/kg in 20 minutes as a first bolus followed by a second bolus of 2litres/20mls/kg (use small boluses in CCF).
OR
S: dobutamine (IV) 2-20mcg/kg/min can be given for patients in shock not responding to fluids or when there is poor cardiac output.
OR
S: norepinephrine (IV) 5-20mcg/min for patients in septic shock not responding after the first 30mls/kg of IVF bolus to maintain the mean arterial pressure (MAP) of ≥ 65mm Hg
AND
A: hydrocortisone (IV) 200mg stat.
OR
S: albumin 60g of 20% running for 2-3 hours

Note:
- Transfuse blood (If hemoglobin is < 7g/dl)
- Lactate clearance should be used as a resuscitation target.

Antimicrobial therapies (broad-spectrum antibiotics must be started within the first hour):

A: ampicillin (IV) 150-200mg/kg/day divided 6 hourly a day
AND
B: cloxacillin (IV) 50-100 mg/kg/day 6 hourly a day
AND
A: gentamicin (IV) or (IM) 120mg, 7.5mg/kg 24hourly for 5 days for children.
If there is no improvement in vital signs within 24 hours (Temp, HR, RR and altered state of consciousness), give:
B: ceftriaxone (IV) 1 gm, 100mg/kg (IV or IM) 24hourly for 4-14 days for children
AND
A: gentamicin (IV) or (IM) 120mg [For children 7.5mg/kg] 24hourly for 5 days
Refer immediately.

D: ceftriaxone + sulbactam (FDC) (IV) or (IM) 75-120 mg/kg 24hourly for 4-14 days
AND
A: gentamicin (IV) or (IM) 120mg [For children 7.5mg/kg] 24hourly for 5days
OR
S**piperacillin + tazobactam (FDC) (IV) (4g+0.5g) administered 8hourly [For children 100 mg Piperacillin+12.5mg Tazobactam per kg body weight 8hourly] for 7-10days
AND
A: gentamicin (IV) or (IM) 120mg [For children 7.5mg/kg] 24hourly for 5days.

Alternatively, (for patients who have evidence of not improving on the treatment above and referred to a zonal/tertiary hospital with judicious decision from a medical specialist or medical super- specialist):

S**meropenem 2g (IV) 8hourly in adults and adolescents [40 mg/kg 8hourly in children] for 7-14days
OR
S**vancomycin (IV) 15 to 20 mg/kg body weight 8 -12hourly (not to exceed 2 g per dose) for 7-14days.

Note: In renal insufficiency, vancomycin can be adjusted for dose and dose interval. These antimicrobial agents are usually reserved for Gram-negative and Gram-positive pathogen(s), respectively, supported by culture and antimicrobial susceptibility testing

For suspected co-existing anaerobic infections, an additional regimen to all regimes above

B: metronidazole (IV) 500mg 8hourly [In children 7.5 mg/kg 8hourly] for 7days

OR

S: clindamycin (IV) 600mg 1.2g/day diluted infusion in two or three doses; In children 15-25mg/kg/day in three equal doses for 7-10days is recommended.

For the rare cases of sepsis or septic shock due to carbapenem-resistant Gram-negative bacteria or vancomycin-resistant Gram-positive bacteria, give:

S** colistin (IV) 2.5-5mg/kg/day 8-12 hourly for 5days

AND

S** linezolid (PO/IV) 400-600mg 12hourly for 10-14 days, respectively or other non-beta-lactam antibiotics may be considered based on culture and antimicrobial susceptibility testing results.

In case there is/are risk factors for invasive candida infections, such as in immunocompromised states, prolonged invasive vascular, necrotizing pancreatitis, then antifungal therapies should be added.

C: fluconazole (IV) 800mg 24hourly on the first day, then 400mg 24hourly for 14days [In children 6-12mg/kg/day for 14days]

1.16 Approach to Pain

Pain is an unpleasant sensation or emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Any pain of moderate or higher intensity is accompanied by anxiety and the urge to escape or terminate the feeling. Pain is subjective and unique perceptual experience with multiple dimensions that may not directly be observed by others or measured by physiological tests. Assessment is almost entirely self-reported.

Assessment of pain.

Self-report is the key to pain assessment. In non- or preverbal children, facial expression is the most valid indicator of pain; therefore, use the faces pain scale to assess severity. Pain should be assessed by:

- Duration
- Severity, e.g., does the patient wake up because of the pain
- Site
- Characteristics, e.g. stabbing, throbbing, crushing, cramp-like
- Persistent or intermittent
- Relieving or aggravating factors
- Accompanying symptoms
- Distribution of pain
- In children, pain can be assessed by a child's crying voice, posture, movement and colour

1.16.1 Approach to Chest Pain

The approach to non-traumatic chest pain requires early recognition of life-threatening conditions. Patients with life-threatening conditions may have stable initial vital signs.

For a patient presenting with chest pain, the following are the differential diagnoses

- Acute coronary syndrome
- Cardiac tamponade
- Pericarditis
- Myocarditis
- Myocardial infarction
- Aortic dissection
- Pulmonary embolism
- Tension pneumothorax
- Acute chest syndrome (sickle cell patients)
- Lung infection (pneumonia)
- Esophageal perforation
- Reflux Esophagitis
- Musculoskeletal pain

Note: Refer to the relevant chapters for detailed management of the specific disease condition.

Investigations

Depending on the Clinical Presentation, the following investigations may be required:

POC ECG, Bedside USS- (cardiac, lungs, pleural, IVC, Abdominal aorta, kidneys, etc.), Serum electrolytes, POC Troponin, Blood gases, Serum creatinine and urea, Urine pregnancy test, Radiological investigations- Chest X-ray and/or CT scan- chest.

Pharmacological Management

Treat the underlying cause as indicated in specific chapters. The following analgesics may be used to relieve the pain:

Mild pain:

A: paracetamol (PO) 1g 6hourly for 24 hours
OR
A: ibuprofen (PO) 400mg 8hourly for 24 hours
OR
A: diclofenac (IM/IV) 50-100mg stat

Mild to moderate pain:

A: paracetamol (PO/IV) 1g 6hourly for 24 hours
OR
A: ibuprofen (PO) 400mg 8hourly for 24 hours
OR
A: diclofenac (IM/IV) 50-100mg stat
AND
B: tramadol (PO/IV) initially 100mg, then 50-100mg every 4-6 hours; usual maximum 400mg for 24 hours

Moderate to severe pain:

S: fentanyl mcg/kg q1-3h
OR
C: morphine (IV) 0.1mg/kg stat
OR
D: paracetamol (IV) 1g stat

If myocardial ischemia is highly suspected, give:

A: acetylsalicylic acid (PO)325mg stat
AND
D: clopidogrel (PO) 300mg stat

> **Note:** Refer to a higher facility with expertise when failed to establish the cause of the chest pain.

1.16.2 Approach to Abdominal Pain

Abdominal pain is among the common complaints of patients presenting to the Emergency Department. While the majority have benign and self-limited etiologies, the goal is to identify those with serious or life-threatening etiologies to perform early intervention.

Differential Diagnoses:

Surgical causes;

- Abdominal aortic aneurysm
- Mesenteric ischemia
- Perforation (PUD, bowel, esophagus, appendix)
- Intestinal obstruction
- Upper GI bleeding

Medical causes;

- Myocardial infarction
- Peptic ulcer disease
- Gastroesophageal reflux disease
- Inflammatory bowel syndrome
- Gastritis
- Hepatitis

Genito-urinary causes;

- Ectopic pregnancy
- Torsion (Testicular, ovarian)
- Ectopic pregnancy
- Dysmenorrhea
- Endometriosis
- Ureteric and kidney stones
- Urinary tract infection
- Pelvic inflammatory disease
- Lower GI bleeding
- Splenic rupture
- Acute appendicitis
- Pancreatitis
- Gallbladder disease

Investigations

Depending on the Clinical Presentation, the following investigations may be required:

ECG, Bedside USS- (gall bladder, liver, lungs, IVC, Abdominal aorta, kidneys etc), Serum electrolytes, Troponin, Blood gases, Lactate, Serum Creatinine and Urea, Urine pregnancy test, Radiological investigations (Chest and Abdomen X-ray and/or CT scan- Abdomen).

Note: Refer to specific chapters for the management of the specific disease condition

Pharmacological Management

Refer to the above section (Chest pain)

Consider Addition of

A: hyoscine butyl bromide (PO) 10mg 8hourly for 24 hours

For those patients who are unable to take oral medications

B: hyoscine butyl bromide (IM) 10mg stat

1.16.3 Headache

Approach to acute headache

Headache is a challenging complaint as it requires balancing symptomatic control with rapid assessment for life-threatening diagnoses. Headaches can be categorized into primary and secondary. Primary causes are neurologic and include tension, cluster and migraine. Secondary headaches are a result of an underlying pathological process such as malignancies, infections and other organic causes.

Differential diagnoses

Sudden onset of severe headache

- Subarachnoid hemorrhage
- Cerebral venous thrombosis
- Hypertension emergency
- Adrenal and pituitary emergencies

Altered

- Meningitis
- Encephalitis
- Space-occupying lesions
- Stroke
- Subarachnoid hemorrhage
- Intracranial tumor

Note: Refer to specific chapters for the management of the specific disease condition

Investigations

Will be specific based on the Clinical Presentation of the patient. These may include:

- Hypoglycemia
- Fever
- Meningitis
- Malaria
- Brain abscess
- Malaria test
- Random blood glucose test
- Blood Gases
- POC Urine dipstick
- Urinalysis
- CSF analysis
- POC ECG
- Bedside USS
- Serum Electrolytes
- Serum Creatinine and Urea
- POC Lactate
- Urine pregnancy test
- Radiological investigations - X-ray, CT scan

Pharmacological Management

Treat the underlying cause as indicated in specific chapters. The following analgesics may be used to relieve the pain:

Mild pain:

A: paracetamol (PO) 1g 6hourly for 24 hours

OR

A: ibuprofen (PO) 400mg 8hourly for 24 hours

OR

A: diclofenac (IM/IV) 50-100mg stat

Mild to moderate pain:

A: paracetamol (PO/IV) 1g 6 hourly for 24 hours
OR
A: ibuprofen (PO)400mg 8 hourly for 24 hours
OR
A: diclofenac (IM/IV) 50-100mg stat
AND
B: tramadol (PO/IV) initially 100mg, then 50-100mg every 4-6 hours; usual maximum 400mg/24 hours

Moderate to severe pain:

S: fentanyl mcg/kg q1-3h
OR
C: morphine (IV) 0.1mg/kg stat
OR
D: paracetamol (IV) 1g stat

> **Note:** Avoid tramadol in pediatrics and CYP2D6 ultrarapid metabolizers due to respiratory depression risk

1.16.4 Other Pains

Other pains may include:

- Generalized body ache
- Joint pain
- Pain due to local infections
- Pains due to injury
- Eye pains
- Ear pains

Non-pharmacological

Perform the primary and secondary assessment with interventions when needed.

Pharmacological Management

For generalized pain give analgesics, advise the patient to rest and make a follow-up. For joint, infections, injury, eye and ear pains treat as for main disease.

Refer patients if:

- Children with moderate and acute severe pain
- No response to oral pain control
- Uncertain diagnosis
- All acute abdominal pain accompanied by vomiting and no passing of stool
- Pain requiring definitive treatment for the underlying disease
- Pain requiring opioids

1.17 Approach to Fever (Pyrexia)

Fever is an abnormal elevation of body temperature that occurs as part of a specific biologic response that is mediated and controlled by the central nervous system and is usually a symptom of an infection. It is characterized by an elevation of body temperature above the normal range of 36.5–37.5 0C

Clinical Presentation

- Depression
- Lethargy
- Anorexia
- Sleepiness
- Hyperalgesia
- Inability to concentrate
- Feeling cold
- Increased muscle tone
- Shivering
- Irritability

Investigations

- Will be specific based on the Clinical Presentation. These may include:
- Rapid Malaria test
- Blood slide for malaria parasites
- Rapid dengue test
- Lactate
- Blood culture
- Bedside USS- Gall bladder, Liver, spleen, Abdominal aorta, kidneys
- POC Urine dipstick
- POC ECG
- Radiological investigations- X-ray,
- CT scan
- Complete blood count
- Serum Electrolytes
- Serum Creatinine and Urea
- Urine Culture
- CRP

Non-Pharmacological Management

- Perform both primary and secondary assessment. Intervene whenever necessary.
- Advise the patient to rest in bed
- Ask patient to take plenty of fluids (If able to take orally)

Pharmacological Management

A: paracetamol (PO) Adults 1g 6hourly when required, Pediatrics 15mg/kg 6hourly when required or suppository 125mg–250mg, 6hourly

OR

A: ibuprofen (PO) Adults 400mg 8hourly when required; Pediatrics 5-10mg/kg 8hourly when required

For patients who are unable to take oral medications, give:

D: paracetamol 1gm (IV) when required

Referral

Note: Refer the patient to the next facility with adequate expertise and facilities.

- If no diagnosis is established
- If no improvement of fever after the use of antibiotics
- Fever that recurs

1.18. Approach to the Trauma Patient

Table 1.2: Approach to Trauma Patient

Preparation	
Mobilize medical emergency team Prepare equipment, examples; monitors, ultrasound, Consider high-risk mechanisms of injury	High Risk Mechanisms of Injury • High speed motor vehicle accident • Pedestrian accidents • Ejection • Fall > 3m in height • Penetrating injuries
Initial Resuscitation	
Airway: Protect as appropriate and ensure Cervical-spine immobilization. **Breathing:** Give oxygen and titrate to SpO_2 (above 92%). If no air entry or if hyper-resonance is present, insert a chest drain. If the patient is showing signs of obstructive shock or a deviated trachea, needle decompression can be used initially before definitive decompression with a chest drain. **Circulation:** Insert 2 large-bore IV Cannula. Resuscitate with crystalloid solutions according to BP. If not responding to crystalloids, the patient should be resuscitated with blood. Control all external bleeding immediately. Avoid hypotension (SBP <90mmHg) since it's associated with increased mortality. **Disability:** Check GCS and document this regularly to check for any changes in the conscious state. Perform a brief neurological examination. Check pupillary response. Check RBG. **Exposure:** Expose the patient to check for other injuries. Prevent hypothermia.	
Secondary Survey		
HEENT – check for scalp hematomas, depressed skull fractures, facial bony tenderness, eye injuries, otorrhea, hemotympanum, tracheal deviation.	**Spine** – Must log-roll patient and palpate spinous processes of C/T/L-spine and check for any tenderness or stepping.	**Chest** – look, palpate, auscultate. Check for signs of pneumothorax, hemothorax, rib fractures, and flail chest. If failing to ventilate or oxygenate, consider NIV or intubation.

Pelvis – careful examination for bony pelvic ring movement. If concerns about pelvic fractures, a pelvic binder (sheet) must be placed on the patient.	**Abdomen** – careful examination for guarding / tenderness/bruising in all quadrants. Ensure FAST examination is performed in all trauma patients.	**Extremities** – examine all peripheries for bony injury, compartment syndrome, muscular or soft tissue damage, and neurological changes.

CHECKLIST: Before the patient leaves EMD, make sure:

- Airways patent/protected
- Tension pneumo-hemothorax? Sp02>92%
- Large-bore IV placed and fluid given
- Control of external bleeding
- Pelvic fracture assessment done
- Assessment for internal bleeding done
- Spinal immobilization done
- Neurovascular status of all limbs assessed
- Does the patient need a chest tube, NGT or catheter?

Note: Refer to chapter 18 (Trauma and injuries) for disease-specific definitive management

1.19 Approach to Dehydrated Patient

It refers to the loss of body water, with or without salt at a rate greater than the body can replace it. The cause of dehydration is a combination of physiological and disease processes. Persons at greatest risk for dehydration include persons with diarrhoea, vomiting, fever, diabetes or infections, impaired level status.

Table 1.3: Types of Dehydration

	Mild	Moderate	Severe
Consciousness	Is normal	May be irritable but is conscious	Unconscious
Skin pinched up	Becomes normal immediately	Takes two seconds for folds to disappear	Remain in folds for over two seconds
Eyes	Moist and tears are present	Sunken, tears and/or absent	Sunken and tearless
Mouth	Not dry	Is dry	Is dry
Urine output	Decreased	Oliguria	Oliguria/anuria
Fontanel	Normal	Depressed	Sunken
Blood Pressure	Normal	Normal but orthostasis	Decreased
Capillary refill	2s	2-4s	More than 4s

Investigations

- Blood chemistry (to check electrolytes, especially sodium, potassium, and bicarbonate levels)
- Blood urea nitrogen (BUN) and creatinine
- Bedside USS- IVC
- Complete blood count
- Urine specific gravity
- Blood Gas analysis
- Lactate

Other tests may be done to determine the cause of the dehydration (for example, blood sugar level to check for diabetes).

Non-Pharmacological Management

- Perform both primary and secondary assessments and provide the necessary interventions.
- Give oxygen if hypoxic or increased work of breathing
- Put TWO large-bore IV cannulas for fluid resuscitations

The treatment for minor dehydration, often considered the most effective, is drinking water and stopping fluid loss.

Pharmacological Management

In more severe cases, correction of a dehydrated state is accomplished by the replenishment of necessary water and electrolytes.

A: oral rehydration salt (ORS)

OR

A: sodium chloride 0.9% (IV) Adults 1-2litres; Pediatrics 20mls/kg

OR

A: sodium lactate compound (ringer's lactate)(IV) Adults 1-2litres; Pediatrics 20ml/kg

Remember to do reassessment after fluids resuscitations., If there is no electrolyte loss, give;
A: dextrose 5% (IV)
If the underlying disease condition is diagnosed, treat as per the specific condition in the guidelines.
Referral: Refer to a high center with expertise if there is no improvement.

Note: Dehydration in Children refer to Plan A, B and C in IMCI guidelines

1.20 Electrolyte disturbances

1.20.1 Hyponatremia

Defined as serum sodium (Na+) levels less than 135mEq/L. It can be classified as: Mild hyponatremia (130-135 mEq/L), Moderate hyponatremia (125 -129 mEq/L), Severe hyponatremia (< 125mEq/L).

Clinical Presentation
Clinical signs generally occur once levels are <125mEq/L. The following are symptoms related to hyponatremia:

- Nausea and vomiting
- Fatigue
- Dizziness
- Headache or confusion
- Tremulousness or seizures
- Loss of consciousness or coma
- Cramps or muscle spasms
- Irritability and restlessness
- Weakness
- Thirst and anorexia

Investigations
Based on classification and patients' clinical findings, the following investigations may be necessary:

- POC RBG
- Urine dipstick
- Electrolytes
- Creatinine and Urea
- LFTs
- Serum Osmolality
- Urine Na+
- Urine Osmolality
- Thyroid profile
- CT brain (suspected cerebral process)
- CXR (suspected pulmonary infection/edema – related to renal failure, CCF)

Non-Pharmacological Management

Nutritional measures adjusted to patients need

- Salt-containing foods
- Rehydration therapy
- Dietary modification

The goal of acute management is the treatment of serious complications and careful restoration of serum sodium concentration. Management depends on the cause, severity and time course. Based on the duration of development, hyponatremia can be (i) acute or (ii) chronic

Table 1.4: Pharmacological Management for Hyponatremia

Acute Hyponatremia	Chronic Hyponatremia
usually symptomatic and onset <48 hours. Symptoms: neurologic deficit, seizures, coma and confusion	usually asymptomatic and onset > 48hours
Requires immediate treatment Give: **C:** sodium chloride 3% (IV) at a rate of 1- 2mEq/L/hr. Alternative: **D:** sodium bicarbonate (IV) 8.4% 50ml over 5min **Do NOT** raise serum Sodium by > 6mmol/L in 6hrs Stop infusion when symptoms have resolved Manage seizures and coma as appropriate	No specific treatment if mild and asymptomatic **If moderate to severe:** Give: **A:** sodium chloride 0.9% (IV) **Do NOT raise** serum Sodium by over 12mmol/L in the first 24 hours Stop correction when Sodium reaches 130mEq/L
Once symptoms have resolved Assess volume status using point of care Ultrasound (POCUS) for IVC as well as vitals assessment and quantify as either (i) Hypovolemic hyponatremia, (ii) Euvolemic hyponatremia and (iii) Hypervolemic hyponatremia	

(I) Hypovolemic	(Ii) Euvolemic	(Iii) Hypervolemic
Possible causes: -Dehydration (vomiting, diarrhoea, sweating, third spacing hydration with hyperosmolar fluids)	**Possible causes** -Psychogenic polydipsia -Iatrogenic -Syndrome of inappropriate ADH secretion)	**Possible causes:** -Renal Failure -Cirrhosis -Nephrotic syndrome -Congestive Cardiac Failure -MDMA (Ecstasy use) -Hypothyroidism -Pseudohyponatremia
- Give sodium lactate compound (ringer's lactate)or 0.9% sodium chloride (IV) 250 – 500mls or 0.5-1ml/kg/hour (guided by BP response)	- Prevent further exacerbation of hyponatrer - Prevent rapid overcorrection - Insert Foleys catheter to monitor output	- Nil per oral, restrict fluids - Furosemide (IV) 40mg daily until fluid volume is corrected.
Note • Look for complications of over-correction such as Osmotic demyelination syndrome (ODS) • Hyponatremia can also lead to cerebral edema which may lead to increased Intra cranial pressure (ICP) • Exercise-associated hyponatremia is common in athletes and the cause is overhydration and not excessive water loss • Psychogenic polydipsia caused by over ingestion of large quantities of water in psychiatric patients or those on SSRI's.		

Severe Hyponatremia: (seizures, coma, signs of brainstem herniation), consider treatment for cerebral edema and elevated ICP; give:

- Sodium Chloride 3% §3-5mls/kg over 15 to 60minutes to increase sodium by 2-4mmol/l
- Close monitoring of Serum sodium initially hourly with a target correction rate of no more than 8-10mmol/l/day and less than 0.5mmol/l/hour over 1-2hours

Hypovolemic Hyponatremia:

- **Determine Sodium deficit:** Total body Sodium deficit = (Desired sodium – actual plasma Sodium) x Total body water {0.6 x weight (kg) Men OR 0.5 x weight (kg) women}
- Replace with 0.9% sodium chloride (IV)
- Correct at no more than 0.5mmol/l/ hour

Note: Symptomatic Hyponatremia: Severe hyponatremia must be admitted to the HDU/ ICU for continuous biochemical and clinical monitoring. If not available, refer the patient to a higher health facility with HDU/ ICU capabilities.

1.20.2 Hypokalemia

It is defined as plasma potassium below 3.5mmol/l. It includes Weakness, constipation, paralysis, bradycardia and reduced tendon reflexes.

Investigations

POC ECG, serum creatinine and urea, serum electrolytes, and/or bedside ultrasound

Additional investigations may be required based on the Clinical Presentation.

Non-Pharmacological Management

- Perform both primary and secondary assessments and provide the necessary interventions needed.
- Give oxygen if hypoxic or increased work of breathing
- Connect the patient to the monitor and obtain Vital signs
- Place IV access

Pharmacological Management

Mild hypokalemia (3.0-3.5mmol/l)

C: potassium chloride (PO) Adults 20-40mEq 8hourly (dissolved in 100-150mL water); Pediatrics 2mEq/kg 8hourly diluted in oral fluids or food. In case of diarrhea, give ORS (5ml/kg/hr)

Moderate hypokalemia (2.5-2.9mmol/l)

C: potassium chloride (IV) Adults 10mEq/hour; Pediatrics 0.5mEq/kg/hour diluted in 25- 50mls of 0.9% sodium chloride or DNS or 5% dextrose solutions via peripheral vein. Do not exceed 10mEq/hour.

Severe hypokalemia (<2.5mmol/l)

Both IV & oral replacement
C: potassium chloride (PO): Adults (28mmol K+) per hour if tolerated (dissolved in 100- 150mL water) diluted potassium; Pediatrics (PO) 2mEq/kg 8hourly.

OR

C: potassium chloride (IV): Adults 20mEq in 100mL fluid over 1 hour via cubital fossa vein. Continue to measure serum potassium every 1 to 2 hours until K+ > 2.8 mmol/L. Pediatrics 1mEq/kg/hour.

The calculated hourly dose is multiplied by 12.5ml volume for dilution with NS/DNS/D5%. Do not exceed 10mEq/hr

Note: Magnesium should be checked. IF LOW, give Magnesium as follows:

Adults

A: magnesium sulphate 50% (IV) Adults: Initially give 4ml diluted to 10ml with 0.9% sodium chloride run over 20 minutes, then potassium chloride infusion, then magnesium sulphate 50% (IV) 0.12ml/kg/day;

Paediatrics

A: magnesium sulphate 50% (IV) 0.1ml/kg/dose administered over 2hours

Hypokalemia in CARDIAC ARREST in Adults: KCl 10mEq IV over 5 min; the dose may be repeated once

1.20.3 Hyperkalemia

It is defined when serum potassium levels are above 5.5 mEq/L. The most common cause is hemolysis from a blood draw. Other causes include Renal failure, medications, and blood transfusions

Clinical Presentations

- Muscle weakness
- Lethargy, fatigue
- Paresthesias
- Nausea and Vomiting
- Difficulty breathing
- Palpitations, chest pain

Investigations

ECG, Blood gas analysis, creatinine, urea, serum electrolytes, toxicology screening

Management of hyperkalemia is focused on three (3) key areas:

- Stabilization of the cardiac membrane
- Intracellular potassium ions shifting
- Removal of the potassium ions from the body

Stabilization of the cardiac membranes; Indicate if there are any ECG changes or evidence of arrhythmias. Consider if K >7mEq/L

Pharmacological Management:

A: calcium gluconate (IV) 10ml of a 10% solution (1 gram) over 5-10 mins.

OR

D: calcium chloride 1-gram IV, given over 1- 2 minutes (administered using a central venous catheter).

Intracellular potassium ions shifting

A: regular insulin 10 units intravenously

AND

C: dextrose 50% (IV) 25 to 50 grams

Note: Consider decreasing to 5 units or increasing the dextrose dose to 50g with individuals with acute kidney injury/chronic kidney disease

B: salbutamol nebulizer 15-20mg in 4mls of saline

OR

D: sodium bicarbonate (IV) 1mEq/kg IV bolus dose

Removal of the potassium ions from the body

A: furosemide (IV) 40-80mg stat

AND/OR

A: hydrocortisone (IV) 2mg/kg up to 100mg IV bolus (if suspicious for adrenal insufficiency)

Note: Hemodialysis is indicated for persistent hyperkalemia

1.20.4 Hypocalcemia

Hypocalcemia is defined as a total serum calcium concentration below 8.8 mg/dL (< 2.20 mmol/L) in the presence of normal plasma protein concentrations, or as a serum ionized calcium concentration below 4.7 mg/dL (< 1.17 mmol/L). Reference ranges for serum calcium vary by age and sex. Causes include reduced absorption, renal failure, hypothyroidism, medications,

Clinical Presentations

- Paresthesias (mouth, fingertips)
- Cramps
- Weakness
- Confusion
- Seizures
- Chvostek/Trousseau signs, Tetany
- Hallucinations
- Laryngospasm
- Bronchospasm
- Cardiac dysrhythmias

Investigations

ECG, Serum electrolytes, PTH

Pharmacological Management

Asymptomatic

A: calcium carbonate (PO) 1- 2gm 6hourly for 2-4 weeks

AND

C: cholecalciferol (Vitamin D3) (PO) 1000-2000 12hourly for 2-4 weeks

Symptomatic

A: calcium gluconate (IV) 10mL of 10% solution IV over 10min

OR

D: calcium chloride (IV) 500-1000mg over 5-10 minutes, repeat as needed

1.20.5 Hypernatremia

Hypernatremia is defined as a plasma sodium concentration of >145mmol/L. Severe hypernatremia is a plasma sodium value of >160 mmol/L. Hypernatremia can be due to loss of water, gain of sodium, or both. Loss of water is the more common denominator. The main cause of hypernatremia is body water loss.

Clinical Presentation

Mild and chronic hypernatremia is usually asymptomatic. Severe acute hypernatremia causes CNS symptoms-irritability, lethargy, seizure and coma

Investigations

- Urine specific gravity/osmolality
- Serum electrolytes
- Creatinine and BUN
- Blood sugar

Non-Pharmacological Management
Encourage free water intake

Pharmacological Management
It depends on the severity of hypernatremia and the patient's volume state.

Hypovolemic Hypernatremia
A: sodium chloride 0.9% (IV) until hypovolemia improves.

OR

A: sodium chloride 0.45% (IV)

OR

A: dextrose 5% IV (To replace the water deficit and ongoing losses)

Euvolemic Hypernatremia

A: sodium chloride 0.45% or Dextros 5%. Refer to a specialist if Diabetes Insipidus is suspected.

Hypervolemic Hypernatremia

A: furosemide (IV or PO) dose and route depending on severity

Note: Formula for Calculating Water Deficit

$$\text{Water Deficit (L)} = \text{TBW} \times \left(\frac{\text{Current Serum Na}}{140} - 1 \right)$$

TBW- Total Body Weight

*TBW refers to estimated total body water which is about 60 and 50 percent of lean body weight in younger men and women, respectively, and in the elderly, it is about 50 and 45 percent in men and women, respectively

CHAPTER TWO
ANAESTHESIA AND CRITICAL CARE

2.1 Anaesthesia

Anaesthesia is a state of controlled reversible loss of consciousness, usually accompanied by analgesia, muscle relaxation, amnesia and areflexia. It is usually induced for the purpose of facilitating surgery and other therapeutic or diagnostic procedures.

Anaesthesia may be achieved with either:

- Local anaesthesia -topical application/spray or infiltration of local anaesthetics
- Regional anaesthesia alone e.g., spinal/epidural anaesthesia, arm block
- Regional anaesthesia with sedation
- General anaesthesia
- A combination of regional and general anaesthesia

2.1.1 Pre-anesthetic review and premedication

Pre-anesthetic review

- Patients MUST be reviewed in the pre-anesthetic outpatient clinic before any anesthetic intervention except for those admitted for emergency operations. The latter can be reviewed a few minutes before anesthesia or the night before the operation for elective inpatients.
- Done by reviewing surgical, medical and anesthesia-related records, performing focused anesthesia Assessment, identify anesthesia related risks and formulate anesthesia plan.
- Ultimate goals are: to optimize patient preparation, ensure safety and anticipate complications and put forward mitigation strategies

Pre-medications

Medicines that are administered before anaesthesia include:
Anxiolytics/amnesics

Pharmacological Management

C: lorazepam (PO) 1-2mg, the night before surgery and 1-2 hours preoperatively. Use half the dose in the elderly. Duration of action (10–20 hours). Unsuitable for daycare surgery.

OR

D: midazolam (intranasal) 0.5mg/kg, pediatrics, 30 minutes preoperatively. Alternatively, (IV) 0.05–0.1mg/kg. Suitable for day care surgery or minor procedures.

OR

C: diazepam (PO) 5–10mg [0.5 – 0.75mg/kg], the night before surgery

AND

A: diazepam (IV) 0.05 – 0.1mg/kg 1-2 hours preoperatively. Use only in adults <65 years of age. Duration of action 4-6 hours. Unsuitable for daycare surgery.

Note: If there is an overdose with benzodiazepines, use the following antidote:

D: flumazenil (IV) 0.2mg stat over 30 seconds. Repeated doses of 0.2mg may be given at 1-minute intervals until the desired level of consciousness is achieved; do not exceed 4doses (1mg).

Ant-sialagogues (ant-vagal medications):

For bradycardia, salivary secretion or other muscarinic side effects give

A: atropine (IV) 0.01mg/kg

OR

S: glycopyrrolate (IV) 0.2–0.4mg

Antiemetics
Antiemetics are indicated for the prevention of Post-Operative Nausea and Vomiting (PONV)

B: dexamethasone sodium phosphate (IV) 4–5mg

OR

B: metoclopramide (IV) 10mg

OR

D: ondansetron (IV) 4mg administered over 2–5minutes

Anti-acids
Antacids are given to patients at risk of aspiration, such as pregnant women, before Caesarean section to prevent aspiration pneumonitis -not more than 30 minutes pre–induction of anaesthesia:

B: Oral nonparticulate antacid: (0.3 Molar) sodium citrate, 15 – 30 mls stat

AND

B: cimetidine 200mg-400mg PO 60 to 90 minutes before operation

OR

C: pantoprazole (IV) 40mg stat (as soon as the possibility of surgery is known in cases of emergency procedures)

2.1.2 General Anaesthesia

General anaesthetics are used for the induction of anaesthesia as boluses or for the maintenance of anaesthesia as continuous infusions in Total Intravenous Anaesthesia (TIVA). Respiratory depression occurs following the induction of General anaesthesia and ventilation should be supported as required. Administer at appropriate doses, after consideration of patient factors, surgical factors and contraindications.

Intravenous anaesthetic agents (for induction and/or maintenance)

Pharmacological Management

B: ketamine (IV) 1–2mg/kg (For induction, however can be used for maintenance under TIVA, but contraindicated in those who a significant rise in BP/IOP/ICP would constitute a serious hazard)

OR

C: thiopental (IV) 3–5mg/kg for induction only.
[however not recommended for maintenance or repeated dose]

OR

D: propofol (IV) 1.5–2.5mg/kg for induction of anaesthesia and 6–12m6-12mg/kg/hour infusion for maintenance in TIVA.

OR

S: etomidate (IV) 0.3mg/kg (between 0.2–0.6mg/kg) for induction (cardiostable, it affects cortisol production)

Inhalational anaesthetic agents (for induction and/or maintenance)

B: isoflurane 1.2–2.5% in air, oxygen titrated to desired effect

OR

S: sevoflurane 5–7% in air, oxygen titrated to desired effect.
Maintenance: 0.5–3% sevoflurane with or without the concomitant use of nitrous oxide.

Note:

- Recommended to use Sevoflurane for induction only, then move to Isoflurane unless the condition recommends maintenance with Sevoflurane.
- Low-flow anesthesia is the best technique to conserve consumption of Sevoflurane
- Propofol is contraindicated for patients at risk of hypotension or in shock. Use IV ketamine infusion for maintenance of anaesthesia

2.1.3 Neuromuscular Blocking Drugs (NMBD)

These are used to enhance intubation and to provide intraoperative muscle relaxation for surgery. It must not be used if difficult intubation is anticipated.

Pharmacological Management

B: suxamethonium (IV) 1–2mg/kg for induction,

OR

C: pancuronium (IV) 0.04–0.1mg/kg for induction /maintenance.

OR

S: atracurium (IV) 0.4–0.5mg/kg over 60 seconds, followed by 0.08–0.1mg/kg 20– 45minutes after initial dose for maintenance or infusion at 0.05–0.1 mg/kg/min (for patients with renal impairment)

OR

S: rocuronium (IV) 0.6 -1 mg/kg can be used for induction if suxamethonium is contraindicated. In this case, the dose is 1.2mg/kg

Reversed by Sugammadex

Note:

- Suxamethonium is contraindicated in patients with risk for developing hyperkalemia or with upper/lower motor neuron defect, prolonged chemical denervation, direct muscle trauma, tumour or inflammation, thermal trauma, disuse atrophy, severe infection
- Not recommended for infusion or maintenance of relaxation

Medicines for the reversal of neuromuscular blockade

B: neostigmine (IV) 50µg/kg

AND

A: atropine (IV), 20µg/kg (maximum 1.2mg)

OR

S: glycopyrrolate (IV)10 µg/kg

OR

S: sugammadex (IV) 2–4mg/kg

2.1.4 Locoregional Anesthesia (Local Anesthesia, Neuraxial anesthesia, Peripheral nerve block)

2.1.4.1 Local Anesthesia:

Temporary loss of sensation in a small area of the body to lessen pain and discomfort during medical, surgical and dental procedures while the patient remains awake.
This can be in the form of topical application of Local Anesthetics (Cream- EMLA, Spray) or intramuscular infiltration.

2.1.4.2 Topical Anaesthesia

Pharmacological Management

B: lidocaine cream (Topical) 2 to 5% -Apply at least 1 hour before and cover with an occlusive dressing.
OR
B: lidocaine gel, topical, 2 g/100mL.
For numbing skin to aid clinical procedures like urethral catheterization (female 5–7 mL, male 10–15 mL).
OR
B: lidocaine topical spray 2% and 10% solutions for topical anaesthesia of the airway (i.e., oropharynx and vocal cords), the trachea, and nasal passages.
A: lidocaine (IM infiltration): Maximum 4.5mg/kg without vasoconstrictors (epinephrine (adrenaline)) or 7mg/kg with vasoconstrictors
OR
B: bupivacaine plain (site): 0.125% or 0.25%

2.1.4.3 Neuraxial Anesthesia

This is the administration of a local anesthetic agent into the subarachnoid or epidural space to produce anesthesia, analgesia or both. Encompasses epidural, Spinal anesthesia and caudal block.

2.1.4.4 Epidural Anesthesia

- Type of neuraxial anaesthesia of which a local anaesthetic (LA) is injected into the epidural space to anaesthetize the spinal nerve roots that traverse the space.
- Can serve for anaesthesia of abdominal, pelvic, and lower extremity procedures and, less commonly, thoracic procedures, but it is famously used for analgesia, especially for labor pain.

Pharmacological Management
A: lidocaine 1 to 2 %(epidurally)
OR
B: bupivacaine 0.25 to 0.75% (epidurally)
Epidural Labour Analgesia

B: bupivacaine 0.1-0.25% with or without Fentanyl 25–50µg (epidurally) as an adjuvant.
OR
B: bupivacaine 0.1% with fentanyl 2µg/ml at infusion rate of 012mls/hour (epidural infusion for analgesia)

2.1.4.5 Spinal (Sub-arachnoid Block-SAB) Anesthesia;

- In this type, LA agent is administered into the subarachnoid space and block spinal nerves
- Only preservative-free medicines should be used (risk of neurotoxicity).
- Larger doses cause block to spread higher, with risks of respiratory depression,
- Hypotension and loss of consciousness.
- In some selected procedures, you can combine spinal-epidural anaesthesia techniques to get both rapid anesthesia and later continue with post op analgesia.

B: bupivacaine 0.5% with or without dextrose (spinal use). Bupivacaine with dextrose-hyperbaric (heavy) allows the spread of anesthetic block to be controlled by the patient/s positions during and shortly after injection.

2.1.4.6 Caudal Anesthesia,

Type of epidural block where a LA is injected into the epidural space at the sacral hiatus, the lowest part of the spinal canal. Mainly intended for analgesia in pediatrics.

Pharmacological Management
B: bupivacaine plain 0.25%, with or without Epinephrine for Caudal block. Dose: 0.5ml/kg- Perineal, 0.75ml/kg T10, 1ml/kg lower thoracic.
OR
D: ropivacaine 0.2% with or without Epinephrine for Caudal block. Target Dose: 0.5ml/kg- Perineal, 0.75ml/kg T10, 1ml/kg lower thoracic.

Note: For Caesarean deliveries: Lower doses are required due to physiologic changes of pregnancy: Bupivacaine 0,5% with dextrose, 1.8 mL (9 mg) with or without Fentanyl, 10 mcg (0.2 mL).

2.1.4.7 Anticoagulants and Neuraxial Anesthesia:

Patients on anticoagulants are at risk of developing a spinal haematoma with subsequent paralysis after a spinal or epidural block.

Note: These anticoagulants should be stopped before spinal or epidural anesthesia is performed, according to the guidelines given below. To ensure safe and quality patient care, please consult a specialist before attempting neuraxial blocks in patients receiving anticoagulants.

Table 2.1: Range of oral anticoagulants with each having specific recommendations about neuraxial blocks.

Anticoagulant	Before Neuraxial Block	After a Neuraxial block
Warfarin, oral	Consult with a specialist to stop warfarin.	Restart after neuraxial block performed (do not delay) and epidural catheter removed. Monitor INR daily with indwelling catheter.
Unfractionated Heparin, SC	Neuraxial techniques may be performed if total daily dose is <10 000U. Check PTT if higher doses are used	
Unfractionated Heparin, IV	Stop heparin 4-6 hours and check PTT<40	Wait 1 hour before next bolus/infusion restarted
Prophylactic LMWH, SC	12 hours after last dose	4 hours after neuraxial block performed and epidural catheter removed
Therapeutic LMWH, SC	24 hours after last dose	>24 hours and consult a specialist (bleeding risk of surgery should be assessed).

Note:

- After neuraxial block or epidural catheter removal, patients should be observed closely for new or progressive neurological symptoms.
- A spinal haematoma can result in permanent paralysis unless decompressive surgery is performed within 8 hours of paralysis onset.
- Clopidogrel and platelet GPIIb/IIIa inhibitors have variable durations of effects on clotting after stopping these medications.
- Specialist advice should be sought before performing neuraxial blocks on patients receiving these medications.
- Patients on warfarin, practice of bridging anticoagulation (giving heparin after warfarin is stopped in preparation for surgery or invasive procedures. Practitioners should exercise careful judgment of competing risks related.
- Heparin may increase the risk of bleeding.
- Whatever practice is adopted the most important consideration is to ensure that adequate anticoagulation with warfarin is re-instituted once the risk of bleeding is over.

2.1.4.8 Peripheral Nerve Blocks:

- Intended for surgical anaesthesia as well as for postoperative analgesia.
- Blocks are often used to enhance multimodal analgesia, avoid opioid effects and enhance ambulation postoperatively.
- Another common rationale for their use is to avoid side effects and complications of general anaesthesia (GA), particularly respiratory-related complications.

Pharmacological Management

Local Anaesthetics

B: lidocaine (Perineurally) 1 to 2% Maximum dose: 3 mg/kg.

OR

B: lidocaine (Perineurally) 1 to 2% with Epinephrine (adrenaline). Not to be used in areas supplied by an end-artery, e.g., finger, ear, penis. Maximum dose: 7 mg/kg.

OR

B: bupivacaine plain (Perineurally) 0.25 to 0.75%. Not be used in mucosal or vascularized areas for risk of systemic toxicity. Maximum dose: 2.5 mg/kg (with epinephrine (adrenaline) 3mg/kg.

Adjuvants

A: epinephrine (adrenaline) (Perineurally) Typical Concentration 5-10µg stat

OR

B: dexamethasone (Perineurally or IV) 4-10mg or 0.1mg/kg.

OR

S: clonidine (perineurally) 0.5-2µg stat.

2.1.5 Management of Anesthesia Complications

2.1.5.1 Local Anesthesia Systemic Toxicity:

Pharmacological Management
Stop injection, follow the ABC approach, and ventilate with 100% oxygen. Seizure suppression with
D: midazolam 3-5mg
OR
A: diazepam, IV, 5-10 mg.
If seizure persists, then
C: thiopental 1-2 mg/kg and or add diazepam. If worse, paralyse and intubate.

- **S**: Lipid emulsion (20%), IV, 1.5 mL/kg over 1 minute, then continuous infusion 0.25ml/kg per minute.
- Repeat bolus 1–2 times for persistent cardiovascular collapse.
- Double the infusion rate to 0.5 ml/kg/minute if BP remains low.
- Continue infusion for at least 10 minutes after cardiovascular stability is attained.
- Recommended upper limit: approximately 10ml/kg lipid emulsion over the first 30 minutes
- For cardiovascular instability, use IV fluids, inotropes and for cardiac arrest, initiate CPR.

2.1.5.2 Anesthesia related Acute hypotension:

Treat the cause of hypotension, ensure appropriate fluids are given to correct hypovolemia.

- The medicines given below all require significant dilution before administration.
- Adrenergic and dopaminergic agents, e.g.:
- **B:** ephedrine (IV) 3–5mg as a single dose and then further boluses as required to a maximum of 30mg.
- Increases heart rate and contractility, and vasoconstrictor.
- Repeated administration can result in tolerance and tachyphylaxis.
- **C:** phenylephrine (IV) 50–100mcg, single dose and then 60–180mcg/minute.
- High doses may cause significant reflexes. Bradycardia: Treat this by discontinuing the phenylephrine only.

Alternatively;
A: epinephrine (adrenaline)/epinephrine (IV) (diluted to 10mcg/ml) give boluses of 5-10mcg may be needed to mitigate unresponsiveness to treatment.

2.1.5.3 High spinal or total spinal anesthesia:

A high neuraxial block is a sensorimotor block that has reached a spinal segmental level higher than that required to achieve surgical anaesthesia (sensory level T3 and above). Local anesthetic agent spreads too high in the spinal cord, blocking cardio accelerator nerves and respiratory muscles, causing difficulty in breathing, severe hypotension and cardiac dysfunction.

- Anticipate and reassure the patient.
- Declare emergency and call for help. Position the head elevated to slow further spread.
- Ensure the wedge is placed properly.
- Use ABC approach, give Oxygen 100% by face mask or intubate (rapid sequence) with a hypnotic and muscle relaxant and ventilate if apneic.
- Give rapid fluid infusion and add vasopressors- ephedrine, phenylephrine or double-diluted epinephrine (adrenaline)/baby epinephrine (adrenaline) (10mcg/ml).
- If hypotension persists, consider vasopressor infusion.

Pharmacological Management
A: atropine (IV) 0.5mg bolus for bradycardia
AND/OR
A: sodium chloride 0.9% /sodium lactate (IV) 500mls or 1000mls bolus

Precautions in Heart Failure and Pre eclamptic patients.

2.1.5.4 Anesthesia-related acute Hypertension:

This can be triggered during intubation, especially in patients prehypertensive, such as in pre-eclampsia, known hypertensive but uncontrolled hypertension. It can occur at induction of anaesthesia or post-operatively. ALWAYS establish the cause (e.g., light anaesthesia or inadequate pain relief) and treat as appropriate.

C: labetalol (IV) 5–10mg IV over 2 minutes.
Repeated at intervals of at least 5 minutes to a maximum of 200mg. Duration of action 50 minutes. Vasodilates and slows heart rate.

Postoperative Nausea and Vomiting:

- Patients identified preoperatively as medium or high risk for PONV should be considered for prophylactic antiemetics.
- Prophylactic antiemetics are also required if postoperative vomiting is potentially dangerous, e.g., after jaw wiring, open eye surgery, oesophageal surgery.
- High-risk patients should receive antiemetics from ≥ 1 class.
- Adequate IV hydration is associated with less PONV and always treat hypotension if present

Table 2.2: **Risk factors for PONV- Female gender, Non-smoker, Previous history of PONV and or motion sickness and use of opioids.**

Class	Antiemetic	Prophylactic dose and timing	Adverse effects
Corticosteroid (glucocorticoids)	**B:** dexamethasone	4-8mg, IV, during induction.	Increases blood glucose in diabetics. Only used for prophylaxis, not established PONV.
5-HT3 receptor antagonist	**D:** ondansetron	4–8mg, slow IV/IM, on induction.	Prolongs QTc interval
Phenothiazine	**A:** promethazine	6.25–12.5 mg, IV (large bore cannula) diluted to 20ml over 10-20 minutes, or deep IM, at the end of surgery.	Intra-arterial injection causes gangrene. Extravasation or subcutaneous injection associated with skin necrosis. Anticholinergic side effects and sedation

B: metoclopramide (IM/IV)

- If <60 kg: 5mg IM or IV (over 2 minutes).
- If ≥60 kg: 10mg IM or IV (over 2 minutes).
- Repeat 8hourly if required.

2.1.5.5 Malignant Hyperthermia:

- Discontinue the anesthetic with risk to trigger- Inhalation and suxamethonium.
- Declare emergency, inform surgeon and call for help. Cool the patient and treat hyperkalemia as per protocol. Monitor ETCO2 and manage arrhythmia.

2.1.6 Anesthesia in Special Conditions

2.1.6.1 Anesthesia in Diabetic Patient

Perioperative Hyperglycemia is associated with increased risk of infection, medical complications and death. The following shall be considered;

- Ideally, the elective patient should have a preoperative glycated haemoglobin less than 9% or a fasting blood glucose level of 10 mmol/l or random blood glucose of 13 mmol/l.
- Screen for nephropathy, cardiac disease, retinopathy and neuropathy and inform the surgical team.
- If on oral hypoglycemic therapy and well controlled, and surgery is minor, omit therapy on the morning of surgery and resume therapy when eating normally.
- If on insulin, adjust depending on the type of surgery and expected fasting period as follows:

Minor surgery (duration < 3hours)
Insulin: in the morning, intermediate–acting insulin, 1/2 to 2/3 of the total daily dose.

- If blood glucose is above 20 mmol/l, give a small dose of short–acting insulin.
- In the evening, give intermediate–acting insulin, 1/3 of the daily dose. Fluid: 5% dextrose (IV), volume according to age.

Blood glucose monitoring: every 1–2 hours, target values between 10–14 mmol/l.

Major surgery (duration > 3hours) involving general anesthesia and therefore a period of fasting.
Insulin and fluid: infusion solution containing 5% glucose and 20 mmol/l potassium chloride (maintenance volume)

- Insulin infusion rate 0.05 IU/kg/hour.
- Blood glucose monitoring: every 1–2 hours; values between 6–14 mmol/l, if < 5 mmol/l reduce infusion rate, continue infusion therapy intraoperatively.
- Post operatively: give 5–10% dextrose (IV) 1 Litre + 20ml potassium chloride + 2/3 of total daily dose of insulin over 8hours and repeat to maintain infusion therapy until food intake is re–established.

2.1.6.2 Anesthesia in Hypertensive Patients

Monitor BP, scan monitors for HR, ECG rhythm, EtCO2, and temperature. Provided the patient is adequately oxygenated & ventilated, deepen the anesthetic.
Examine patient:

- Pupils (high ICP).
- Diaphoresis & flushing (carcinoid, pheochromocytoma, hyperthyroidism).
- Rigidity (malignant hyperthermia, serotonin syndrome).
- Bladder distension.
- Hot (thyroid storm, malignant hyperthermia, serotonin syndrome).

Examine drugs & equipment:

- Potential drug error
- Possible TIVA or circuit disconnect (awareness)
- Tourniquet (pain)
- Equipment error (falsely high reading)

Pharmacological Management

B: hydralazine (IV) 5-20mg (max 30mg) slow IV push every 20minutes
OR
C: labetalol (IV) 5-20mg every10min (max total 300mg)
OR
S: esmolol (IV) 0.5mg/kg over 1minute; start infusion at 50mcg/kg/min
OR
S: nitroglycerin (IV) 50-100mcg; start infusion at 10mcg/min.

Treat the underlying cause, i.e., pain.

2.1.6.3 Anesthesia in Asthmatic Patients

Considerations;
Risk of perioperative respiratory complications:

- Bronchospasm, mucous plugging, pneumothorax, atelectasis, pneumonia.
- Possible pulmonary hypertension & RV failure.

Need for preoperative optimization:

- Treatment of bronchospasm, infection, and atelectasis.
- Avoidance of triggers & exacerbating factors
- Avoid general anesthesia, endotracheal intubation, histamine-releasing medications, and light anesthesia.

Pharmacological Management

- Continue usual inhalers pre-operatively
- Stress dose steroids if recent high-dose steroid use.
- For Severe Asthma Exacerbation Treatment Options, refer to the **Respiratory Diseases Condition chapter.**

Anesthetics
B: ketamine (bronchodilator effect)
OR
D: propofol (bronchodilator effect)

If intubation & ventilation:

- Use permissive hypercapnia.
- Use low respiratory rates: start at 10-12 breaths/minute but may need lower rates.
- Use prolonged expiratory time (e.g. I: E ratios 1:3, 1:4, or even 1:5).
- Tidal volume 6-8cc/kg.
- FiO2 to achieve PaO2>60mm Hg

2.1.6.4 Anesthesia in Sickle Cell Patients

- Avoid precipitants of sickle cell crisis:
- Optimize perioperative pain control.
- Optimization (in consultation with hematology).

Risk factors for acute pain crises:
Procedural risk for complications:

- Low: minor surgery (e.g., inguinal hernia & extremity surgery).
- Intermediate: intra-abdominal operations (e.g., cholecystectomy).
- High: intracranial & intrathoracic procedures, hip surgery.

2.1.7 Anesthesia in Special Groups

2.1.7.1 Pediatric Anesthesia

Special anatomical, physiological and Pharmacological considerations in the pediatric group (different from adults):

- Larger head relative to the body-neck flection/obstruction
- Small mouth and large tongue proportion-obstruction
- Large head, little hair, prone to heat loss
- Breath mainly by nose, small and easy to obstruct
- Larynx is more anterior (at C3/4, while adults' C6)
- Short neck/Short trachea, little ETT movement-tube out
- Small airways-increased airway resistance and obstruction from secretions
- Narrowest part-cricoid ring in adult vocal cords. May lead to airway edema, difficult-Intubation.

Pre-anesthetic review and preparations

- Prenatal history-term or preterm delivery, what is the growth milestone. Any history of respiratory tract infections and the last episode.
- Airway assessment and cardiovascular examination are mandatory.
- Get or estimate body weight for drug calculations.
- Strict fasting guidelines with emphasis on solids up to six hours preop and pediatric patients to be first in the operating list.

Intraoperative considerations

- Premedication are vital to enhance smooth separation from parents. If IV line is in place IV induction should be considered.
- Otherwise, gas induction and then IV access with top up IV medications.
- Strict temperature management throughout and tight calculated IV fluids.
- For neonates and premature children, avoid opioid analgesics to prevent respiratory complications.

Postoperative Care:

- Extubate when fully awake. For prolonged anesthesia, measure the sugar level and assess for opioid or benzodiazepine overdose
- Keep the patient warm

2.1.7.2 Obstetric Anaesthesia

General anaesthesia (GA)

Preparation: Prevent aspiration pneumonitis (Refer to premedication section).

- Antibiotic prophylaxis: before skin incision as guided by guidelines.
- In view of potential difficult airway, ALL equipment for difficult airway including supraglottic airway devices (SGAs), and video laryngoscopes when available in addition to routine airway equipment. Have small-sized ETT 6.0 and 6.5 cuffed with a stylet.

Note: Applying left lateral displacement to prevent aortocaval syndrome is mandatory

Monitoring:

- Routine; Noninvasive blood pressure (NIBP), ECG, SPO2.
- When available, consider Bispectral index (BIS) and neuromuscular blockage monitoring due to increased risk of awareness.

Induction agents

Hypnotics: hemodynamically stable

D: propofol (IV) 1-2mg/kg,
If hemodynamically unstable;
B: ketamine (IV) 1-1.5mg/kg;
OR
D: propofol (IV) low dose 0.5-1mg/kg, with ketamine
OR
S: etomidate (IV) 0.3-0.5mg/kg;

Analgesia: Multimodal analgesia Opioids combined with non-steroidal analgesics and or IV paracetamol.
Opioids: Same dosages as in normal general anesthesia, except they should be administered after delivery of the baby to avoid neonatal bradycardia and respiratory depression

Intubation: Perform rapid sequence intubation (RSI) with cricoid pressure using appropriate drugs and dosage (see section for RSI).

Maintenance of anaesthesia:

Volatile anaesthetics:
B: isoflurane avoiding minimum alveolar concentration (MAC) higher than 1;
AND
S: sevoflurane avoiding a minimum alveolar concentration (MAC) higher than 1.
OR
Total intravenous anaesthesia (TIVA) using propofol or Ketamine infusion with muscle relaxant, depending on availability.

Maintenance Analgesia:

Multimodal, but opioids are given after delivery of the baby
Uterotonics – Administered after cord clamp:

A: oxytocin (IM) 10IU
OR
A: oxytocin (IV) 10IU slow infusion.

Note:
- Other uterotonics as appropriate, depending on the risk for haemorrhage.
- Recovery- Extubate when fully awake and maintaining airway reflexes.

Spinal anaesthesia (SA)

Single-shot spinal anaesthesia

B: bupivacaine heavy 0.5% (Intrathecal) alone 7.5-10mg
OR
B: bupivacaine heavy 0.5% (Intrathecal) 7.5-10mg with opioids 20-25mcg fentanyl or 100-200mcg preservative free morphine.

Combined Spinal-Epidural anaesthesia (CSE)

When surgery is anticipated to last the duration of a single shot SA and an epidural kit is available, CSE allows surgical anaesthesia and avoids conversion to GA.

Epidural anaesthesia

In selected obstetric conditions or conversion of neuraxial labour analgesia into surgical anaesthesia.

B: bupivacaine (Intrathecal) 10-15mls bolus
OR
D: ropivacaine (Intrathecal) 10-15mls bolus (with or without opioids)

Pain management after caesarean delivery:
- Multimodal analgesia with systemic opioids, NSAIDs, and paracetamol.
- Peripheral nerve blocks (tranversus abdominis plane block, quadratus lumborum blocks), depending on expertise.

2.2 Sedation

This procedural sedation and analgesia are commonly used in emergency units, radiological /diagnostic units, dentistry and for certain endoscopic and gynaecological procedures.

Pharmacological Management
Minimal Sedation/Anxiolysis (no analgesic effect is required)

D: midazolam (IV) 0.05mg/kg (In a 60 kg patient, give boluses of 1 mg every minute; may require up to 5mg)
OR
A: diazepam (IV) 0.1mg/kg (In a 60kg patient, give boluses of 2mg every minute; may require up to 10mg)

Medicines for moderate sedation & analgesia
If analgesia is required, one of the above is usually combined with an opiate. However, ketamine has analgesic activity and can be used on its own or combined with a benzodiazepine.

B: ketamine (IV) 0.5mg/kg. Repeat doses of 0.5mg/kg as required, every 5-10minutes
OR
C: morphine (IV) 0.1mg /kg in increments of 2mg every 5minutes
OR
S: fentanyl (IV) 0.25µg/kg
OR
S: dexmedetomidine (IV) 1mcg/kg bolus over 10 minutes, then 0.2-0.7µg/kg per hour infusion

Alternative medicines

D: propofol (IV) 0.5mg/kg. Repeated as 0.25mg/kg boluses every 5minutes as required
OR
S: etomidate (IV) 0.1mg/kg. Repeat doses of 0.05 mg/kg (IV) every 5minutes, as required. But it is more likely to cause myoclonus

Medicines for Deep Sedation & Analgesia:

This is usually achieved with either higher doses of medications used for moderate sedation, or by combining an opiate, a benzodiazepine, and either Propofol or Etomidate. When agents are combined, lower doses may be adequate.

Supplemental Analgesia: Simple analgesics can be given before or after the procedure:

A: paracetamol (IV/PO): 1g 4-6 hourly when required to a maximum of 4g per 24hours.
OR
A: diclofenac (IM) 75mg stat or 0.5mg/kg pediatric,
OR
A: ibuprofen (PO) 400mg 8hourly with meals after the procedure.

Short–term and long–term sedation

Medicines for short–term sedation (less than 24 hours)

D: midazolam (IV) 0.05–0.2mg/kg/hour.
OR
D: propofol (IV) 0.5mg/kg/hour.

Due to high fat solubility, midazolam also becomes 'long acting' after infusions of more than 24 hours

Medicines for longer–term sedation (72 hours or more)

C: lorazepam (IV) 0.1mg/kg/hour.
OR
D: midazolam (IV) 0.2mg/kg/hour.

Lorazepam (0.1 mg/kg/hour) is as effective (and as easy to wean) as midazolam 0.2 mg/kg/hour) but more difficult to titrate.

Supplemental analgesia

C: morphine (IV) 0.1–0.2mg/kg/hour.
OR
S: fentanyl (IV) 1 µg/kg/hour (also becomes long acting after prolonged infusion due to fat solubility)

2.3 Fluid therapy

Each patient has unique fluid needs based on their medical condition, fluid losses and ability to maintain fluid intake. For neonates and premature babies-refer to specific fluid management guidelines.

The following IV fluids can be used for replacement and maintenance therapy:
A: sodium chloride 0.9%, IV
OR
A: sodium lactate
OR
A: dextrose solutions IV 5%, 10% 25% 50%
OR
A: sodium chloride + Dextrose (Dextrose Normal Saline)
OR
A: sodium Chloride 3% (Hypertonic Saline)
OR
C: sodium chloride 0.45%

Table 2.3: **Complications of Inappropriate Fluid Management:**

Complication of fluid therapy	Features	Management
Fluid overload/volume overload	Periorbital edema Pitting edema in extremities and /or lumbar sacral area	Limit further fluids, diuresis with Furosemide
Hyperkalemia	Serum potassium more than 5.5 mmol/l	Avoid fluids containing Potassium like RL and manage as per protocol
Hypokalemia	Serum potassium less than 3.0 mmol/l likely to be due to the infusion of fluids without adequate potassium replacement	Replace potassium as per protocol
Hyponatremia Serum Na< 125mEq/L	Headache, lethargy, seizure and comma	Fluid restriction, Hypertonic saline, treat underlying cause
hypernatremia Serum Na> 158mEq/L	Lethargy, irritability, weakness	Treat underlying cause, give dextrose 5% or hypotonic fluid
Metabolic acidosis due to excessive Normal saline use (Normal saline is slightly acidic)	Deep rapid breathing, confusion and headache	Supplement bicarbonate
Metabolic alkalosis-excessive use of Ringer's lactate (lactate converted to bicarbonate)	Irritability and muscle cramps	Treat underlying cause, electrolyte and fluid replacement
Central pontine myelinolysis (osmotic demyelination syndrome)	Difficulty speaking or swallowing, paralysis or coma	Supportive care, best to prevent

2.4 Pain Management (Acute and Chronic Pain Management)

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage. The relationship between pain (subjective) and actual or potential tissue damage (objective) is influenced by socio-cultural context as well as the nervous system.

Perioperative Analgesia:
Multimodal approach; IM/ IV analgesics and/or a central neuraxial or locoregional anaesthetic block may be used. The analgesic effect of these techniques may extend into the early postoperative period. However, it is best to assess pain frequently to determine additional demand of analgesia.

Non-Opioid Analgesics
D: paracetamol (IV) 15mg/kg 8hourly
OR
A: diclofenac –(IM) 75mg
OR
D: ketorolac

Weight 50kg or more: 30mg IM/IV 6hourly as needed; max dose: 120 mg/day.
Weight <50 kg: 15mg IM/IV 6hourly as needed; max dose: 60 mg/day.

Opioid analgesics
B: tramadol (IM/IV) 50-100mg 6hourly.
OR
C: morphine (IV/IM) 3–5mg as a single dose, then further boluses of 1–2mg/minute. Maximum dose of morphine 0.1–0.2mg/kg, and monitor vitals closely.
OR
B: pethidine (IV/IM) 1–2mg/kg (used for analgesia during anaesthesia, and during labour).
OR
S: fentanyl (IV) 1–2µg/kg.
OR
S: remifentanil 0.5-1mcg/kg/min or 1mcg/kg

Antagonists of Opioids for opioid overdose:

B: naloxone (IV) 0.4mg–2mg, alternatively may be given IM or SC. For reversal of opioid sedation initial dose 0.1–0.2mg (IV) at 2–3 minutes' intervals to the desired degree of reversal.

Acute Pain Due to Gastrointestinal Colic
B: Hyoscine butyl bromide, IV/oral, 10 mg 8 hourly.

Note:
- There are various medical conditions associated with severe acute pain e.g., myocardial infarction, renal colic, sickle-cell crisis and intra-articular haemorrhage due to haemophilia.
- The analgesic treatment for these conditions is the same as for patients with acute postoperative pain.
- Patients should be monitored for respiratory and cardiovascular depression when IV opioids are provided.
- Patients already on opioids for chronic pain, who experience an acute painful event, may be opioid tolerant and require higher IV opioid boluses to control their pain.

Chronic Pain Management

Chronic Non-Cancer Pain: A biopsychosocial assessment is necessary for effective pain management. Look out for the etiology and perpetuating factors and manage accordingly. Note that there may be overlap between different aetiologies, and condition specific pain management is paramount.

Pharmacological Management

Paracetamol, ibuprofen and tramadol may be used alone or in combination according to the severity of the pain.

Mild/moderate pain:
A: paracetamol (PO) 1 g 4-6hourly when required. Maximum daily dose: 4g in 24 hours.
OR
A: ibuprofen (PO) 400mg 8hourly with meals. May be used in combination with paracetamol or opioids.

For high-risk patients or patients with peptic ulcers, add a proton pump inhibitor

C: lansoprazole (PO) 30mg once a day.

Severe pain:

B: tramadol, oral, 50–100mg 4-6hourly.
OR
C: morphine syrup (PO).
Starting dose: 10-15mg (maximum 0.2 mg/kg) 4 hourly. Elderly or frail patients: 2.5–5mg (PO) (maximum 0.1 mg/kg) 4hourly. Increase dose by 50% every 24 hours if pain control is inadequate.

2.5 Critical Care

The goal is to guide the management of critically ill patients and perioperative care, emergency stabilization, and continuous ICU support. The Core Principles of Critical Care include;

- Early recognition of deterioration (ABCDE).
- Support failing organs: respiration, circulation, consciousness.
- Prioritize oxygen, fluids, monitoring, and referral.

Table 2.4 Summary of Key Conditions and Initial Management

Condition	Key Initial Management
Sepsis/Septic Shock, hypovolemic shock	Fluids (30ml/kg), antibiotics within 1 hour, monitor BP, urine Vasopressors/Inotropes and definitive source control.
Cardiogenic Shock	Inotropes.
Haemorrhagic Shock	Oxygen, Fluids (ie RL/0.9%-NS), Tranexamic acid, Vasopressors, Blood and blood products.
Respiratory Distress/Failure	High-flow oxygen, sit the patient up, consider assisted ventilation
Status Epilepticus	Maintain and secure ABC, Anti-convulsant, check glucose & temperature.
Hypotension/Shock	IV fluids, identify cause, use vasopressors if trained
Unconscious Patient	Airway protection, GCS, glucose check, avoid aspiration
Post-op Monitoring	Observe for bleeding, hypoxia, pain, delirium, and infection
Anaphylactic Shock	Epinephrine (adrenaline) IV/IM, Steroids, Anti-histamines, plus supportive care and specific antidote if poison/toxin is known.
DKA/HHS	Fluids (ie RL/0.9%-NS), Insulin, treat any trigger, ABG and check serum electrolytes (i.e., do not start Insulin without knowing K+).
Acute kidney injury	Look for the cause, maintain minimal fluid intake, and may need urgent referral to a nephrologist (refer to a chapter for acute kidney injury)

Referral: Refer to Higher Level (Triage/Red Flags) urgently if:

- SpO_2 < 90% despite oxygen therapy
- SBP < 90 mmHg after fluids
- GCS < 8 or declining
- Oliguria/anuria
- Persistent seizures
- Uncontrolled pain or bleeding

2.5.1 Indications for High Dependency Unit (HDU) admission

High Dependency Unit (HDUs) is an intermediate, step-down or step-up care unit. This is a specially staffed and equipped section of a hospital, usually located close to the ICU, that provides a level of care intermediate between intensive care and the general ward.

Acute Respiratory Support

- Mild to moderate hypoxia: SpO_2 < 90%
- Need of high flow oxygen, Non-Invasive ventilation (NIV)
- Increased work of breathing or respiratory fatigue, COPD or pneumonia

Cardiovascular Monitoring

- Systolic BP < 90 mmHg requiring fluid resuscitation
- Need for vasopressors or inotropes
- Heart failure, pulmonary embolism, stable arrhythmia

Postoperative Care

- After any major surgery
- Persistent bleeding or Hemodynamic instability post-surgery

Metabolic and neurological Compromise

- Severe sepsis, diabetic ketoacidosis, epilepsy or meningitis
- Glasgow Coma Scale (GCS) ≤ 15
- Severe electrolyte/metabolic disturbances
- Seizures

Single Organ Failure

- Oliguria/anuria despite fluids
- Acute renal failure requiring/awaiting dialysis
- Elevated lactate, acidosis, or confusion/delirium

Other Specific Indications

- Major trauma (especially with head, chest, or abdominal injuries)
- Precautionary monitoring- if there is a risk of deteriorating disease

2.5.2 Indications for ICU Admission

Common ICU Admission Criteria

Respiratory Failure

- Severe hypoxia: SpO_2 < 90% despite oxygen therapy
- Need for mechanical ventilation or assisted ventilation
- Rapidly increasing work of breathing or respiratory fatigue

Cardiovascular Instability

- Systolic BP < 90 mmHg despite fluid resuscitation
- Need for vasopressors or inotropes
- Life-threatening arrhythmias

Postoperative Monitoring (High Risk)

- Major surgery with expected need for respiratory/cardiac support
- Persistent bleeding or instability post-surgery

Neurological Compromise

- Glasgow Coma Scale (GCS) ≤ 8
- Coma of any cause (e.g., head injury, stroke, intoxication)
- Uncontrolled seizures/status epilepticus

Multiorgan Failure or Severe Sepsis

- Suspected or confirmed sepsis with signs of shock or organ dysfunction
- Oliguria/anuria despite fluids
- Elevated lactate, acidosis, or confusion/delirium

Other Specific Indications

- Poisoning or overdose requiring intensive monitoring
- Severe electrolyte/metabolic disturbances
- Severe trauma (especially with head, chest, or abdominal injuries)

2.5.3 Intensive Care Unit (ICU) Daily Assessment (FASTHUG BID)

FASTHUG BID is a widely used mnemonic in critical care to ensure comprehensive daily assessment and management of ICU patients. It's an evolution of the original FASTHUG, expanded to cover more domains of ICU care.

See Table 2.5 Below

Table 2.5 FASTHUG BID Mnemonic in ICU Care

Letter	Focus Area	Key Considerations
F	**Feeding**	Is the patient receiving adequate nutrition (enteral or parenteral)?
A	**Analgesia**	Is pain well-controlled? Are opioids or other analgesics needed or being reassessed?
S	**Sedation**	Is sedation needed? Can it be lightened or stopped? Daily sedation breaks if possible.
T	**Thromboprophylaxis**	Is the patient on DVT prophylaxis (e.g., heparin, compression devices)?
H	**Head of bed elevation**	Keep HOB elevated 30–45° to prevent aspiration and ventilator-associated pneumonia.
U	**Ulcer prophylaxis**	Stress ulcer prophylaxis for patients at risk (e.g., on ventilation, coagulopathy).
G	**Glycemic control**	Keep blood glucose in target range (typically 140–180 mg/dL or 7.8–10 mmol/L).

- **B- Bowel care** -Is the patient passing stool? Prevent ileus or constipation.
- **I- Indwelling devices** -Review lines, catheters, and tubes daily. Remove if no longer needed.
- **D- De-escalation of therapy** -Can antibiotics, ventilation, or other interventions be reduced or stopped?

ICU Discharge Criteria

Patients may be discharged from the ICU when intensive monitoring or organ support is no longer required, and they can be safely managed in a general ward or step-down unit. Discharge Considerations;

- Prioritize discharge if ICU resources are needed for a more critically ill patient and the current patient is stable.
- Ensure proper documentation and communication with the receiving team.

CHAPTER THREE

HAEMATOLOGY AND BLOOD TRANSFUSION

3.1 Anaemia

3.1.1 Iron Deficiency Anaemia

A lack of iron in the body (mainly due to nutritional deficiency, chronic blood loss, malabsorption and hookworm infestations and increased demand such as during pregnancy).

Risks groups

- Pediatric population
- Pregnant women
- Patients with chronic or recurrent bleeding
- Patients on chronic use of proton pump inhibitors
- Gastrointestinal surgical resections.

Clinical Presentation

Fatigue, palpitation, dizziness, glossitis, koilonychias (spoon-shaped nails), and pica.

Investigations

- Full blood picture (FBP)
- Peripheral smear
- Iron studies- serum iron levels, total iron binding capacity, serum ferritin.
- Stool analysis for hookworm ova and occult blood. If stool for occult blood is positive, do an Oesophagoduodenoscopy (OGD) to confirm upper gastrointestinal bleeding.

Non-Pharmacological Management

- To prevent iron deficiency;
- Eat a variety of iron-rich foods like meat, eggs, legumes (dried beans, lentils, peas), spinach and dark green leafy vegetables, iron fortified breads and cereals, nuts and seeds.
- To help in iron absorption from the diet
- Avoid drinking tea/coffee with meals
- Increase intake of Vitamin-C rich foods (e.g., citrus fruit, broccoli, cauliflower, guavas, tomatoes, bell peppers and strawberries) with meals to maintain iron in its reduced state.

Pharmacological Management

Treat the underlying cause of iron deficiency anaemia.

Adults

A: ferrous sulfate (PO) 200mg 24hrly for 3months.

Children

A: ferrous sulphate (PO) 5mg/kg 24hrly for 3 months. Continue for 3 months after the normal hemoglobin has been achieved.

OR

B: blood transfusion (is only indicated if anaemia is life-threatening; e.g., anaemia in failure, hypoxia.)

OR

D: iron sucrose (IV) 200mg in 100ml 0.9% sodium chloride running for 15 minutes once a day, three times a week for 2 weeks.

Note

- Parenteral iron is indicated in patients who cannot tolerate or are refractory to oral iron.
- Total cumulative dose = number of 100mg ampoules for Hb increase
- Divide the total cumulative dose in 200mg doses, given 24hourly

Table 3.1: Number of 100mg/ampoules of iron sucrose needed for Hb increase based on body weight.

Increase in Hb required (g/dl) i.e Target Hb minus Actual Hb								
		1g	2g	3g	4g	5g	6g	7g
Body weight (Kg)	**40**	6	7	8	9	10	11	12
	45	6	7	8	9	10	11	12
	50	6	7	9	10	11	12	13
	55	6	8	9	10	12	13	14
	60	6	8	9	11	13	14	16
	65	7	8	10	11	13	14	16
	70	7	8	10	12	13	15	17
	75	7	9	10	12	14	16	18
	80	7	9	11	13	15	17	18
	85	7	9	11	13	15	17	19
	90	7	9	11	14	16	18	20
	95	7	10	12	14	16	19	21
	100	7	10	12	15	17	19	22

- Duration of treatment may extend to 4 weeks based on the total cumulative dose required.
- Monitor blood counts and clinical assessment monthly.

Note: Formulations of iron combined with other nutritional supplements (vitamins, 0.4mg-5mg folic acid, zinc and amino acids) are recommended to enhance absorption of iron and correct combined nutritional deficiencies.

3.1.2 Megaloblastic Anemia

This is a condition whereby the bone marrow usually produces large, structurally abnormal, immature red blood cells (megaloblasts), often due to inadequate intake or malabsorption of vitamin B12 or folate.

Clinical Presentation
Pallor, depression, hair loss, pins and needles, numbness in hands or feet, tremors and palsies, mildly jaundiced (lemon yellow tint), beefy tongue, darkening of palms and ataxic gait.

Investigations

- FBC-Low Hb, sometimes pancytopenia, raised mcv but maybe low or normal if coexisting with iron deficiency (combined deficiency anaemia)
- Peripheral smear
- Serum vitamin B12,
- Serum folate level,
- TSH
- Reticulocyte count
- Bone marrow aspiration may be indicated

Pharmacological Management
Vitamin (B12 deficiency anaemia) and other macrocytic anemias without neurological involvement
C: hydroxocobalamin (IM) initially 1mg 3times a week for 2weeks
THEN
C: hydroxocobalamin (IM) 1mg every 3months.
Review the patient's blood counts and clinical assessment every 3months.

Pernicious Anaemia (B12 deficiency) with neurological symptoms and signs

C: hydroxocobalamin (IM) initially 1mg on alternate days until no further improvement (maximum reversal or neuro-psychiatric signs and symptoms are achieved) then 1mg every 2-3months
OR
C: methylcobalamin (PO) 500µgm 8hourly for 3 months
AND
A: folic acid (PO) 5mg 24hourly for at least 3 months. This must be started simultaneously with the injection of vitamin B12
AND
A: ferrous sulphate (PO) 200mg 8hourly for at least 3months

3.1.3 Haemolytic Anaemia

Haemolytic anaemia results from an increase in the rate of red cell destruction in the intravascular or in the reticuloendothelial system in some pathological disorders

Clinical Presentation
Pallor, jaundice, splenomegaly, Anaemia, Reticulocytosis, indirect hyperbilirubinemia, and haemoglobinuria

Investigations
- FBP
- Peripheral blood smear
- Reticulocyte count
- Haemoglobinuria
- Bilirubin (direct and indirect)
- Coombs test (Direct and Indirect)
- LDH
- Haptoglobin

Non- Pharmacological Management
Splenectomy may be considered in those who fail to respond to Pharmacological Management.

Pharmacological Management

A: prednisolone (PO) 1-1.5mg/kg/day for 1-3 weeks until Hb > 10g/dl
AND/OR
S: cyclophosphamide (IV) 50mg/kg/day for 4days

If no response;
A: folic acid (PO) 5mg 24hourly should be given for 1to 3months.
OR
B: blood transfusion if anaemia is severe
OR
S*: High dose human immunoglobulin G (IV) 400mg/kg/day for 5days

3.1.4 Sickle Cell Disease (SCD)

Clinical Presentation
Displays a wide spectrum of clinical manifestations with onset from 6 months of age, typically presenting with acute onset of unexplained illness, accompanied by pain and swelling of different parts of the body, fever, anaemia, jaundice, dyspnea, hepato-splenomegaly and neurological impairment with loss of vision.

Investigations
- Sickling test, Point-of-care rapid diagnostic tests (RDTs),
- High-performance liquid chromatography (HPLC),
- Hemoglobin electrophoresis, Isoelectric focusing (IEF)

Other ancillary laboratory investigations useful in the detection and monitoring of the disease include:
- FBP
- Peripheral Smear
- Reticulocyte count,
- LDH, Bilirubin Direct
- Total liver and renal profile,
- ECG and ECHO
- Spirometry
- Extended Blood grouping CXR,
- Abdominal USS
- Transcranial Doppler USS,

Note: Confirmatory test should be done to all patients with positive screening tests and those with negative screening test results but have Clinical Presentation suggestive of SCD.

Screening
From the age of 10 years, screen for renal disease (proteinuria by urine dipstick) and retinopathy annually
Annual screening for risk of stroke by transcranial Doppler from the age of 2years to 16years.

Pharmacological Management
Supportive therapy

A: folic acid (PO) 5mg 24hourly
AND
A: phenoxy methyl penicillin (PO) 125mg for children younger than 3years;

A: phenoxy methyl penicillin (PO) 250mg for children 3 years and older, 12hourly until 5years of age in all children with SCA for prophylaxis against Pneumococcal Infection.

Immunisation against pneumococcal infection

A: pneumococcal conjugate vaccine (PCV-13) from two months of age, 3 doses 8 weeks apart (i.e at age 2months, 4 months and 6 months), and a booster dose between 12-15 months.
If the child has not previously received this vaccine, then at least one dose should be given between 6-18 years.
S: pneumococcal polysaccharide vaccine (PPSV-23) - at 2 years, then after every 5 years for life.

Table 3.2 Analgesia for General Pain Relief

Severity	Management
Mild	Reassurance, hot packs, reposition, massage, distraction (stories, play) **Child**: **A:** paracetamol (PO) 15mg/kg 6hourly **Adult**: **A:** paracetamol (PO) 1g 6hourly
Moderate	As for mild pain, PLUS **Child**: **A:** ibuprofen (PO) 5mg/kg 8hourly **Adult**: **A:** ibuprofen (PO) 400mg 8hourly
Severe	As for moderate pain PLUS **Child: C:** morphine (PO) 0.5mg/kg 3–4 hourly as needed **Adult**: **C:** morphine (PO) 5–10mg, 3–4 hourly as needed If unable to take orally, administer paracetamol (IV) 1g 6-8hourly and morphine 0.1mg/kg 8-12hourly If morphine is not available, tramadol may be used. **B:** tramadol (PO) 50-100mg 6hourly as needed

Hydration: Encourage oral fluids first; it should be used whenever possible. Give IV fluids, preferably normal saline, if the patient is unable to drink well, has severe pain, or abdominal symptoms.

Body weight (kg)	Fluids (ml/kg/day)
<10 kg	150ml/kg/day
11 – 20kg	75ml/kg/day for every kilogram above 10kg ADDED to 1500ml for the first 10kg of weight
> 20kg	30ml/kg for every kilogram above 20kg ADDED to 225Oml for the first 20kg of weight
Divide the total daily volume by 24 hours to obtain hourly fluid rate	

Disease Modifying Therapy

Principle of Dosage Initiation and Monitoring:

D: hydroxyurea (PO) 15 mg/kg/day 24hourly; (5–10 mg/kg/day if patient has chronic kidney disease).
OR
D: hydroxyurea (PO) 20mg/kg/day, starting dosage for infants and children.

Increase the dose by 2.5–5 mg/kg/day every 3 months. The maximum tolerated dose (MTD) should not exceed 30mg/kg/day.

If haematologic toxicity occurs;

- Discontinue hydroxyurea until counts recover, usually 1-2 weeks,
- Reinitiate hydroxyurea at a dose of 2.5mg/kg/day less than the dose given before onset of cytopenias to achieve the maximum tolerable therapeutic dose,
- Do FBP according to the initiation schedule.

Note:

- Clinical response to treatment with hydroxyurea may take 3-6months. A 6month trial on MTD is required before considering discontinuation due to treatment failure.
- Hydroxyurea should be stopped at least three months prior to conception in both males and females
- Hydroxyurea should be discontinued in all pregnant women
- Hydroxyurea should be discontinued in all breastfeeding women

Chronic Transfusion Program

Regular scheduled blood transfusions, including both simple and exchange (manual or automated).

D: Chronic (Top-Up) Blood Transfusion:
Scheduled, long-term red cell transfusion program aims to prevent complications in SCD by maintaining the target Hb and reducing HbS level to 30%.

Potential risks include iron overload and alloimmunization; regular ferritin monitoring, chelation, and extended phenotype-matched, leukodepleted blood are essential.

S: Exchange Blood Transfusion
Can be manual or automated by use of an Aphaeretic machine. Indicated in severe SCD patients with

- Abnormal TCD
- Cerebrovascular Accidents (CVAs)
- Recurrent Acute Chest Syndrome (ACS) major surgery
- Multi-organ failure, including Systemic Marrow Fat Embolism (SMFE)
- Multiple pregnancies
- Prevention of recurrent stroke.
- SCD undergoing a Hematopoietic Stem Cell Transplant.

Relative Indications for Exchange Blood Transfusion

- Intractable or very frequent severe crises
- Major priapism unresponsive to other therapy.

Note:

- Because the cardiovascular system adjusts to the chronic anaemia, blood transfusion is not routinely indicated in steady state SCD simply for the reason that haemoglobin level is below 8-10g/dl.
- Packed red cell transfusion is preferred to minimize the risk of fluid overload.

Allogeneic Hematopoietic Stem Cell Transplantation

SCD in pregnancy

- Stop hydroxyurea 3 months before conception
- Educate the patient about the risks associated with pregnancy in SCD.
- Determine the haemoglobinopathy status of the partner.
- Document pre-pregnancy baseline results, if any.
- Refer the patient to a high-risk antenatal clinic for proper follow-up
- Prescribe routine prenatal vitamins, see under Obstetrics and Gynaecology chapter
- Prophylactic blood transfusion is not recommended.
- Vaginal delivery is preferred unless there is an indication for cesarean section.
- Prescribe prophylaxis for venous thromboembolism (VTE) for patients with additional risk factors for VTE e.g. history of VTE. See details under the coagulation disorders section 3.5
- Monitor hydration status, warmth, and give analgesia as needed after delivery.
- Assess and manage neonatal opioid dependency and withdrawal in all infants with a history of in utero opioid exposure.

Pharmacological Management.

A: acetylsalicylic acid (PO) 75mg 24hourly, starting from the second trimester to reduce the risk of pre-eclampsia.

Iron Overload in SCD
Excessive iron deposition in organs, including the liver, heart, pancreas, and endocrine glands, leading to fibrosis, organ dysfunction, and failure caused by Chronic Transfusions:
Each unit of transfused blood contains approximately 200–250 mg of iron and the body lacks a physiological mechanism to excrete excess iron.

Investigations

- Serum Ferritin
- ALT, AST, GGT
- MRI to assess for Liver Iron Concentration LIC

Pharmacological Management

Iron Chelation:

C: deferiprone (PO) 25mg/kg 8hrly until serum ferritin falls to safe levels
OR
D: deferoxamine (IV/SC) 25-50mg/kg/day over 8-24 hours, 5 days per week

Check - Ferritin levels and LFTs 3 months, to monitor response, CBC weekly, stop if severe agranulocytosis develops.
Continue if - patient remains transfusion dependent, ferritin still above 1000ng/Ml, in heavily transfused patients, and elevated MRI Liver/heart iron.
De-escalate or stop if ferritin falls to <500ng/Ml, transfusions have stopped, MRI liver/heart iron is reduced

SCD Emergency Conditions:

Acute chest syndrome

- Life-threatening – admit the patient in a high dependency unit or ICU,
- Diagnostic criteria – respiratory distress (fast breathing, SPO2<95% on air) and/or pleuritic pain, cough, fever, tachycardia, infiltrates on CXR,
- Investigations – arterial blood gases, creatinine, electrolytes, ALT, FBP, malaria test, blood and urine culture and sensitivity, CRP, CXR, HPLC,
- Management – Give supplemental oxygen to maintain SPO2>95%, analgesia for pain relief, fluids per hydration protocol, broad-spectrum antibiotics while awaiting culture and sensitivity results, top up blood transfusion or exchange transfusion if expertise available.

Acute anaemia

- Haemoglobin < 5g/dl or recent acute drop in Hb >2g/dl below steady state.
- Causes – infection, splenic sequestration, haemolytic crisis and aplastic crisis.
- Investigations – do FBP, reticulocyte count, creatinine, bilirubin, ALT, LDH, malaria test, urine and blood culture and sensitivity, blood grouping and cross-matching,
- Management – immediately transfuse packed red cells 10mls/kg over 4hours, repeat transfusion as needed as per transfusion protocol, treat the underlying cause, document the size of the liver and spleen.

Stroke

- See management details under the central nervous system chapter,
- Exchange transfusion or top-up transfusion to prevent recurrent stroke.

3.1.5 G6PD Deficiency

G6PD is an inherited X-linked recessive genetic disorder; haemolysis results from oxidative damage to RBCs due to loss of protective effect of the enzyme G6PD.

Clinical Presentation

- Usually asymptomatic but liable to haemolysis (acute anaemia) if infection, incriminated drugs (e.g., sulphonamides, chloroquine, primaquine or proguanil). or foods (e.g., fava beans) are taken.
- Pallor,
- Jaundice and
- Dark urine (Coca-colored urine)

Investigations

- FBP, peripheral smear, reticulocyte count,
- Methaemoglobin reduction (G6PD) test.

Pharmacological Management

A: folic acid (PO) 5mg 24hourly for 1-3 months.
AND
D: Transfusion of packed red blood cells in severe anaemia. Give 10ml/kg body weight. Then assess the level of haemoglobin and Clinical Presentation.

3.1.6 Aplastic Anaemia (Bone Marrow Failure)

Aplastic anaemia is defined as pancytopenia resulting from aplasia of the bone marrow. it can be inherited (Fanconi anaemia) or acquired (idiopathic, chemical, or drug-induced). It is one of the haematological emergencies.

Clinical Presentation
Vary with severity but include; Anaemia, easy bruising/bleeding, recurrent infection, Splenomegaly is not a feature.

Diagnostic Criteria
Pancytopenia, Bone marrow hypocellularity of < 30% hematopoietic cells.

Investigations

- FBP, peripheral smear, reticulocyte count,
- Viral screening (HIV, Hepatitis B, and C),
- Bone marrow aspiration and trephine biopsy.

Pharmacological Management

Supportive treatment
B: blood transfusion (preferred irradiated, leukodepleted) when Hb<7g/dl
OR
S: platelet transfusion if bleeding or if platelet count is <10 X109/l. See dosage under the blood transfusion section 3.6
AND
Prophylactic antibiotics, hygiene, isolation of the patient, and use of masks to prevent neutropenic sepsis in patients with ANC of less than 0.5 X 109/l.

Note: Culture and sensitivity in patients with neutropenic sepsis. Refer to management of neutropenic sepsis under malignant diseases chapter.

Definitive treatment
Allogeneic haematopoietic stem cell transplantation is indicated in patients younger than 45 years. Immunosuppressive Therapy.

S: anti-thymocyte globulin (ATG) (IV) 40mg/kg 24hourly for 4-10 days.
AND
S: cyclosporine (PO) 2-10mg/kg 12hourly for 6-24 months
AND
S: eltrombopag (PO):

- Children <5 years: 2.5 mg/kg 24 hourly (every 24 hours)
- Children 6–11 years: 75 mg 24 hourly
- Adolescents ≥12 years: 150 mg 24 hourly

Duration of therapy: 6 months

For patients who develop cyclosporine toxicity (nephrotoxicity, hypertension, gingival hypertrophy and hirsutism), the following drugs may be used, although the response rate is low.

D: methylprednisolone (PO) 5-10mg/kg for 3–14days
OR
S: cyclophosphamide (IV) 45mg/kg /day for 4days.
OR
S: danazol (PO) 5mg/kg 24hourly for 6months.

Note

- Give supportive therapy and refer patients to higher health facility with adequate expertise and facilities.
- Monitor blood counts bi-monthly for outpatients, and as needed for admitted patients.

3.1.7 Myelodysplastic syndrome (MDS)

Pre-malignant condition, primarily a disease of older people.

Investigations
similar to aplastic anaemia, plus analysis of 5q deletion.

Pharmacological Management
B: blood transfusion for symptomatic treatment
AND
S: azacitidine (SC) 75mg/m2 24hourly for 7 days, repeat after every 28days.

3.2 Bleeding Disorders

3.2.1 Hereditary Bleeding Disorders

Hereditary bleeding disorders include haemophilia A and B, Von Willebrand disease

3.2.1.1 Haemophilia

Haemophilia is an inherited, X-linked lifelong bleeding disorder that affects males almost exclusively.

Clinical Presentation

- Spontaneous muscle and joint bleeding without injury,
- Prolonged bleeding after injury,
- Epistaxis and easy bruising.
- Complication includes arthropathy and disability.

Haemophilia A (Factor VIII deficiency)
Is the most common of the hereditary clotting factor deficiencies and are caused by a deficiency of factor VIII.

Haemophilia B (Factor IX deficiency)
It is caused by a deficiency of clotting factor IX, Presentation as in Haemophilia A, this is less common, 20%.

Classification of Haemophilia
Haemophilia is classified as mild, moderate, or severe according to the levels of circulating factor VIII or IX and indicates the expected frequency of bleeding.

Table 3.3: Classification of Haemophilia

Classification	Haemophilia A Factor VIII level	Haemophilia B Factor IX level	Clinical features
Severe	<1% of normal ≤ 0.01 U/ml	≤ 1% of normal ≤ 0.01U/ml	• Spontaneous haemorrhage • Frequent spontaneous haemarthrosis
Moderate	2-5%of normal 0.01-0.05 U/ml		Haemorrhage secondary to trauma or surgery Occasional spontaneous haemarthrosis
Mild	5-40%of normal	5-40% of normal	• Haemorrhage post trauma or surgery • Rare spontaneous

Investigations

- Prolonged aPTT but normal PT and platelet counts
- Confirm by factor VIII or IX assay

Non-Pharmacological Management

- Avoid I.M injections and use small-gauge needles if necessary
- Inform the patient and parents thoroughly on the problem, and provide means of alerting other medical/pharmaceutical personnel
- Genetic counselling
- For Acute Bleeding episodes (RICE): Rest, Ice/cold pack 5 minutes on, 10 min off, Compression, and Elevate the joint.

For haemarthrosis – AVOID incising or aspiration of the affected joint. Treat by replacing the specific factor e.g. factor 8 or 9 concentrate if available or FFP (10-15ml/kg), joint support and tabs Paracetamol for pain.

Pharmacological Management
Avoid use of NSAIDs, instead use paracetamol

Haemophilia A (Factor VIII Deficiency) no Inhibitor
Dose depends on bleeding severity

Minor bleed:
S: coagulation factor VIII (IV) 20–40IU/kg.

Major bleed:
S: coagulation factor VIII (IV) 50–100 IU/kg 12hourly for 3-5 days or until bleeding stops, Expected response: 1IU/kg = 2% rise in factor VIII level. Half-life Factor VIII: 8–24hours

Haemophilia B (Factor IX deficiency), no inhibitor
Dose depends on bleeding severity

Minor bleed:
S: coagulation factor IX (IV) 20-50IU/kg

Major bleed:
S: coagulation Factor IX (IV) 100IU/kg

Expected response: 1IU/kg= 1.5 rise in the factor IX level Half-life Factor IX: 16–24 hours

D: fresh frozen plasma (FFP) can be used where factor concentrate is unavailable. Average dose 10-15mls/kg.

Note:

- If there is no response to appropriate replacement therapy tests for inhibitors (an inhibitor is formed when one develops antibodies against factor concentrates)
- Detection of inhibitor is by aPTT mix study and confirmed by the Bethesda assay (BU)

Factor VIII Inhibitor Management Options

- High dose factor concentrate infusion
- Use by-pass agent like FEIBA (Factor Eight Inhibitor By-passing Agent)
- Immune tolerance induction therapy (ITI)
- In case of emergency surgery, consider plasmapheresis
- Adjuvant antifibrinolytics agents e.g., Tranexamic acid, can be used with either of the above.

Note:

- All patients suspected of haemophilia A or B should be referred to a higher facility with adequate expertise or consult the haematology Unit.
- Children with severe haemophilia are recommended to be on low-dose prophylaxis of factor concentrate
- Male circumcision should be done at a hospital where factor concentrate is available. Concentrate should be given before and after the procedure.

3.2.2 Von Willebrand Disease (VWD)

Von Willebrand Disease is an inherited disease due to a deficiency of vWF. It is the commonest bleeding disorder in the population, especially in women.

Clinical Presentation
History of easy bruising, Menorrhagia**,** Gum bleeding**,** Joint bleeding in severe cases

Investigations

- Confirmatory test: VWF level assay.
- PT, aPTT, and platelet count are normal except in severe cases.

Pharmacological Management

C: etamsylate (PO) 500mg 8hourly until the bleeding stops
OR
C: tranexamic acid (PO) 500mg 8hourly until bleeding is stopped.

If no response

S: desmopressin (IV) 0.3µg/kg IV stat. Max. Dose20µg.

Note:

- Patient unresponsive to DDVAP may be treated with virus-inactivated vWF containing FVIII concentrate.
- Never give Etamsylate or Tranexamic acid to patients bleeding per urethral

3.2.3 Acquired Bleeding Disorders/Platelet Disorders

3.2.3.1 Disseminated Intravascular Coagulation (DIC)

Clinical Presentation

- Usually are related to the underlying disorder.
- Bleeding manifestation,
- Extensive organ dysfunction,
- Shock, renal cortical ischemia, coma, delirium and focal neurological symptoms.

Rapid and appropriate treatment of the underlying disorder, including;

Non- Pharmacological Management

- Surgical debridement of necrotic tissues,
- Evacuation of dead fetus; Platelets transfusion for thrombocytopenia,
- Fresh frozen plasma (FFP) for coagulation factor depletion.
- Monitor prothrombin time (PT), international normalized ratio (INR), activated partial thromboplastin (aPTT), platelet count and fibrinogen

Pharmacological Management

- Antibiotics for infection,
- Chemotherapy for malignant causes,

> **Note:** If the patient is not bleeding Platelets concentrate is contraindicated. If DIC is severe enough to cause multiorgan dysfunction, management in an intensive care unit is required.

3.2.3.2 Idiopathic Thrombocytopenic Purpura (ITP)

Clinical Presentation

- Long history of Purpura, menorrhagia, epistaxis, and gingival haemorrhage.
- Intracerebral haemorrhage occurs infrequently but is the most common cause of death
- Overt bleeding is rare unless thrombocytopenia is severe (less than 10 X109/L).

> **Note:** A palpable spleen strongly suggests that ITP is NOT the cause for thrombocytopenia.

Non-Pharmacological Management

- Patients with platelet counts over 50 X109/L usually do not have spontaneous bleeding and may undergo an invasive procedure.
- Emergency treatment of acute bleeding caused by severe thrombocytopenia needs immediate platelet transfusion.

Pharmacological Management

A: prednisolone (PO) 1mg/kg 24hourly for 3-6 weeks, then taper 10mg weekly (for all patients with platelet counts below 30 X109/l)

OR

B: dexamethasone (IV) 40mg in 500ml 0.9% sodium chloride running for 4 hours once a day for 4 days.

If no response;

S: human Immunoglobulin G (IV) 0.4g/kg 24hourly for 5 days

OR

S: human Immunoglobulin G (IV) 1g/kg 24hourly for 2 days followed by immediately platelets transfusion

3.2.3.3 Heparin-Induced Thrombocytopenia (HIT)

Immune-mediated prothrombotic complication of heparin causing a platelet fall (≥50% from baseline), occurring typically 5–10 days after heparin exposure, with high risk of venous/arterial thrombosis.

Clinical Presentation

- 4Ts score -Thrombocytopenia, Timing, Thrombosis, and other causes
- Low (0–3) HIT unlikely → consider other causes
- Intermediate/High (≥4): Treat as HIT.

Investigations

- FBP,
- peripheral smear,
- PT,
- PTT,
- INR
- PF4-ELISA/functional assay as confirmatory test.

Non-Pharmacological Management

Avoid platelet transfusions unless life-threatening bleeding.

Pharmacological Management

- Start a non-heparin anticoagulant (use DOACs dosing on **section 3.3.1**).
- Duration of Non-Heparin Anticoagulation in HIT:
- HIT without thrombosis treatment should be continued for 4 weeks
- HIT with thrombosis (HIT-T) treatment should be continued for 3 months
- Use the non-heparin anticoagulant until platelet recovery and at least the above durations.
- Transition to oral anticoagulant (warfarin or DOAC) only after platelets ≥150 $\times 10^9$/L, overlapping if warfarin.

3.3 Coagulation Disorders

Venous thromboembolism (VTE) is a common disorder that comprises deep vein thrombosis (DVT) and pulmonary embolism (PE). In most cases, pulmonary embolism arises from proximal deep vein thrombosis i.e., popliteal, femoral or iliac veins in at least 90%.

3.3.1 Deep Vein Thrombosis (DVT)

Clinical Presentation

- Leg pain, tenderness and swelling.
- A palpable cord representing thrombosed vessels.
- Discoloration, venous distention and prominence of superficial veins and cyanosis.
- The clinical diagnosis of DVT is highly nonspecific.

Table 3.4: Wells Score for clinical prediction of DVT

Clinical Feature	Score
Active cancer (treatment ongoing, within 6 months, or palliative)	+1
Paralysis, paresis, or recent plaster immobilization of lower extremities	+1
Recently bedridden for ≥3 days or major surgery within 12 weeks	+1
Localized tenderness along distribution of deep venous system	+1
Entire leg swollen	+1
Calf swelling ≥3 cm compared to asymptomatic leg (measured 10 cm below tibial tuberosity)	+1
Pitting edema confined to the symptomatic leg	+1
Collateral superficial veins (non-varicose)	+1
Previously documented DVT	+1
Alternative diagnosis at least as likely as DVT	–2

Investigations

- PT, PTT and INR
- D-dimer,
- Doppler USS,
- CT or MRI Venography

Pharmacological Management

Start anticoagulation promptly if imaging delays and bleeding risk is acceptable. Long term anticoagulation is required to prevent the frequency of symptomatic extension of thrombosis and/or recurrent venous thromboembolic events. Unfractionated Heparin (UFH) or Low Molecular Weight Heparin (LMWH) is started, followed by Direct Oral Anticoagulation without bridging. If Warfarin is started with initial unfractionated heparin or Low Molecular weight Heparinin therapy, bridge for 5days.

C: warfarin (PO) 5mg 24hourly for 5days, then adjust the dose according to INR levels for 3-6 months
AND
D: low molecular weight heparin (SC) 1mg/kg 24hourly for 5days
OR
C: unfractionated heparin (IV) by 75units/kg followed by continuous infusion of 18units/kg/hrs.

Adolescents or children: loading dose 75units/kg then 15–25 Units /kg/hr by IV infusion or 250units/kg 12hourly by SC injection.
S: rivaroxaban (PO) 15mg 12hourly for 21days, then rivaroxaban (PO) 20mg 24hourly for the remaining duration of treatment.
OR
S: apixaban (PO) 10mg 12hrly for 7 days, then 5mg apixaban (PO) 12hrly for the remaining duration of treatment.

Pregnant women

Warfarin is teratogenic; low molecular weight heparin is recommended during pregnancy.

D: low molecular weight heparin (SC) 1mg/kg 12hourly for the whole duration of treatment.

3.3.2 Pulmonary Embolism (PE)

Refer to Cardiovascular Diseases Conditions, **Chapter 20.**

3.4 Blood Transfusion

Currently, the following blood components are available for transfusion: packed red blood cells, Fresh Frozen Plasma, single-unit platelets (plasma-rich) and whole blood units.

i. **Whole blood:** One unit contains 450mls of blood. Indications: Open heart surgery, and in the absence of PRBCs in patients with acute blood loss and hypovolaemia.

ii. **D: Packed red blood cells** (PRBCs); One unit increases haemoglobin (Hb) level by approximately 1g/dl in adult, whereas in children, a dose of 10-15mls/kg will increase the Hb by about 3g/dl.

- Indications: acute blood loss, exchange transfusion, cardiac patients with Hb level <8g/dl, chronic symptomatic anaemia with Hb <5g/dl, preoperative patients with Hb level <8g/dl, pre-radiotherapy patients with Hb level <10g/dl, pre and post chemotherapy patients with Hb <9g/dl, and patients admitted to ICU with Hb <7g/dl.

iii. D: Platelets; Dosage: 50mls per 10kg i.e., 5-6 RDP units in adults. In infants < 10kg, the dose is 5mls/kg, one adult therapeutic dose increases platelet counts by approximately 20-40 X109/L.

- Indications include, Therapeutic: thrombocytopenia of platelet counts< 50X109/L with clinical evidence of bleeding. Prophylactic in patients with platelet counts of: <10 X109/L, <20X109/L with additional risk factor of bleeding, <50X109/L and planned for minor surgery, <100X109/L with multiple injuries, or microvascular bleeding, or planned for major surgery. Also, in massive transfusion to maintain a platelet count of >50X109/L.
- Contraindications: Absolutely contraindicated in heparin-induced thrombotic thrombocytopenia (HITT) and thrombotic thrombocytopenic purpura (TTP). Relatively contraindicated in idiopathic thrombocytopenia (ITP) unless a life-threatening bleeding is anticipated.

i.v D: Fresh frozen plasma (FFP)

Dosage: 10-20ml/kg, approximately 4-6 units for adult, this will raise a minimum of 30% of plasma clotting factors.

- Indications: haemophilia if factor concentrates not available, patients with significant coagulopathy eg DIC, Vitamin K deficiency and massive transfusion, thrombotic thrombocytopenic purpura (TTP) or haemolytic uremic syndrome (HUS) as top up or exchange plasma transfusion, scoline apnoea, haemorrhagic disease of the newborn.

Types of blood transfusion

i. Acute simple/episodic transfusion

Used in the management of symptomatic patients with anaemia or bleeding tendencies.

ii. Chronic/top-up transfusion

Used as a prophylactic to prevent complications, e.g. In patients with sickle cell anaemia (SCA)

iii. Exchange blood transfusion

Indications: Severe hyperbilirubinemia (per nomogram), hemolytic disease, or failed intensive phototherapy. In SCD, exchange is indicated in patients with severe disease, those undergoing a major surgery and as a preparatory procedure before Hematopoietic Stem Cell Transplant.

i.v Massive blood transfusion

Transfusion of blood volume to the patient equivalent to his/her total blood volume in less than 24 hours, or 10 units or more in 24 hours. Administer in parallel a 1:1:1 ratio of 6 Units of RBCs, 6 Units of FFP and 6 Units of Platelets. The target is to achieve 1:1:1 ratio over 6 hours. Aim the PT, PTT <1.5x control mean, fibrinogen >1 g/L, target platelet > 100x109/L if pts has CNS trauma, eye and > 50x109/L for other type of injuries.

Plasma Derived Medicinal Products (PDMPs) available from commercial outlets

- Haemosolvate factors VIII and IX used in management of haemophilia
- Immunoglobulins used in immune-mediated conditions
- Albumin used in management of hypovolaemia, hypoalbuminaemia and in therapeutic plasma exchange.

Table 3.5: Adverse effects of blood transfusion

Reaction	Transfusion	Management
Acute immunologic reactions	Acute haemolytic transfusion reaction	Stop transfusion, supportive care to maintain hemodynamics. Regroup and crossmatch the donor and the recipient's samples. Assess for haemolysis.
	Allergic reactions	Stop transfusion, administer antihistamine e.g. Chlorphenamine 4mg PO as needed +/- steroid e.g. Hydrocortisone 100mg IV stat, resume transfusion if symptoms subside. If an anaphylactic reaction occurs, add vasoconstrictors, e.g., epinephrine and supportive care.
	Febrile non-haemolytic transfusion reaction	Stop transfusion, administer antipyretics A: Paracetamol 1g PO as needed+/- steroid e.g. Hydrocortisone 100mg IV stat, Resume transfusion if symptoms subside
	Transfusion-related acute lung injury (TRALI)	Stop transfusion, oxygen supplementation and mechanical ventilation if required.
	Transfusion-associated graft-versus-host disease (TA-GVHD)	Supportive care
Delayed immunologic reactions	Delayed hemolytic transfusion reaction	Symptomatic treatment, request an extended cross-match for additional transfusions.
	Post-transfusion purpura	Self-limiting, **S:** IV immunoglobulin 0.4g/kg/day IV for 5days or plasma exchange may be needed in severe cases.
Acute non-immunologic reactions	Transfusion-related circulatory overload (TACO)	Stop transfusion, administer diuretics, manage as cardiac failure. See details under the cardiovascular diseases chapter.
	Bacterial contamination	Stop transfusion, antibiotics and supportive care
Delayed non-immunologic reactions	Infectious disease transmission	Manage the infection accordingly, e.g., HIV, Hepatitis B & C. See details under respective chapters
	Iron overload	Iron chelation with deferoxamine

Note: Haematological malignancies refer to **Chapter 22, Malignant disease conditions**.

3.5 Hematopoietic Stem Cell Transplantation

Curative intervention that involves infusion of healthy stem cells to replace defective hematopoietic system and reconstitute the bone marrow after a high-dose chemotherapy in both hematological (Leukemia, Lymphoma, Multiple Myeloma, and Sickle Cell Disease) and other non-hematological conditions.

Allogeneic Hematopoietic Stem Cell Transplantation for SCD. Refer to the tertiary/specialized hospital.

Conditioning Regimen

Myeloablative conditioning (MAC)

S: busulphan (IV) 0.8-1.2mg/kg 6hourly for 4 days.
AND
S: cyclophosphamide (IV) 50mg/kg/day for 4days.
AND
S: rituximab (IV) 200mg/sq/m STAT dose.

Post-transplant complications
Infections (Bacterial, Viral, Fungal)

General Principles

- Risk periods: Highest in neutropenia (pre-engraftment) and during immunosuppression.
- Multidisciplinary approach: Involve transplant team + infectious diseases specialist.
- Infection control: Hand hygiene, HEPA filtration (if available), low-microbial diet during neutropenia.
- Monitor for drug toxicities (e.g., renal with amphotericin/amikacin, neutropenia with ganciclovir).
- De-escalate therapy promptly based on cultures and clinical response.

Bacterial Infections / Febrile Neutropenia (FN)
Fever ≥38.3°C once or ≥38°C sustained ≥1 hour + ANC less the 500/microliter

Pharmacological Management
S: Piperacillin-tazobactam (IV) 4.5g 6 hourly for 7-14days. (Renal-adjusted; paediatric dosing per weight).
AND
S: amikacin IV (15–20 mg/kg/day, FOR 7-14days in high-risk cases (septic shock, known MDR Gram-negative colonisation, pneumonia, or local high resistance).

Note:
- Add vancomycin (IV) 1g 8hourly for 7-14 days: If suspected Gram-positive (severe mucositis, catheter-site infection, known MRSA).
- Escalate to carbapenem if unstable or ESBL suspicion.
- Documented infection: Complete targeted course (e.g., 7–14 days for bacteremia) + de-escalate based on sensitivities.

Viral infections: active disease or breakthrough):
D: acyclovir (IV) 10 mg/kg 8hourly (or higher for VZV/visceral disease).
Switch to oral when stable. Duration: 7–14 days or until lesions resolve.

CMV infection / disease (pre-emptive or treatment):
S: ganciclovir (IV) 5 mg/kg 12hourly
OR
S: valganciclovir (PO) 900mg 24hourly, when CMV PCR exceeds local threshold.
Induction: Minimum 2 weeks or until 2 consecutive negative PCRs (weekly monitoring).
Maintenance (half-dose): Until risk period ends or immune reconstitution.

Fungal Infections (Suspected / Proven Invasive Fungal Infection – IFI)
Empiric therapy (persistent fever >4–7 days despite broad-spectrum antibiotics in high-risk neutropenic patient):

S: liposomal amphotericin B (IV) –5 mg/kg/day for 14 days or until clinical/radiological resolution + immune recovery.

Prophylaxis:
A: sulfamethoxazole + trimethoprim (cotrimoxazole) (PO) 960mg 24hourly, if high risk for PJP

Vaccination
Post-immune reconstitution (usually ≥6–12 months post-HSCT and off immunosuppression): Follow national schedule + HSCT-specific (pneumococcal conjugate → polysaccharide, Hib, etc.).

Graft-versus-Host Disease (GVHD)
Acute GVHD: skin, liver, gut (Day 20–100)
Chronic GVHD: multi-organ autoimmune-like disease (>Day 100).

General Principles
- GVHD risk highest with mismatched/unrelated donors, peripheral blood stem cells, older patients, and female donor–male recipient.
- Multidisciplinary team: Transplant physician, dermatology, gastroenterology, ophthalmology, pharmacists and infectious diseases.
- Early diagnosis critical — biopsy (skin/gut/liver) where feasible to exclude infection/malignancy.
- Monitor for overlapping infections, drug toxicities (renal with CNIs, osteoporosis with steroids), and quality of life.
- Taper immunosuppression slowly once controlled; abrupt withdrawal risks flare.

Acute GVHD (typically Day +20–100; can occur earlier/later):
- Classic target organs: Skin (maculopapular rash), liver (cholestatic jaundice), gut (diarrhoea, nausea, abdominal pain).
- Staging/Grading: Use modified Glucksberg or MAGIC criteria (stage 1–4 per organ; overall grade I–IV). Biopsy preferred for confirmation.

Pharmacological Management
First-line (all grades II–IV or progressive grade I):
Systemic corticosteroids:

D: methylprednisolone or prednisolone (IV/PO) 1–2 mg/kg/day (divided doses).
Continue or resume Calcineurin Inhibitor (CNI) prophylaxis at therapeutic levels.
Response assessment: Day +7–14 (skin/gut/liver improvement).

Mild (grade I, skin-only): Consider topical steroids + optimization of prophylaxis (no systemic steroids if possible).
Duration: Taper steroids slowly over 4–8 weeks once complete/partial response; monitor for rebound.

Prophylaxis:
Calcineurin inhibitor:

S: cyclosporine: (IV/PO) 3 mg/kg/day 12hourly or infusion for 6months, Taper from month 4 if no GVHD
Serum concentration target level (200–300 ng/mL) (first 4 weeks) then 100–200 ng/mL.
OR
S: tacrolimus (IV) 0.03 mg/kg/day continuous
OR
S: tacrolimus (PO) 0.12 mg/kg/day 12hourly, Serum concentration target level 5–15 ng/mL for 6 months
AND
S: methotrexate (PO/IV) 15 mg/m² D+1; 10 mg/m² - D+3, +6 (±+11), Short course only (max 4 doses) + folinic acid rescue
OR
S: mycophenolate Mofetil (MMF) (IV/PO) 15 mg/kg/dose 8hourly (max 1 g/dose) for 30 days (MRD) to 2–3 months

Steroid-refractory GVHD (no response by day 7–14 on ≥1–2 mg/kg steroid
Preferred second-line:
Ruxolitinib (reduce steroids rapidly once started).

S: ruxolitinib (PO) 5mg 12hourly (increase to 10 mg 12hourly after 3 days if counts stable) Continue until best response (assess 4–8 weeks); taper after 6 months if response.
OR
S: antithymocyte globulin (rabbit) 2.5–5 mg/kg/day IV × 3–5 days (total 7.5–15 mg/kg) Single course; may repeat once after 2–4 wk.
OR
S: extracorporeal photopheresis ECP (where available)2 sessions/week (one cycle = 2 consecutive days) 8–12 weeks (2×/wk) → taper to monthly

Supportive care (in addition to systemic therapy)
Skin care
- Emollients (petroleum jelly/urea cream): liberally 2–4× daily – lifelong or until healed.
- Topical steroids: – Body (neck-down): Betamethasone 0.1% or clobetasol 0.05% cream 24 hourly × 2–4 weeks max. – Face/groin: Hydrocortisone 1% 24 hourly × 2–4 weeks max.

Nutritional support (gut GVHD)
Enteral nutrition (preferred) or TPN if diarrhoea >1 L/day: 25–30 kcal/kg/day + 1.2–1.5 g protein/kg/day – until oral intake adequate and diarrhoea <500 mL/day.

Veno-Occlusive Disease / Sinusoidal Obstruction Syndrome (VOD/SOS)
Timing: Early (within 21–30 days post-HSCT)
Features: Painful hepatomegaly, ascites, rising bilirubin, weight gain, renal dysfunction.

Pharmacological Management
S: defibrotide (IV) 6.25mg/kg 6hourly for ≥21 days (only evidence-based therapy). Duration: Minimum 21 days; continue until complete resolution of symptoms/signs if longer.
- Supportive: fluid balance, diuretics, avoid hepatotoxic drugs.
- Monitor for bleeding (contraindicated in active haemorrhage).

Supportive care (Essential for All Cases)
- Fluid balance: Strict input/output charting; restrict fluids to 1–1.5 L/m²/day if weight gain/ascites.
- Diuretics: Spironolactone 100–200 mg/day + furosemide (as needed) to maintain negative fluid balance without hypotension.
- Pain management: Analgesia for hepatomegaly (avoid hepatotoxic NSAIDs).

Graft Failure / Poor Graft Function
Manifestations: Persistent low blood counts (cytopenias) + mixed chimerism on chimerism test.
Higher risk in SCD Reduced-intensity conditioning or history of many blood transfusions.

Treatment (stepwise)

- Optimize immunosuppression – Adjust tacrolimus/cyclosporine to therapeutic levels.
- Growth factors – G-CSF 5 µg/kg/day SC/IV until neutrophils recover.
- Donor lymphocyte infusion (DLI) – Selected cases only (low dose to avoid GVHD).
- Second transplant – Only in selected stable patients; refer to specialized centre.

Supportive care

- Regular blood/platelet transfusions
- Strict infection prophylaxis
- Avoid marrow-toxic drugs

Hemorrhagic cystitis post-HSCT.
Timing Early (cyclophosphamide-related) or late (BK virus).
Symptoms Hematuria (blood in urine), dysuria (painful urination), clots.

Treatment (stepwise)

- Aggressive hydration (IV 2–3 L/m²/day) + continuous bladder irrigation with normal saline (if clots).
- Analgesia + antispasmodics e.g., **D:** oxybutynin (PO) 5 mg 8hourly
- For BK virus (severe cases only): Antivirals (cidofovir if available) + reduce immunosuppression if feasible.
- Urology input for clot retention or heavy bleeding.

Supportive care

- Strict fluid balance and daily urine monitoring.
- Prevent with MESNA + hydration during cyclophosphamide.

Mucositis & GI Toxicity
Timing: Early post-conditioning (peaks day +5 to +14).
Treatment (stepwise)

- Pain control: Paracetamol → opioids (morphine) for severe pain. Refer pain management.
- Oral care protocols: Normal saline or sodium bicarbonate mouth rinses every 2–4 hours; soft brushing.
- Nutrition: Enteral (NG tube) preferred; parenteral (TPN) if severe. Aim 25–30 kcal/kg/day.
- Infection prophylaxis: Intensify acyclovir, antifungal, and antibacterial per Infection STG.

Supportive care

- Anti-nausea medicines.
- Daily mouth/gut assessment.
- Cryotherapy (ice chips) during conditioning if possible.

Thrombotic Microangiopathy (TA-TMA)
Features:
Hemolysis, thrombocytopenia, renal injury, hypertension.
Treatment (stepwise)

- Withdraw calcineurin inhibitors immediately (stop tacrolimus/cyclosporine).
- Supportive care & BP control: Aggressive hypertension management (ACEi/ARB or other agents); dialysis if needed.

Supportive care

- Blood transfusions as required.
- Avoid nephrotoxic drugs.
- Daily monitoring of blood film, LDH, platelets, creatinine, and BP.

Organ Toxicity (Liver, Kidney, Lung)
Causes: Conditioning chemo, infections, GVHD, iron overload

Treatment
Dose adjustment/avoid nephrotoxic drugs
Manage iron overload (chelation post-engraftment if indicated)
Pulmonary rehab, treat infections early

Late Effects (Months–Years)

- Infertility → fertility preservation counseling pre-HSCT
- Endocrine dysfunction (thyroid, growth in children) → periodic screening
- Secondary malignancies (rare) → long-term surveillance
- Psychosocial challenges → counseling, reintegration support
- Revaccination → consider when immunosuppressants are stopped.

Autologous Stem Cell Transplantation
Antimicrobial Prophylaxis as described in the above section
Antiviral:
B: acyclovir (PO) 200-400mg 8hourly, from Day +1
Continue until immune reconstitution (minimum 1year post-HSCT)

Pneumocystis prophylaxis:
A: sulfamethoxazole + trimethoprim (cotrimoxazole) (PO) 960mg 24hourly, when ANC >1.0 × 10^9/L (usually ~Day +28)
Continue for at least 6–12 months

Antifungal:
A: fluconazole (PO) 400mg 24hourly until neutrophil recovery

Encapsulated bacteria prophylaxis (where indicated):
A: Phenoxymethylpenicillin (PO) 200mg for at least 1year post-transplant

Growth Factors & Hematopoietic Support
S: pegfilgrastim (SC) 6 mg on Day +2
OR
D: erythropoietin (SC) 150 IU/kg 2–3 times/week
OR
S: romiplostim (SC) 5 µg/kg weekly until platelets >50 × 10^9/L

Bleeding Prophylaxis
B: phytomenadione (vitamin K) (IV) 300 µg/kg weekly during admission

Laboratory Monitoring
Baseline (Admission): CBC, U&E, Ca/Mg/PO_4, LFTs, Creatinine, PT/aPTT
Daily: CBC, electrolytes, creatinine
Twice weekly: Full renal & liver profile

Haematological Emergencies

3.5.1 Febrile Neutropenia

Applied only to the management of patients with:

- Fever >38 C and neutropenia < 500 cells per microliter as a result of a known or suspected malignancy, the use of chemotherapy and those undergoing HCST
- Fever and neutropenia as a result of a bone marrow failure syndrome.
- Fever (or evidence of infection), who chemotherapy or have completed cancer therapy within 6 months, even though they are not neutropenic.

Work up

- FBP, LFT, RFT, Peripheral Smear, CRP
- Galactomannan test, Malaria screen
- 2 sets of blood for culture and sensitivity, one from central venous catheter and the other one peripheral access to assess for anaerobes and aerobes
- Chest imaging, Serum Electrolytes, Throat Swab

Pharmacological Management

Broad spectrum Antibiotic administration within 30 minutes of fever
Initial (first-line) and subsequent (second-line – deteriorating patients) empiric antibiotic selection.
Patients with no significant beta-lactam reactions:

S: piperacillin tazobactam (IV) 80-100mg/kg/dose given 6 hourly
AND
A: gentamicin (IV/IM) 3-6mg/kg 24hourly.

Deteriorating patients on first-line treatment with no history of anaphylaxis to Beta Lactams (i.e., if history of rash only, can still use:

S: meropenem (IV) 500mg 8 hourly
AND
S: amikacin (IV) 15mg/kg/dose in 2-3 divided doses
OR
C: ciprofloxacin (IV) 200– 400 mg 12 hourly
AND
S: vancomycin 15 - 20mg/kg/dose 8 - 12 hourly

Patients with history of definite anaphylaxis to Beta Lactams

C: ciprofloxacin (IV) 200-400mg 12hourly
AND
B: metronidazole (IV) 500mg – 750mg 8 hourly
AND
S: amikacin (IV) 15mg/kg/dose per day in 2-3 divided doses
AND
S: vancomycin 15-20mg/kg/day divided into 2 to 3 doses

For Culture Negative Patients, in the first 48 hours

Note

- If the patient had a single spike of fever (i.e., the patient's temperature returns to normal within 4 hours of the initial fever), antibiotics may be discontinued.
- If the patient had more than a single spike of fever, antibiotics must be continued for at least 7 afebrile days, if post HSCT continue with antbiotics until neutrophil engraftment Also, consider the following.

If the patient develops oral herpes or severe mucositis, commence
D: acyclovir (IV) 500mg 12hourly

Diarrhoea and vomiting – culture stool and commence
C: ciprofloxacin IV 200-400mg 12hourly
AND
B: metronidazole (IV) 500-750mg 8hourly

Signs of skin infection
Add; **S:** vancomycin (IV) 15-20mg/kg/day divided into 2-3 doses

If by day 5, the patient remains febrile
Add;
S: liposomal Amphotericin B (IV) 3-5mg/kg 24hour

CHAPTER FOUR

NOTIFIABLE DISEASES

Notifiable Diseases, conditions and events usually pose a great public health threat, with a potential of international spread. They require immediate notification by health personnel (clinical, laboratory, environmental, etc.), to health authorities, as required by the International Health Regulations (IHR 2005). Notification is mandatory, to ensure prompt and effective response, to avoid further spread and to prevent deaths.

Note:

- Immediately notify the Public Health Authorities using the electronic reporting system for priority diseases, i.e., the electronic Integrated Disease Surveillance and Response (e- IDSR) System
- Ensure that the disease, condition or event is recorded in the Health Facility e-IDSR reporting booklet
- Manage patients on site, in an isolation ward/room or an established isolation Centre
- Use Personal Protective Equipment (PPE) before attending a suspected patient
- Strictly apply principles of IPC during patient management and waste disposal

4.1 Bacterial Infections

4.1.1 Cholera

Cholera is an acute gastrointestinal infection caused by Vibrio cholerae. Infection occurs through ingestion of contaminated water or food by Vibrio cholerae leading to severe diarrhoea and emesis associated with body fluid and electrolyte depletion.

Note: When a case of cholera is suspected at home, advise to rehydrate the patient using ORS if available while preparing to take the patient to the nearest health facility or Cholera Treatment Centre

Clinical Presentation
A sudden onset of painless watery diarrhoea that may quickly become severe with profuse watery stool, vomiting, severe dehydration and muscular cramps, leading to hypovolemic shock and death

Case Definition

- Suspected cholera case: In areas where a cholera outbreak has not been declared: Any patient aged two years and older presenting with acute watery diarrhoea and severe dehydration or dying from acute watery diarrhoea
- In areas where a cholera outbreak is declared: any person presenting with or dying from acute watery diarrhoea
- Confirmed cholera case: A suspected case with Vibrio cholerae O1 or O139 confirmed by culture or PCR (Polymerase Chain Reaction).

Laboratory Investigation

- Specimen: Liquid stool or rectal swab
- Diagnostic test: Isolate V. cholerae from stool culture and determine O1 serotype using polyvalent antisera for V. cholerae O1. If desired, confirm identification with Inaba and Ogawa antisera.
- If specimen is not serotypeable, consider, V. cholerae O139
- Antibiotic Susceptibility Testing before provision of antibiotics; Follow up 48 -72 hours after antibiotic initiation

Note:

- For confirmation at the beginning of an outbreak, rectal swab or stool specimen should be taken from first 5 to 10 suspected cases.
- If any are positive, every tenth case will be sampled for specimen throughout the outbreak.
- Manage a suspected cholera case in an isolation ward or in an established Cholera Treatment Centre

Prevention

- Drink treated or boiled water from safe sources (taps, decontaminated deep wells, bottles)
- Boil water or treat to kill bacteria and make it safe for drinking and for other domestic uses
- Wash hands with liquid soap and running water after visiting the toilet, before preparing foods, and before eating
- DO NOT eat uncooked food from the street and do not eat cooked food that is no longer hot
- DO NOT eat street prepared fruits. Always eat home prepared fresh fruits

Pharmacological Management
Cholera requires immediate treatment because the disease can cause death within hours. There are three elements of treatment: Rehydration, Antibiotic Treatment, Zinc and Folic Acid Supplements.

i. Rehydration

Assess the patient's level of dehydration as per National Guidelines for Prevention and Control of Cholera. It is of paramount importance to make correct diagnosis and administer the right treatment.

- Plan A: No dehydration,
- Plan B: Moderate dehydration and
- Plan C: Severe dehydration.

For Severe dehydration:

- Administer intravenous (IV) fluid immediately to replace fluid deficit; Use Ringer Lactate solution or, if that is not available, 0.9% sodium chloride solution. Give 100 ml/kg IV in 3 hours, 30 ml/kg as rapidly as possible (within 30 min) then 70 ml/kg in the next 2.5 hours.
- After the initial 30 ml/kg has been administered, the radial pulse should be strong and blood pressure should be normal. If the pulse is not yet strong, continue to give IV fluid rapidly. Administer ORS solution (about 5 ml/kg/hour) as soon as the patient can drink, in addition to IV fluid.
- If the patient can drink, begin giving A: oral rehydration salt solution (ORS) by mouth while the drip is being set up; ORS can provide the potassium, bicarbonate, and glucose that saline solution lacks.

ii. Antibiotic treatment

Antibiotic treatment to patients with severe dehydration is as follows:

Adults (Not for pregnant women)

A: doxycycline (PO) 300 mg start
OR
A: ciprofloxacin (PO) 1g stat then 500mg (PO) 12 hourly for 7 days
OR
B: azithromycin (PO) 500mg once a day for 7 days

Expectant mothers:

A: erythromycin (PO) 500mg 8 hourly for 7 days

Children:
A: erythromycin syrup (PO) 12.5mg/kg 6hourly for 5 days
OR
B: azithromycin 250mg (PO) once a day for 7 days

For moderate Dehydration

- Give oral rehydration, approximately 75-100ml/kg in the first four hours
- Reassess after four hours; if improved, continue giving WHO based ORS, in quantity corresponding to losses (e.g. after each stool) or 10 to 20ml/kg. If not improved, treat as severe dehydration.

If no signs of dehydration

- Patients who have no signs of dehydration when first observed can be treated at home
- Give these patients ORS packets to take home, enough for 2 days
- Demonstrate how to prepare and give the solution
- Instruct the patient or the caretaker to return if any of the following signs develop; increased number of watery stools repeated vomiting or any signs indicating other problems (e.g. fever, blood in stool)

For each loose stool or vomiting give;

- 50-100 ml (¼ - ½ cup) of ORS solution for a child less than 2 years old.
- 100-200 ml for older children. Adults can take as much as they want

iii. Zinc and Folic Acid Supplements

- Zinc (PO) 20mg 24 hourly decreases diarrhea and shortens the duration of illness in children with cholera.
- Provide zinc supplementation, at a dosage of 20 milligrams per day for children older than six months or 10 mg per day for those younger than six months, for 10–14 days.
- Folic acid (PO)2.5mg 24 hourly for children < 6 months, or 5mg 24 hourly for children >6 months for the duration of the treatment. For Pregnant women use Folic acid (PO) 5mg 24 hourly for the duration of the treatment.

4.1.2 Anthrax

Anthrax is a bacterial disease caused by the spore forming Bacillus anthraces, a gram positive, rod- shaped bacterium. It is a zoonotic disease whereby man is infected directly through contact with infected hides or inhalation of spores in the lungs or ingestion of infected meat. It can be manifest on the skin (Cutaneous Anthrax) in the lungs (Pulmonary / Inhalation Anthrax), and/or intestinal (Gastrointestinal Anthrax and Oropharyngeal anthrax) or CNS (Meningeal Anthrax).

Clinical Presentation

Cutaneous Anthrax

Itching, Pruritic papule or vesicle, Characteristic depressed black eschar surrounded by moderate to severe edema, A malignant pustule, Pyrexia.

Inhalation Anthrax

- Mild inhalation Anthrax
  Cough, Fever, Fatigue, Myalgia, can resemble a viral respiratory illness, Pulmonary and gastrointestinal signs may occur together
- Severe inhalation Anthrax
  Diaphoresis, Stridor, Dyspnea, Hypotension, Acute respiratory distress. These patients may develop sepsis accompanied by cyanosis, shock, and hemorrhagic pneumonia. Hemorrhagic pleural effusions often develop.

Gastrointestinal Anthrax
Fever, Abdominal pain, Vomiting, Diarrhea Bloody stool.

Oropharyngeal anthrax
Signs of oropharyngeal anthrax may include Dysphagia with posterior oropharyngeal necrotic ulcers, Unilateral neck swelling, Cervical adenopathy, Edema, Pharyngitis fever.

Meningeal Anthrax
Hemorrhagic meningoencephalitis that involves both

- Deep brain parenchymal hemorrhagic lesions
- Infection of the cerebrospinal fluid (CSF) in the subarachnoid space

Case Definition
Suspected Case: Any person with acute onset illness characterized by several clinical forms which are:

- **Cutaneous form:** Any person with skin lesion evolving over 1 to 6 days from a papular through a vesicular stage, to a depressed black eschar invariably accompanied by oedema that may be mild to extensive.
- **Gastro -intestinal:** Any person with abdominal distress characterized by nausea, vomiting, anorexia and followed by fever
- **Pulmonary (inhalation**): Any person with brief prodromal resembling acute viral respiratory illness, followed by rapid onset of hypoxia, dyspnoea and high temperature, with X-ray evidence of mediastinal widening
- **Meningeal:** Any person with acute onset of high fever possibly with convulsions, loss of consciousness, meningeal signs and symptoms; commonly noted in all systemic infections, but may present without any other clinical symptoms of anthrax.

AND
Has an epidemiological link to confirmed or suspected animal cases or contaminated animal products?
Confirmed case: A confirmed case of anthrax in a human can be defined as a clinically compatible case of cutaneous, inhalational or gastrointestinal illness that is laboratory-confirmed by:

- Isolation of B. anthracis from an affected tissue or site; or
- Other laboratory evidence of B. anthracis infection based on at least two supportive laboratory tests.

Laboratory Investigation

- Isolation of Bacillus anthracis from a clinical specimen (e.g., blood, lesions, discharges)
- Demonstration of B. anthracis in a clinical specimen by microscopic examination of stained smears (vesicular fluid, blood, cerebrospinal fluid, pleural fluid, stools)
- Positive serology (ELISA, Western blot, toxin detection, chromatographic assay, fluorescent antibody test).
- Detection of nucleic acid by PCR.

Other supporting tests

- Measurement of antibodies or toxin in blood
- Chest X-ray
- Computerized tomography (CT) scan
- Detection of B. anthracis by nucleic acid test (NAT) covering the genes coding for capsule and virulence factors;

Prevention: Post Exposure Prophylaxis

Initial 10-day exposure:

A: ciprofloxacin (PO)500 mg 12hourly for 5 days
OR
A: doxycycline100 mg (PO) 12 hourly (or, if pathogens are documented to be susceptible phenoxy methyl penicillin) may be used
Adults:
A: phenoxy methyl penicillin (PO) 250-500 mg6 hourly.

Children 1-5 years:
A: phenoxy methyl penicillin (PO)125 mg 6hourly.

Children 6-12 years:
A: phenoxy methyl penicillin (PO)250 mg6 hourly
48 hours' exposure:
OR
S: clindamycin (PO) 150-300mg 6hourly for 5days
OR
S: levofloxacin (PO) 500 mg 12hourly for 5 days are alternative antimicrobial prophylaxis to the local population within 48 hours of the initial exposure.

Pharmacological Management

A: benzylpenicillin (IV) 0.6MU 6hourly until local oedema subsides then continue with
A: phenoxy methyl penicillin (IV) 250mg 6hourly for 7days

If not responding change to
A: doxycycline (PO)200mg initial dose then 100mg 12hourly for 7days

OR
A: ciprofloxacin (PO) 500mg 12hourly for 7days
AND
A: paracetamol (PO)15mg/kg 8hourly for 5days
In severe forms Add
D: dexamethasone (PO) 0.6mg/kg per day (in divided doses every 8hours) for 4days

Public Health Control Measures

- Notify public health authorities immediately (within 24 hours) via IDSR upon suspicion.
- Line-list suspected/confirmed cases and link to laboratory confirmation.
- Identify, line-list, and trace all contacts exposed to infected hides, inhalation of spores, or ingestion of contaminated meat.
- Monitor contacts daily for signs of illness for 21 days (from last exposure). Test and treat promptly if symptoms develop.
- Apply standard infection prevention and control (IPC) precautions, with special attention to body fluid spills (spores persist on surfaces).
- Use appropriate personal protective equipment (PPE) to prevent splashes or inoculation injuries during patient care.
- Mobilize community for early case detection, reporting, and care-seeking.
- Ensure safe burial or cremation of deceased humans and animals (deep burial ≥2 m or incineration; avoid skinning/handling without protection).
- Perform active case finding (door-to-door) targeting hard-to-reach groups (e.g., older women, young children); provide prevention information and care-seeking advice.
- Ensure multi-sectoral collaboration (livestock, agriculture, environment, sanitation) for comprehensive interventions (e.g., animal vaccination, safe carcass disposal, environmental decontamination).
- Request additional support from district, regional, or national levels as needed.

4.1.3 Brucellosis

Brucellosis is a zoonotic bacterial disease caused by Brucella species (mainly B. melitensis, B. abortus, B. suis, B. canis) affecting humans, livestock, and wildlife.

Transmission: Foodborne (undercooked meat, unpasteurized milk/soft cheese), direct contact with infected animal blood/placenta/foetus/secretions via skin breaks/mucosa, or airborne.

High-risk groups: consumers of raw animal products, farmers, butchers, hunters, veterinarians, lab personnel. Incubation: usually 2–4 weeks (range 1 week–several months).

Clinical Presentation

Wide range: acute/insidious onset with continued/intermittent/irregular fever, night sweats, chills, fatigue, headache, malaise, anorexia, weight loss, myalgia, arthralgia.

Others include low back pain, dizziness, abdominal pain, dyspepsia, cough. In children: higher rash, respiratory/cardiac complications, orchitis/epididymitis.

Late presentation common; untreated cases lead to focal/multi-organ involvement (e.g., splenomegaly/hepatomegaly, osteoarticular, orchitis in males, abortion/premature delivery, rare endocarditis/neurobrucellosis causing most deaths).

Case Definitions

Suspected case: Any person epidemiologically linked to suspected/confirmed animal cases or contaminated animal products presenting with an illness characterized by acute or insidious onset of fever and/or one or more of the following: night sweats, arthralgia, headache, fatigue, anorexia, myalgia, weight loss, arthritis/spondylitis, meningitis or other organ involvement (i.e.: endocarditis, orchitis/epididymitis, hepatomegaly, splenomegaly).

Probable case: A suspected case with presumptive laboratory diagnosis OR epidemiologically linked to a confirmed human or animal brucellosis case.

Confirmed case: A suspected or probable case with confirmatory laboratory diagnosis

Severity of the Disease

Uncomplicated Brucellosis: Clinical symptoms, signs and laboratory confirmation without focal/multi-organ involvement.

Complicated Brucellosis: Clinical symptoms, signs and laboratory confirmation with focal/multi-organ involvement.

Laboratory Investigation

- Presumptive: Positive Rose Bengal Plate Test (RBT) with serial dilution OR Positive result (≥1:160) in standard agglutination test (SAT) in a single sample
- Confirmatory: Isolation of Brucella from blood/other specimens (bone marrow/CSF/wounds/joint fluid; prefer acute febrile phase) OR ≥4-fold rise in SAT titres between acute (<7 days' onset) and convalescent (2–4 weeks later) samples.

Pharmacological Management

Uncomplicated acute cases respond well to prolonged combination antibiotics to minimize risk of failure/relapse). Relapses (5–15%) treated as new cases; failures often due to poor compliance.

Uncomplicated Brucellosis

Adults and Children >8 years (all PO unless stated):

A: doxycycline (PO) 100 mg 12hourly for 6weeks

AND

A: streptomycin (IM) 1g 24hourly for 2–3 weeks

OR

A: doxycycline (PO) 100mg 12hourly for 6weeks

AND

A: gentamicin (IM/IV) 5mg/kg 24hourly for 1–2weeks

OR

A: doxycycline (PO) 100mg 12hourly for 6weeks

AND

A: rifampicin (PO) 15mg/kg/day (600–900 mg 24hourly) for 6weeks

OR

A: doxycycline (PO) 100mg 12hourly for 6weeks

AND

A: sulfamethoxazole + Trimethoprim (PO) 960mg 12hourly for 6weeks

Neonates and Children <8 years (use Sulfamethoxazole + Trimethoprim and aminoglycoside or rifampicin):

A: sulfamethoxazole + trimethoprim (PO) 48mg/kg/day 12hourly for 6weeks

AND

A: streptomycin (IM) 30mg/kg 24 hourly for 21days

OR

A: sulfamethoxazole + trimethoprim (PO) 48mg/kg/day 12hourly for 6weeks

AND

A: gentamicin (IM/IV) 5mg/kg 24hourly for 7–10days

OR

A: sulfamethoxazole + trimethoprim (PO) 48mg/kg/day 12hourly for 6weeks

AND

A: rifampicin (PO) 15mg/kg/day (600–900 mg 24hourly) for 6weeks

Pregnancy (individualize and assess risks/benefits ratio):

A: sulfamethoxazole + trimethoprim (PO) (960mg) 12hourly for 6weeks

AND

A: rifampicin (PO) 15mg/kg/day (600–900mg 24hourly) for 6weeks

OR

A: sulfamethoxazole + trimethoprim (PO) (960mg) 12hourly for 6weeks

AND

A: gentamicin (IM/IV) 5mg/kg (160mg 24hourly) for 1–2weeks

For Complicated Brucellosis

For neurobrucellosis (poor BBB penetration of tetracyclines/aminoglycosides): add rifampicin or Sulfamethoxazole + Trimethoprim.

Doxycycline + Streptomycin + Rifampicin regimen

A: doxycycline (PO) 100 mg 12 hourly for 6 weeks (≥8 weeks if spondylitis/osteomyelitis)

AND

A: streptomycin (IM) 1 g 24 hourly for 2–3 weeks

AND

A: rifampicin (PO) 15 mg/kg/day (600–900 mg 24 hourly) for 6 weeks

OR

Doxycycline + Streptomycin + Sulfamethoxazole + Trimethoprim

A: doxycycline 100 mg 12 hourly for 6 weeks (≥8 weeks if spondylitis/osteomyelitis)

AND

A: streptomycin (IM) 1 g 24 hourly for 2–3 weeks

AND

A: sulfamethoxazole + trimethoprim (PO) 160/800 mg 12 hourly for 6 weeks

OR

Doxycycline + Gentamicin + Rifampicin

A: doxycycline (PO) 100 mg 12 hourly for 6 weeks (≥8 weeks if spondylitis/osteomyelitis)

AND

A: gentamicin (IM/IV) 5 mg/kg 24 hourly for 1–2 weeks

AND

A: rifampicin (PO) 15 mg/kg/day (600–900 mg 24 hourly) for 6 weeks

OR

Doxycycline + Gentamicin + Sulfamethoxazole + Trimethoprim

A: doxycycline (PO)100 mg 12 hourly for 6 weeks (≥8 weeks if spondylitis/osteomyelitis)

AND

A: gentamicin (IM/IV) 5 mg/kg 24 hourly for 1–2 weeks

AND

A: sulfamethoxazole + trimethoprim (PO) 160/800 mg 12 hourly for 6 weeks

Note:

- Doxycycline should be taken 2 hours before or after taking milk, milk products and/or anti-acid preparations.
- Adequate counseling should be done to avoid poor compliance due to prolonged antibiotic therapy.
- Renal function should be monitored for patients taking aminoglycosides (Streptomycin and Gentamicin).

Prevention and Public Health Control Measures

Endemic in Tanzania; human elimination requires animal control via One Health approach. No approved human vaccine. Focus on:

- Education/awareness: avoid undercooked meat/unpasteurized milk/derivatives.
- Barrier precautions (gloves/aprons/boots/eye protection) for high-risk occupations (farmers/vets/butchers/lab staff).
- Proper disposal (burial/burning) of placentas/non-viable foetuses and disinfection.

4.1.4 Plague

A zoonotic systemic bacterial infection caused by Yersinia pestis (plague bacillus) usually transmitted to humans by rodent fleas or by handling an infected animal. There are 3 forms of plague infection, depending on the route of infection:

- **Bubonic plague** is the most common, caused by the bite of an infected flea. Y. pestis, which enters the body at the bite site and travels through the lymphatic system to the nearest lymph node, replicates itself and causes the lymph node to be inflamed, tense and painful, turning into open sores with pus.
- **Septicemic plague** occurs when infection spreads through the bloodstream, following untreated bubonic plague causing bleeding, tissue necrosis and shock.
- **Pharyngeal and or Pneumonic plague** is the most virulent form and is rare. It is typically caused by spread to the lungs from advanced bubonic plague. Untreated pneumonic plague can be fatal.

Human to human transmission only occurs with the pneumonic form of plague by infectious droplets. Incubation period is 2 to 6 days and case fatality rate (CFR) may exceed 50-60% in untreated bubonic plague and is nearly 100% in untreated pneumonic or septicemic plague. However, it is usually <1% with appropriate and timely treatment. Currently, plague is one of the most important reemerging bacterial zoonoses in the world. The main risk factor is exposure to infected populations of wild or domesticated rodents and their fleas in plague endemic areas.

Case Definition Bubonic Plague

Suspected case; Any person with a very painful swelling of lymph nodes – buboes And Fever (or history of fever) or at least 3 of the following: headache or chills or generalized or severe asthenia and consistent epidemiological features, such as exposure to infected animals and/or evidence of flea bites and/or residence in or travel to a known endemic area within the previous 10 days.

Confirmed case: Any person with suspected case confirmed by isolation of Yersinia pestis from blood or aspiration of buboes, or specific seroconversion or rapid diagnostic test detecting the Ag F1 in endemic areas

Pneumonic Plague

Suspected case: Anyone, of any age, with coughs of less than 5 days with one of the following signs: Striated sputum from blood or dyspnea or chest pain and Fever (or history of fever) or at least 3 of the following: headache or chills or generalized or severe asthenia and Epidemiological context (contact with suspect or confirm pneumonic plague case, etc.).

Confirmed case of pneumonic plague: Any suspected case of plague in which Yersinia pestis has been isolated in culture

Or Suspect plague case with positive F1 rapid diagnostic test (RDT) and positive PCR or Seroconversion or increase in IgG antibody titre by 4 to 15 days

Suspicious death of plague**:** Anyone who died suddenly without apparent cause but with an epidemiological link to plague established and without biological sampling

Probable case of plague: Any suspected case of plague alive or deceased with F1 rapid diagnostic test (RDT) Or Positive PCR alone

Note: Human plague remains a public health concern in Tanzania despite its quiescence in most foci for years, considering the recurrence nature of the disease. Plague hosts comprises about 50% of all the animals trapped in West Usambara Mountains in north-eastern Tanzania.

Clinical Diagnostic Criteria

- Sudden onset of fever, chills, head and body aches
- Weakness, vomiting and nausea.
- Yersinia pestis is identified by laboratory testing from a sample of pus from a bubo, blood or sputum. A specific Y. pestis antigen can be detected by different techniques.

Note: Differential diagnosis Bubonic plague may be confused with streptococcal or staphylococcal lymphadenitis, infectious mononucleosis, cat-scratch fever, lymphatic filariasis, tick typhus, tularemia and other causes of acute lymphadenopathy

Laboratory Investigation

- Aspiration after an injection of 1-2 ml of saline through an 18-22-gauge needle. Suitable microbiological culture media (e.g., brain heart infusion, broth, sheep blood agar, or MacConkey agar) should be inoculated with a portion of each specimen.
- Smears should be examined with Wayson or Giemsa stain and with Gram=s stain to show Small gram-negative and/or bipolar-staining coccobacilli
- smears should also be submitted for direct fluorescent antibody testing (anti-F1 antibody)
- Serological testing - anti-F1 antigen titre by agglutination
- Molecular biological techniques based on PCR and DNA Hybridization

Note: Anti-F1 rapid diagnostic test (RDT) positive alone is not a confirmed case. Culture and PCR tests need to done at the appropriate facility.

Prevention:

- Inform people of the presence of zoonotic plague and advised to take precautions against flea bites
- Do not handle animal carcasses and avoid direct contact with infected body fluids and tissues
- Apply standard precautions when handling potentially infected patients and while collecting specimens

Vaccination: Not recommended except for high-risk groups (such as laboratory personnel who are constantly exposed to the risk of contamination, and health care workers).

Pharmacological Management

A: streptomycin (IM)30mg/kg/day 24hourly (max.2 g/day) in divided doses, to be continued for 10 days of therapy or until 3days after the temperature has returned to normal.

OR

A: erythromycin (PO) 500mg (or 12.5 mg/kg) 8hourly for 14days

OR

A: doxycycline (PO) 200mg 12hourly for 14days

4.1.5 Bacterial Cerebro-Spinal Meningitis

Bacterial epidemics for Cerebro-Spinal Meningitis are commonly caused by Neisseria meningitidis. Other common bacteria are Haemophilus influenza, Staphylococcus aures and Streptococcus pneumoniae. Human-to-human disease transmission is via large respiratory droplets from the nose and throats of infected people. Incubation period is 2 to 10 days. Attack rates

are highest among children aged less than 15 years. Case fatality rates are usually 8-15% among treated patients, and >70% among untreated cases.

Case Definition

Suspected meningitis case: Any person with a sudden onset of fever (>38.5 °C rectal or 38.0 °C axillary), and neck stiffness or other meningeal signs and in case of infants, a bulging fontanelle.

Probable meningitis case: Any suspected case with macroscopic aspects of cerebrospinal fluid (CSF) (turbid, cloudy or purulent); or with a CSF leukocyte count >10 cells/mm3 or with bacteria identified by Gram stain in CSF; or positive antigen detection (for example, by latex agglutination testing) in CSF

In infants: CSF leucocyte count >100 cells/mm3; or CSF leucocyte count 10–100 cells/mm3 and either an elevated protein (>100 mg/dl) or decreased glucose (<40 mg/dl) level.

Confirmed meningitis case: Any suspected or probable case that is laboratory confirmed by culturing or identifying (i.e. polymerase chain reaction) a bacterial pathogen (Neisseria meningitidis,

Streptococcus pneumoniae, Haemophilus influenzae type b) in the CSF or blood

Clinical Diagnostic Criteria

Sudden fever**,** Neck stiffness, Intense headache, nausea and vomiting, altered consciousness and convulsions, Bulged anterior fontanelle (in infants)

Laboratory Investigation

- Lumbar puncture for Cerebrospinal Fluid Analysis with a median opening pressure
- CSF leukocyte count in episodes with CSF leak–associated meningitis
- CSF Culture and Sensitivity
- Elevated white blood cell count (WBC) in CSF of over 1000 cells/mm3
- Glucose concentration, <1.9 mmol/L
- Ratio of CSF glucose concentration to blood glucose concentration, <0.23;
- Protein concentration
- WBC count, >2000 cells/mL CSF neutrophil count, >1180 cells/mL

Table 4.1: Cerebrospinal Fluid Analysis Findings

CSF Characteristic	Normal Range	Suggestive of Bacterial Meningitis	Suggestive of Viral Meningitis
Colour	Clear	Cloudy	Cloudy
RBC Count	None	None	None
Gram stain	Negative	Usually, Positive	Usually Negative (60%-90%)
Pressure*	20–30 cmH2O (16–24 mmHg or 2.1–3.2 kPa) with the patient sitting up	Above > 42 cm H_2O	Normal
Protein	15 to 20.2 milligrams per deciliter (mg/dL) or 0.15 to 0.6 milligrams per milliliter (mg/mL)	Above 20.2 milligrams per deciliter (mg/dL) ,>2.20 g/L	Above 20.2 milligrams per deciliter (mg/dL),>2.20 g/L
Glucose	50-75 mg/dL (around 1.9 mmol/L) 50 to 75 mg/dL (or greater than 2/3 of the blood sugar level).	Below normal (<1.9 mmol/L)	Usually normal or below normal
Lymphocytic pleocytosis	None	Positive with neutrophilic pleocytosis	Positive with lymphocytic pleocytosis

**Measured by recording the height of CSF in the manometer tube with the patient's leg gently and return the neck to a neutral position with the head supported with a pillow. Use intravenous tubing sets and a ruler to measure cm of pressure if manometer is not available.*

Prevention

- Vaccines targeted against N. meningitidis serogroups A or C, or a tetravalent A, C, Y, and W135 vaccine are useful for immunocompromised children.
- Hib conjugate vaccine is useful for immunocompromised children

Pharmacological Management

A: benzathine benzylpenicillin (IV/IM) 300,000U/kg/day with a maximum dose of 24MU/day for 10-14 days, give 4 million units 4 hourly IV in adults and pediatric patients older than 1 month for 10-14 days.

AND

B: chloramphenicol (IV) 50-100mg/kg/day (maximum. 4g/day divided 8hourly) for 10-14 days.

OR

B: ceftriaxone (IV) 2g 12 hourly for 10-14days (50 mg/kg in pediatric patients older than 1 month)

OR

C: cefotaxime (IV) 2 g 6hourly for 10-14days (50 mg/kg in pediatric patients older than 1 month).

OR

B: ceftriaxone (IM/IV) 2g 24hourly for 10-14days (preferred for patients with CNS involvement)

AND

B: dexamethasone (IV/IM) 0.15mg/kg (maximum 16mg/day) divided 8hourly for 3days

4.1.6 Neonatal Tetanus

A neuromuscular toxin-mediated illness caused by the anaerobic spore-forming soil bacterium Clostridium tetani. The disease is transmitted when spores enter open wounds (injections, cutting the umbilical cord) or breaks in the skin. While tetanus may occur in adults, infection primarily affects newborns. Incubation period is 3 to 21 days, with an average of approximately 6 days. Usually occurs through introduction of tetanus spores via the umbilical cord during delivery through the use of an unclean instrument to cut the cord, or after delivery by “dressing” the umbilical stump with substances heavily contaminated with tetanus spores.

Clinical Diagnostic Criteria

- Sudden inability of a newborn to suck/feed between 2nd and 28th day after birth
- Generalized stiffness
- Convulsions

Laboratory Investigation

- Diagnosis is mainly clinical as there are no reliable laboratory tests for confirming tetanus
- Blood counts and blood chemical findings are unremarkable.
- Peripheral leukocytosis may be suggestive

Prevention

- Immunize women of reproductive age with TTCV, either during pregnancy or outside of pregnancy. This protects the mother and also her baby through the transfer of tetanus antibodies to the fetus.
- Good hygienic practices when the mother is delivering a child are also important to prevent neonatal and maternal tetanus.

To be protected throughout life, WHO recommends that an individual receives 6 doses (3 primaries plus 3 booster doses) of TTCV through routine immunization.

Non-Pharmacological Management

Rigorously cleanse the umbilical stump to stop the production of toxin at the site of infection

Pharmacological Management

For Paediatrics

B: amoxicillin + clavulanic acid (PO) via NGT 20–30mg/kg/day divided 8hourly for 7days

AND

Medicine	Route	Postnatal Age	Body Weight	Dosage
A: Metronidazole	PO/IV	≤ 7 days	1,200–2,000 g	7.5 mg/kg/dose every 24 hours
		≤ 7 days	> 2,000 g	7.5 mg/kg/dose every 12 hours
		> 7 days	1,200–2,000 g	7.5 mg/kg/dose every 12 hours
		> 7 days	> 2,000 g	15 mg/kg/dose every 12 hours for 7 days

OR

B: ceftriaxone (IV) 50 mg/kg (in pediatric patients older than 1month) 12hourly for 7days

OR

C: cefotaxime) (IV) 50 mg/kg (in pediatric patients older than 1 month) 6hourly for 5days.

For Adults

B: amoxicillin + clavulanic acid (PO) via NGT 625mg 12hourly for 7days

AND

A: metronidazole 400mg (PO) 8hourly for 7days

OR

B: ceftriaxone (IV) 2g 24hourly or 1g 12hourly for 7days

OR

C: cefotaxime (IV) 2g 24hourly or 1g 12hourly for 7days

OR

Immunotherapy to neutralize circulating toxin

A: tetanus immunoglobulin TIG, (IM)100–300IU/kg stat,

Note: The dose divided into two different muscle masses to the confirmed infected patients (Don't give vaccine to the confirmed infected patients)

AND

C: diazepam (PO) 0.5mg/kg 8hourly as the effective management of muscle spasm, give a sedative cocktail of ALL the following via NGT:

AND

A: magnesium Sulphate Loading dose: 75–100 mg/kg IV (infused slowly (e.g., over 30 minutes).
Maintenance infusion: 40–100 mg/kg/hour IV, titrated to control spasms while monitoring for toxicity (e.g., loss of deep tendon reflexes, respiratory depression). Serum magnesium levels (target 2–4 mmol/L) guide adjustments if monitoring is available.

AND

A: chlorpromazine (PO) 2mg/kg 8 hourly

AND

A: phenobarbitone (PO) 6mg/kg 12 hourly

Table 4.2 Guidelines for Dosage Administration**

Time (hours)	0	3	6	9	12	15	18	21	24
Diazepam	*	*		*		*		*	*
Chlorpromazine		*		*		*			
Phenobarbitone	*		*					*	

** These are general guidelines. Frequency of drug administration should be titrated vs clinical condition

- Airway / respiratory control Provide mechanical ventilation.
- Provide adequate fluids and nutrition, as tetanus spasms result in high metabolic demands and a catabolic state.

4.1.7 Tick-Borne Relapsing Fever (TBRF)

A bacterial infection caused by bacteria Borrelia duttonii, are known zoonoses transmitted to humans through the bite of infected "soft ticks" Ornithodoros spp that live within rodent burrows feeding on the rodent. Humans typically come into contact with soft ticks when they sleep in rodent-infested cabins.

Clinical Presentations

Recurring episodes of fever, Non-specific headache, Non-specific Muscle pain, Non- specific Joint pain, Non-specific Chills, Non-specific Vomiting, and Abdominal pain.

Bacteremia tends to be greater among pregnant women, and may sometimes result in more severe infection. Symptoms tend to develop within 7days after the tick bite. Long-term sequelae of TBRF are rare but include iritis, uveitis, cranial nerve and other neuropathies.

Clinical Diagnostic Criteria

- Recurring episodes of high fever, headache, muscle and joint aches, and nausea
- Recurring symptoms, producing a telltale pattern of fever lasting roughly 3 days, followed by 7 days without fever, followed by another 3 days of fever. Without antibiotic treatment, this process can repeat several times.

Laboratory Investigation

- Microscopy from the peripheral blood smear will reveal a long and spiral-shaped bacterium Spirochetemia (spirochetes in blood) in TBRF patients often reaches high concentrations (>106 spirochetes/ml). Direct microscopic observation of relapsing fever spirochetes using dark field microscopy or stained peripheral blood smears

Prevention

- Avoid sleeping in rodent-infested buildings whenever possible. Although rodent nests may not be visible, other evidence of rodent activity (e.g., droppings) are a sign that a building may be infested.
- Prevent tick bites. Use insect repellent (on skin or clothing) or permethrin (applied to clothing or equipment).

Pharmacological Management

A: erythromycin (PO) 500mg (12.5 mg/kg) 8 hourly for 14days

OR

A: doxycycline (PO)100mg 12hourly for 14days

OR

B: ceftriaxone (IV/IM) 2 grams 24hourly for 10-14days is preferred for patients with CNS involvement

4.2 Viral Infections

4.2.1 Viral Haemorrhagic Fevers (VHF)

Viral Haemorrhagic Fever (VHF) is a general term for a severe illness caused by viruses and sometimes associated with bleeding. Their distribution is dependent on the ecology of reservoir hosts with a potential to cause life-threatening illness in humans. Diagnosis and management is challenging due to the non-specificity of early symptoms, limited laboratory facilities in endemic areas, severity of disease, lack of effective therapy, strict infection control requirements and propensity to cause epidemics with secondary cases in healthcare workers.

Primary transmission is from animal to human, through contact with an infected animal or its product. Secondary transmission is from person to person through:

- Contact with a sick person or direct contact with the blood and/or secretions or with objects, such as needles that have been contaminated with infected secretions of an infected person.
- Breast feeding
- Sexual contact

4.2.1.1 Ebola

Ebola Virus Disease (EVD) is a deadly disease in people and non-human primates. The viruses that cause EVD are located mainly in sub-Saharan Africa. People can get EVD through direct contact with an infected animal (bat or nonhuman primate) or a sick or dead person infected with Ebola virus. Symptoms appear from 2 to 21 days after contact with the virus, with an average of 8 to 10 days.

Case Definition:

Suspected case: Illness with onset of fever and no response to treatment of usual causes of fever in the area, and at least one of the following signs: bloody diarrhoea, bleeding from gums, bleeding into skin (purpura), bleeding into eyes and urine.

Confirmed case: A suspected case with laboratory confirmation (positive IgM antibody, positive PCR or viral isolation), or epidemiologic link to confirmed cases or outbreak.

Note: During an outbreak, case definitions are likely to be adapted to new Clinical Presentation(s) or different modes of transmission related to the local event. In outbreak setting, the following standard case definitions apply;

Suspected case:

- Any person, alive or dead, suffering or having suffered from a sudden onset of high fever and having had contact with: - a suspected, probable or confirmed Ebola case; - a dead or sick animal OR
- Any person with sudden onset of high fever and at least three of the following symptoms: - headaches - lethargy - anorexia / loss of appetite - aching muscles or joints - stomach pain - difficulty swallowing - vomiting - difficulty breathing - diarrhoea - hiccups; OR
- Any person with inexplicable bleeding; OR
- Any sudden, inexplicable death; OR
- A person (alive or dead) suffering or having suffered from a sudden onset of high fever and having had contact with: a dead or sick animal.

Clinical Diagnostic Criteria

A combination of symptoms suggestive of EVD AND a possible exposure to EVD within 21 days before the onset of symptoms is suggestive of Ebola.

Clinical Presentation
Fever**,** Aches and pains, such as severe headache, muscle and joint pain, and abdominal (stomach) pain**,** Weakness and fatigue**,** Gastrointestinal symptoms including diarrhea and vomiting**,** Abdominal (stomach) pain**,** Unexplained hemorrhaging, bleeding or bruising**.** The Patient may also present with red eyes, skin rash, and hiccups (late stage)

An exposure may include contact with:

- Blood or body fluids from a person sick with or who died from EVD,
- Objects contaminated with blood or body fluids of a person sick with or who died from EVD,
- Infected fruit bats and non-human primates (apes or monkeys), or Semen from a man who has recovered from EVD.

Laboratory Investigations
Ebola virus can be detected in blood after onset of symptoms. It may take up to three days after symptoms start for the virus to reach detectable levels. Investigations includes:

- Blood for RT-PCR
- Antigen detection or IgM (ELISA)
-

Note: Do not take specimen before wearing appropriate PPE and ensuring the patient is in an Isolation Ward/ Centre

Pharmacological Management
A: paracetamol (PO/IV) 15mg/kg 8 hourly for 3 days
AND
B: oxygen and manage hypoglycaemia if present

Fluid and electrolyte balance
A: sodium lactate compound (ringer's lactate)OR Sodium chloride 0.9% (NS) intravenously if cannot take fluids orally
B: Give Oxygen therapy to maintain oxygen status.
A: sodium lactate compound (ringer's lactate)(Ringers Lactate), NS intravenously if cannot take fluids orally.
A: Manage hypoglycaemia with 5% DNS or 25% Dextrose Solution if hypoglycaemia is shown by RBG testing
A: Using medication to control blood pressure, reduce vomiting and diarrhea and to manage fever and pain.
A: Treat other infections or any complicating infection and co-morbid condition
A: Psychological support be given to patient and family
C: Refer for provision of mechanical ventilation, renal dialysis, and anti-seizure therapy may be required.

4.2.1.2 Marburg Haemorrhagic Fevers

Marburg virus belongs to the family Filoviridae, divided into three genera: ebolaviruses, Marburg viruses, and Cueva viruses. The reservoir host of Marburg virus is the African fruit bat, Rousettus aegyptiacus. Fruit bats infected with Marburg virus do not show obvious signs of illness. Primates (including humans) can become infected with the Marburg virus and may develop serious disease with high mortality. The disease can spread rapidly within the health care setting. The virus enters through broken skin, mucous membrane or exchange of bodily fluids or ingestion, inhalation and injection of infectious material

Case Definition
Suspected case: Illness with onset of fever and no response to treatment of usual causes of fever in the area, and at least one of the following signs: bloody diarrhea, bleeding from gums, bleeding into skin (purpura), bleeding into eyes and urine.

Confirmed case: A suspected case with laboratory confirmation (positive IgM antibody, positive PCR
or viral isolation), or epidemiologic link to confirmed cases or outbreak. In an outbreak setting, the following standard case definitions apply;

Suspected case:

- Any person, alive or dead, suffering or having suffered from a sudden onset of high fever and having had contact with: - a suspected, probable or confirmed Marburg case; - a dead or sick animal OR
- Any person with sudden onset of high fever and at least three of the following symptoms: - headaches - lethargy - anorexia / loss of appetite - aching muscles or joints - stomach pain - difficulty swallowing - vomiting - difficulty breathing - diarrhoea - hiccups; OR
- Any person with inexplicable bleeding OR
- Any sudden, inexplicable death OR
- A person (alive or dead) suffering or having suffered from a sudden onset of high fever and having had contact with a dead or sick animal

Non-Pharmacological Management

Supportive therapy includes:

- Mechanical ventilation, renal dialysis, and anti-seizure therapy may be required.
- Management of complications symptomatically
- Maintaining Oxygen status and Blood Pressure

Pharmacological Management

There is no specific treatment for Marburg Haemorrhagic Fever.

A: paracetamol (PO/IV) 15mg/kg 8hourly for 3days

AND

B: Give oxygen and manage hypoglycaemia if present If there is Fluid and electrolyte imbalance:

AND

A: sodium lactate compound (ringer's lactate)(Ringers Lactate), NS intravenously if cannot take fluids orally

B: Give Oxygen therapy to maintain oxygen status.

A: Sodium lactate compound (Ringers Lactate), NS intravenously if cannot take fluids orally. Provide IV fluids and electrolytes (body salts) through infusion into the vein (intravenously)

A: Manage hypoglycaemia with 5% DNS or 25% Dextrose Solution if hypoglycaemia is shown by RBG testing

A: Using medication to support blood pressure, reduce vomiting and diarrhea and to manage fever and pain.

A: Treating other infections or any complicating infection and co-morbid condition

A: Psychological support is given to patient and family

D: Refer for Provision of Mechanical ventilation, renal dialysis, and anti-seizure therapy may be required.

4.2.1.3 Rift Valley Fever

Rift Valley Fever (RVF) is a viral disease that affects mainly animals and occasionally humans. The virus is a member of the Phlebovirus genus, one of the five genera in the family Bunyaviridae. The disease is frequently reported following heavy rainfall and floods. RVF is mainly transmitted from animals (sheep, cattle, goats, camels) to humans through close contact with infected animals (such as handling meat and body fluids and consumption of raw milk). During established RVF outbreaks in animals, humans can also get infected through bites of infected mosquitoes and other biting insects.

The incubation period of RVF varies from 2 to 6 days. These symptoms usually last from 4 to 7 days. Most of the infected people recover on their own. However, a small proportion gets complications such as vomiting blood, nose bleeding and passing bloody stool. Rift Valley fever is difficult to distinguish from other viral haemorrhagic fevers as well as many other diseases that cause fever, including malaria, shigellosis, typhoid fever, and yellow fever.

Case Definitions

Suspected case: Early Disease: Acute febrile illness (axillary temperature >37.5 ºC or oral temperature of >38.0ºC) of more than 48 hours' duration that does not respond to antibiotic or antimalarial therapy, and is associated with:

- Direct contact with sick or dead animal or its products AND / OR
- Recent travel (during last week) to, or living in an area where, after heavy rains, livestock die or abort, and where RVF virus activity is suspected/confirmed AND / OR
- Abrupt onset of any 1 or more of the following: exhaustion, backache, muscle pains, headache (often severe), discomfort when exposed to light, and nausea/vomiting AND / OR:
- Nausea/vomiting, diarrhoea OR abdominal pain with 1 or more of the following:
  - Severe pallor (or Hb < 8 gm/dL)
  - Low platelets (thrombocytopenia) as evidence by presence of small skin and mucous membrane haemorrhages (petechiae) (or platelet count < 100x109 / d
  - Evidence of kidney failure (edema, reduced urine output) (or creatinine > 150 mol/L) AND / OR
  - Evidence of bleeding into skin, bleeding from puncture wounds, from mucous membranes or nose from gastrointestinal tract and unnatural bleeding from vagina AND / OR
  - Clinical jaundice (3-fold increase above normal of transaminases)

Late stages of diseases or complications (2-3 weeks after onset)

- Patients who have experienced, in the preceding month a flu-like illness, with clinical criteria, who additionally develop the following:
- CNS manifestations which resemble meningo-encephalitis AND/OR:
- Unexplained visual loss OR
- Unexplained death following sudden onset of acute flu-like illness with haemorrhage, meningoencephalitis, or visual loss during the preceding month.

Confirmed case:
Any patient who, after clinical screening, is positive for anti-RVF IgM ELISA antibodies (typically appear from fourth to sixth day after onset of symptoms) or tests positive on reverse transcriptase polymerase chain reaction (RT-PCR).

Transmission to human is mainly through direct or indirect contact with blood or organs of infected animals. The virus can be transmitted to human through;

- Handling of animal tissue during slaughtering or butchering, assisting with animal births, conducting veterinary procedures.
- Inoculation e.g., via wound from infected knife or through contact with broken skin or through inhalation of aerosols produced during the slaughter of an infected animals.
- Infected mosquito.

Human become viraemic; capable of infecting mosquitoes shortly before onset of fever and for the first 3–5 days of illness. Once infected, mosquitoes remain so for life.

Clinical Diagnostic Criteria

- Acute febrile illness that does not respond to antibiotic or antimalarial therapy,
- Exhaustion, backache, muscle pains, headache (often severe),
- Photophobia
- Nausea/vomiting
- Evidence of bleeding into skin, bleeding from puncture wounds, from mucous membranes or nose, from gastrointestinal tract and unnatural bleeding from vagina
- Clinical jaundice (3-fold increase above normal of transaminases)

Clinical diagnosis is difficult, because RVF symptoms can be mild and non-specific, especially early in the course of the disease.

Laboratory Investigations
Definitive diagnosis of RVF involves laboratory testing of blood (during illness) or other tissue samples (postmortem tissue).

- The virus detection in the blood then virus isolation in cell culture
- Molecular techniques (reverse transcriptase polymerase chain reaction or RT-PCR).
- Antibody testing using Enzyme-Linked Immunoassay (ELISA) confirms infection with RVFV
- IgM antibodies reflect a recent infection and IgG antibodies persist for several years (Detection of anti-RVF IgM suggests an ongoing transmission of RVFV in humans during inter-epidemic periods.).
- FBC
  - Low Hb [Hb<8gm/dL - Severe pallor
  - Low platelet < 100 x109 /Dl (Thrombocytopenia) – small skin and mucous membrane hemorrhages (Petechiae))
- Serum Creatinine

Note:
Acute RVF can be diagnosed using several different methods

- Serological tests such as ELISA may confirm the presence of specific IgM antibodies to the virus. The virus itself may be detected in blood during the early phase of illness or in post-mortem tissue using a variety of techniques including, antigen detection tests by ELISA, RT-PCR, virus propagation (in cell cultures), Immunohistochemistry in formalin-fixed tissues
- ELISA IgG can be used for retrospective diagnostic.

Non-Pharmacological Management
Management of RVF in humans is mainly supportive as there is no definitive treatment for RVF. Early detection and management of the disease is important. Human control of RVF is through control of the disease in animals through a sustained vaccination program and limiting human- animal contact. Use of insecticide treated nets and mosquito repellents can also reduce infections in human. In addition to human suffering and death, RVF has far reaching economic implications to the Livestock industry. In outbreak settings, the disease manifestation includes non-haemorrhagic febrile syndromes, and laboratory testing should be considered among persons with milder symptoms suggestive of viral illness.

Prevention
People living in or visiting areas with RVF shall be protected from the RVF infection with these steps:

- Protect people from contact with blood, body fluids, or tissues of infected animals. (Use PPEs like gloves, boots, long sleeves, and a face shield)
- Protect people from unsafe animal products. All animal products (including meat, milk, and blood) should be thoroughly cooked before eating or drinking.
- Protect people from mosquitoes and other bloodsucking insects. Use insect repellents and bed nets and wear long sleeved shirts and long pants to cover exposed skin.

No vaccines are currently available for vaccination in people at risk of RVF infection.

4.2.1.4 Yellow Fever

Yellow fever virus is an RNA that belongs to the genus Flavivirus and is related to West Nile, St. Louis encephalitis, and Japanese encephalitis viruses. It is transmitted human-to-human via the domestic species of Aedes mosquitoes (Urban epidemics) or to humans from the primate reservoir via a forest mosquito species (Sylvatic cycle). About 15% of infections progress to fever and jaundice. While only the minority of cases are severe, case fatality rate may be 25% to 50% among patients with syndrome of haemorrhage, jaundice, and renal disease. A small proportion of patients develop “toxic phase” with jaundice (yellowing of the skin and eyes, hence the name ‘yellow fever’), dark urine and abdominal pain with vomiting. Bleeding can occur from the mouth, nose, eyes or stomach and half of those die within 7 to 10 days.

Risk factor: Sporadic cases often linked to occupation or village location near woods or where monkeys are numerous, also non-vaccinated persons. Infection and disease can be prevented by vaccination. With a vaccine efficacy > 95% and duration of immunity is lifetime

Case definition

Suspected case: Any person with acute onset of fever, with jaundice appearing within 14 days of onset of the first symptoms.

Probable case: A suspected case with one of the following;

- Epidemiological link to a confirmed case or an outbreak
- Positive post-mortem liver histopathology

Confirmed case: A probable case with one of the following;

- Detection of YF-specific* IgM
- Detection of four-fold increase in YF IgM and/or IgG antibody titres between acute and convalescent serum samples
- Detection of YFV-specific* neutralizing antibodies

***YF**-specific means that antibody tests (such as IgM or neutralizing antibody) for other prevalent flavivirus are negative. This testing should include at least IgM for Dengue and West Nile and may include other flavivirus depending on local epidemiology.

OR

One of the following

- Detection of YF virus genome in blood or other organs by PCR

Detection of yellow fever antigen in blood, liver or other organs by immunoassays Isolation of the yellow fever virus

Laboratory Investigations

- ELISA for the presence of yellow fever Specific IgM and IgG antibodies.
- Exclusion of Dengue, West Nile virus and other locally prevalent flavivirus will be necessary for the confirmation of yellow fever.
- PCR, YF specific seroneutralization, virus isolation or histopathology

Non-Pharmacological Management

No specific anti-viral treatment, supportive therapies are recommended. Good and early supportive treatment for dehydration, liver and kidney failure, and fever improves outcomes. Associated bacterial infections can be treated with antibiotics

Prevention

Prevention and Control involve mosquito control and provision of Yellow Fever vaccine. The yellow fever vaccine is safe, affordable and a single dose provides life-long protection against yellow fever disease.

Indication of Yellow Fever Vaccination

- Persons ≥ 9 months of age
- Planning travel to or residence in an endemic area
- Planning travel to a country with an entry requirement Needs to be given ≥ 10 days prior to arrival in endemic area

Contraindications of Yellow Fever Vaccination

- Infants aged less than 9 months;
- Pregnant women – except during a yellow fever outbreak when the risk of infection is high;
- People with severe allergies to egg protein; and

People with severe immunodeficiency due to symptomatic HIV/AIDS or other causes, or who have a thymus disorder

4.2.1.5 Dengue Fever

Dengue virus is an arbovirus transmitted by aedes mosquitoes (both Ae. aegypti and Ae. albopiticus). Dengue fever is caused by four serologically distinct, but closely related Dengue viruses: dengue virus (DENV) 1, 2, 3, and 4 of the Flaviviridae family. Dengue fever is an emerging pandemic that has spread globally during the past 30 years as a result of changes in human ecology. Dengue haemorrhagic fever (DHF) is a potentially deadly complication that has become a leading cause of hospitalization and death among children in Asia and Africa. There is good evidence that sequential infection with the different serotypes of dengue virus increases the risk of more severe disease that can result in dengue shock syndrome (DSS) and death.

Infected humans are the main carriers and multipliers of the virus, serving a source of the virus for uninfected Aedes aegypti mosquitoes which maintain the urban dengue transmission cycle. The virus circulates in the blood of infected human for 2-7 days, at approximately the same time that they have a fever. A sylvatic transmission cycle has been documented in West Africa where DENV-2 has been found in monkeys. There is no evidence of person-to-person transmission.
DENV is frequently transported from one place to another by infected travelers; when susceptible vectors are present in these new areas, there is the potential for local transmission to be established.

Case Definition

Dengue Fever Suspected case: Any person with acute febrile illness of 2-7 days duration with 2 or more of the following: headache, retro-orbital pain, myalgia, arthralgia, rash, haemorrhagic manifestations, leucopenia.

Dengue Fever Confirmed case: A suspected case with laboratory confirmation (positive IgM antibody, four-fold or greater rise in IgG antibody titres, positive PCR or viral isolation).

Dengue Haemorrhagic Fever: A probable or confirmed case of dengue with bleeding tendencies as evidenced by one or more of the following: positive tourniquet test; petechieae, ecchymoses or purpura; bleeding: mucosa, gastrointestinal tract, injection sites or other; haematemesis or melaena; and thrombocytopenia (100,000 cells or less per mm3) and evidence of plasma leakage due to increased vascular permeability, manifested by one or more of the following: 20% rise in average haematocrit for age and sex, 20% drop in haematocrit following volume replacement therapy compared to baseline, signs of plasma leakage (pleural
effusion, ascites, hypo-proteinaemia).

Dengue Shock Syndrome: All the above criteria, plus evidence of circulatory failure manifested by rapid and weak pulse, and narrow pulse pressure (≤ 20 mm Hg) or hypotension for age, cold, clammy skin and altered mental status.

Laboratory Investigations

- Reverse Transcriptase–Polymerase Chain Reaction (RT–PCR)
- Rapid Tests for Dengue NSI antigen
- Serological methods, such as Enzyme-Linked Immunosorbent Assays (ELISA) for IgM and IgG anti-dengue antibodies
- FBP

Non-Pharmacological Management

There is no specific treatment for dengue, but appropriate medical care frequently saves the lives of patients with dengue haemorrhagic fever.

Pharmacological Management:

A: paracetamol (PO/IV) 15mg/kg 8hourly for 3days
A: Maintenance fluid (Ringer's lactate, NS) intravenously if one cannot take enough fluid orally
B: Blood transfusion and clotting factors.
B: oxygen and manage hypoglycaemia if present

Note:

- No antibiotics are of proven value.
- Children below 12 years require close monitoring for dangerous form.
- Steroids should not be used.
- Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) such as ibuprofen and aspirin should be avoided. These anti-inflammatory drugs act by thinning the blood, and in a disease with risk of hemorrhage, blood thinners may exacerbate the prognosis

Prevention

At present, the only method of controlling or preventing dengue virus transmission is to combat the vector mosquitoes using environmental management and chemical methods.

- Prevent dengue by avoiding mosquito bites by Aedes. aegypti and Aedes. albopictus bite during the day and night (Using mosquito repellant, bed nets and removing reservoirs).
- All four dengue viruses are spread primarily through the bite of an infected Aedes mosquito.
- A dengue vaccine is available for use in some parts of the world

4.2.1.6 Chikungunya Fever

Chikungunya Virus Disease is the arthropod-borne virus caused by Chikungunya Virus (CHIKV), transmitted by the Aedes aegypt, Aedes albopictus mosquitos the same which transmit Dengue virus, West Nile and Yellow Fever viruses. Chikungunya disease (Seroprevalence 7.7% to 26.9% in Tanzania) does not often result in death, but the symptoms can be severe and disabling. People at risk for more severe disease include newborns, older adults (≥65 years), and people with medical conditions such as high blood pressure, diabetes, or heart disease.

Case Definition

Acute clinical case

- Clinical criterion: Fever >38.50 C (101.30F) and joint pain (usually incapacitating) with acute onset AND
- Epidemiological criterion: resident or visitor in areas with local transmission of Chikungunya on the last 15 days (suspected case for epidemiological surveillance) b OR
- Laboratory criterion: confirmation by laboratory: PCR, serology or viral culture (confirmed case for epidemiological surveillance)
- Usually accompanied by exanthema, myalgia, back pain, headache and, occasionally, vomiting and diarrhoea (pediatric age group).
- In children aged <3 years, joint pain is expressed as inconsolable crying, irritability, rejection to mobilization and/or walking

Atypical case

Clinical case of laboratory confirmed Chikungunya accompanied by other manifestations: neurological, cardiological, dermatological, ophthalmological, hepatic, renal, respiratory, or hematological, among others.

Severe acute case

Clinical case of laboratory-confirmed Chikungunya presenting dysfunction of at least one organ or system that threatens life and requires hospitalization

Suspected and confirmed chronic cases

Suspect chronic case: Person with previous clinical diagnosis of chikungunya after 12 weeks of the onset of the symptoms presenting with at least one of the following articular manifestations: pain, rigidity, or edema, continuously or recurrently.
Confirmed chronic case: Every chronic case with a positive chikungunya laboratory test

Laboratory Investigations

Chikungunya is a biosafety level 3 (BSL-3)

- Detection of Chikungunya virus (CHIKV) viral culture of blood in the first 3 days
- RT-PCR for Viral RNA from the serum collected <6 days after onset of illness. Serological tests show a four-fold rise in antibody titer to Chikungunya virus;

Non-Pharmacological Management

The mainstay treatment for Chikungunya is the supportive symptomatic treatment.
A: Assure plenty of rest to patients

Pharmacological Management

A: sodium lactate compound (ringer's lactate)(RL) intravenously.

AND

A: paracetamol (PO/IV]15mg/kg 8hourly for 3days

Note:

- No antibiotics are of proven value.
- Steroids should not be used.
- Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) such as ibuprofen and aspirin should be avoided. These anti-inflammatory drugs act by thinning the blood, and in a disease with risk of hemorrhage, blood thinners may exacerbate the prognosis
- Do not use products containing oil of lemon eucalyptus (OLE) or para-menthane-diol (PMD) on children under 3 years old.
- Do not apply insect repellent to a child's hands, eyes, mouth, cuts, or irritated skin

Prevention

The most effective way to prevent infection from Chikungunya virus is to prevent mosquito bites during the day and night.

- Use insect repellent (DEET, Picaridin (known as KBR 3023 and icaridin IR3535, Oil of lemon eucalyptus (OLE), Para-menthane-diol (PMD), 2-undecanone)
- Modification of the mosquito bleeding sites
- Wear long-sleeved shirts and pants,
- Treat clothing and gears with permethrin
- Take steps to control mosquitoes indoors and outdoors

4.2.2 Measles (Rubeola)

Measles is an acute, highly communicable (contagious) infectious viral disease caused by Measles virus (MeV) which is the member of the family Paramyxoviridae, genus Morbillivirus. The mode of transmission is airborne, by droplet spread through coughing or sneezing, or by direct contact with nasal or throat secretions of infected persons. It is the fourth leading cause of death in children less than 5 years of age in many African countries.

Case Definition Suspected case:
Any person with fever and maculopapular (non-vesicular) generalized rash and cough, coryza or conjunctivitis (red eyes) or any person in whom a clinician suspects measles.
Confirmed case:
A suspected case with laboratory confirmation (positive IgM antibody) or epidemiological link to confirmed cases in an outbreak.

Clinical Diagnostic Criteria

- Generalized, reddish (erythematous), blotchy (maculopapular) rash;
- History of fever usually above 38˚C (if not measured, then "hot" to touch);
- Dry cough; Sore throat; Runny nose (coryza);
- Inflamed eyes (conjunctivitis), tiny white spots with bluish-white centers on a red background found inside the mouth on the inner lining of the cheek- also called Koplik's spots.
- In addition, children with measles frequently exhibit a dislike of bright light (photophobia), and often have a sore red mouth (stomatitis).

Symptoms usually develop 10–12 days after exposure to an infected person and last 7–10 days

Laboratory Investigation
With coordination from the WHO, the Global Measles and Rubella Laboratory Network (GMRLN) performs case-based laboratory surveillance standardized methods to confirm Measles Infection by

- Detection of viral RNA by RT-PCR (increasing role in case confirmation),
- Enzyme Immunoassay (EIA) for immunoglobulin M (IgM)

Pharmacological Management

Note: No specific antiviral treatment exists for measles virus

Adults
A: paracetamol (PO) 1g 8hourly for 5days
AND
A: vitamin A (PO) 200000 IU stat
In case of ocular involvement, add
A: oxytetracycline eye ointment 1% apply 24 hourly for 7 days

Paediatrics:
A: paracetamol (PO) 10–15mg/kg 8hourly for 5days
AND
A: vitamin A if less than 1 year gives 100,000IU (PO) stat and if over 1 year give 200,000IU (PO) stat

Prevention
Routine measles vaccination for children combined with mass immunization campaigns

- Administration of the first dose of measles-containing vaccine (MCV) at 9 months and 18 months in measles-endemic regions (Tanzania) and at 12–15 months in non-endemic regions.
- Accelerated immunization activities have had a major impact on reducing measles deaths.
- The World Health Organization (WHO) defines measles elimination as “the absence of endemic measles virus transmission in a defined geographical area (e.g., region or country) for at least 12 months in the presence of a surveillance system that has been verified to be performing well.

4.2.3 Rabies

Rabies is a zoonotic disease (a disease that is transmitted to humans from animals eg. dogs) that is caused by a virus. Rabies infects domestic and wild animals and is spread to people through close contact with infected saliva (via bites or scratches) The rabies virus infects the central nervous system, causing disease in the brain and, eventually, death. Early symptoms in people include: fever, headache, and general weakness or discomfort. As the disease progresses, symptoms include; insomnia, anxiety, confusion, slight or partial paralysis, excitable behavior, hallucinations, increase in saliva, difficulty swallowing, and fear of water (hydrophobia). In unvaccinated humans, rabies is almost always fatal if post-exposure prophylaxis is not administered before the onset of severe symptoms.

Case Definition
Suspected: A person with one or more of the following: headache, neck pain, nausea, fever, fear of water, anxiety, agitation, abnormal tingling sensations or pain at the wound site, when contact with a rabid animal is suspected.
Confirmed: A suspected case that is laboratory confirmed

Laboratory Investigation
Human rabies is confirmed by intra-vitam and post mortem diagnostic techniques that detect whole viruses, viral antigens, or nucleic acids in infected tissues (brain, skin or saliva). E.g., Direct fluorescent antibody (DFA) test, which targets rabies virus antigens in brain tissue, Identification of viral nucleic acid by reverse transcriptase PCR on fixed tissue collected post mortem or in a clinical specimen (brain tissue or skin, cornea or saliva) or Detectable rabies-neutralizing antibody titre in the CSF of an unvaccinated person.

Pharmacological Management
Post-exposure prophylaxis (PEP) is the immediate treatment of a bite victim after rabies exposure by

- Extensive washing and local treatment of the bite wound or scratch as soon as possible after a suspected exposure;
- Providing effective rabies vaccine that meets WHO standards
- Administration of Human rabies immunoglobulin (HRIG), if indicated.

Local wound therapy: -wash wound thoroughly with running water and soap for 10 minutes, and repeat process with:
Adults
A: povidone iodine 10%; to prevent secondary bacterial infection.
If patient present with Anxiety, Agitation, Seizures,
A: diazepam (IV) 10mg slowly in 3–5minutes (0.1–0.3 mg/kg in 3–5 min) 10mg in 3– 5minutes, repeated 1–4 hourly

Paediatrics
A: diazepam (IV) (0.1–0.3 mg/kg in 3–5min, repeated 1–4hourly (total 2.4–12 mg/kg IV for 24hours)
OR
A: diazepam (IV) slowly in 3–5minutes, repeated 1–4hourly for 24hours
OR
A: diazepam (IM) 20mg 2hourly for 24hours
OR
C: diazepam (Intrarectally) 10mg 1–4 hourly for 24hours
OR
C: lorazepam 25–50mcg/kg 6hourly for 24hours
OR
D: midazolam 0.08–0.2mg/kg (IV) repeated 1–4 hourly for 24-48 hours
OR
D: midazolam (intrarectally)10–30mg over 24hours by pump for 24-48 hours
If patient present with Anxiety
B: haloperidol 5mg (IM/SC) hourly until calm, then 4 or 6hourly and when necessary
OR
B: haloperidol 5 mg (IV) 5–15mg for 24 hours
OR
A: chlorpromazine (IM) 25–50mg/6–8hourly for 2 days

Table 4.3 Support for Patient with Fever, Hypersecretion and Pain

Indication	Pharmacological Management	Route of Administration	Adult Dose	Paediatric Dose
Fever	**D:** paracetamol	IV infusion over 15 minutes	1g every 8 h, max 3-4 g/24 h	10–15 mg/kg 8hourly for 3-5 days
	A: paracetamol	**OR**		
		Intrarectal	1 g every 4-6 h, max 3-4 g/24 h	10–15 mg/kg 8hourly for 3-5 days
		OR		
		Oral	1g 8 hourly as needed	10–15 mg/kg 8hourly for 3-5 days
	A: ibuprofen	**OR**		
		(Oral implied)	300-400 mg 8 hourly	—

Indication	Pharmacological Management	Route of Administration	Adult Dose	Paediatric Dose
Hypersecretion	**A:** hyoscine hydrobromide	SC or IV injection	400 mcg 4 hourly	10 mcg/kg 4–8 hourly
		OR		
		SC infusion	1.2–2 mg/24 h	40–60 mcg/kg/24 h
Pain	**C:** morphine	Slow IV, SC or IM	10 mg 4 hourly	—
		OR		
	S: fentanyl	Slow IV	25–100 mcg/h	0.5–2 mcg/kg/h infusion

Prevention
Rabies can be prevented by

- Vaccinating pets
- Staying away from wildlife
- Seeking medical care after potential exposures before symptoms start
- Immunization

Immunization
Active Immunization
Pre-exposure immunization is recommended for people in certain high-risk occupations such as laboratory workers handling live rabies and rabies-related (lyssavirus) viruses; and people (such as animal disease control staff and wildlife rangers)
Active immunization: Rabies vaccine –either ID or IM

A: Rabies vaccines (2- 3 IU/dose)

- IM: 1ml on days 0, 3, 7, 14, 28 (5 doses)
- ID: 0.2ml by dividing 0.1 ml on left shoulder and 0.1ml on right shoulder, on days 0, 3, 7 and 28 (4 doses).

Intradermal (ID) is mostly advised.
In addition, patients should receive rabies immune globulin with the 1st dose (day 0)

Passive Immunization
B: Human rabies immunoglobulin (HRIG) 20 IU/kg; half the dose given parenterally and the other half injected into and around the wound for victims suspected to be infected

AND

A: tetanus vaccine.

Note: Treat the person immediately after the animal bite, before onset of symptoms. Corticosteroid therapy generally is not considered for the management of brain edema in rabies.

4.2.4 Zika Virus Disease

Zika virus is a flavivirus that is transmitted primarily through the bite of an infected mosquito, primarily Aedes aegypti, and also Aedes albopictus, the same mosquitoes that transmit dengue, chikungunya, and yellow fever. Zika virus can also be transmitted in-utero from mother to fetus, and through sexual contact, blood transfusion, and organ transplantation. Zika virus infections are usually asymptomatic. When symptoms occur, they tend to be mild and include mild fever, rash, conjunctivitis, and muscle and joint pain that last for 2 to 7 days. There is no specific treatment but symptoms can be treated with common fever medicines, rest and drinking fluids.

Case Definition

Suspected Case: Any person presenting with rash and/or fever and at least one of the following signs or symptoms:

- arthralgia; or
- arthritis; or
- conjunctivitis (non-purulent/hyperaemic).

Probable case: A suspected case with presence of IgM antibody against Zika virus and an epidemiological link (with no evidence of infection with other flaviviruses).

Confirmed case: Any person with laboratory confirmation of recent Zika virus infection presence of Zika virus RNA or antigen in serum or other samples (e.g., saliva, urine, tissue, whole blood); or IgM antibody against Zika virus positive and Plague Reduction Neutralizing Test (PRNT90) for Zika virus with titre ≥20 and Zika virus PRNT90 titre ratio ≥ 4 compared to other flaviviruses; and exclusion of other flaviviruses.

Clinical Diagnostic Criteria:

- Fever, skin rashes, conjunctivitis,
- Joint pain, malaise, Headache - usually mild and last for 2–7 days.
- Neurological and auto-immune complications of Zika virus disease, babies born with microcephaly (Observed in northeast Brazil).

Laboratory Investigations

- Reverse transcriptase-polymerase chain reaction (RT-PCR) for viral RNA
- Serology for IgM detection
- Plaque reduction neutralization test (PRNT)

Non-Pharmacological Management

The mainstay treatment for Zika Virus is the supportive symptomatic treatment.

A: Assure plenty of rest to patients

Pharmacological Management

A: sodium lactate compound (ringer's lactate)(Ringers Lactate) intravenously.

AND

A: paracetamol 15mg/kg (PO/IV) 8hourly for 3-5days

Note:

- No antibiotics are of proven value.
- Steroids should not be used.
- Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) such as ibuprofen and aspirin should be avoided. These anti-inflammatory drugs act by thinning the blood, and in a disease with risk of hemorrhage, blood thinners may exacerbate the prognosis
- Do not use products containing oil of lemon eucalyptus (OLE) or para-menthane-diol (PMD) on children under 3 years old.
- Do not apply insect repellent to a child's hands, eyes, mouth, cuts, or irritated skin

Prevention

- Vector control: - removal and modification of breeding sites and reducing contact between mosquitoes and people
- Wearing clothing (preferably light-colored) that covers as much of the body as possible;
- Using physical barriers such as window screens and closed doors and windows;
- Applying insect repellent to skin or clothing that contains DEET, IR3535 or icaridin

4.2.5 COVID-19

COVID-19 is an infectious disease caused by SARS-CoV-2 virus (coronavirus family, related to SARS/MERS), with zoonotic origin and human-to-human transmission. First detected in Wuhan, China in December 2019. WHO declared a Public Health Emergency of International Concern (PHEIC) in January 2020 and Pandemic in March 2020. In May 2023 WHO declared it no longer a PHEIC.

Transmission

Mainly via respiratory droplets/aerosols (coughing, talking, sneezing); close contact; contaminated surfaces (fomites). Higher airborne risk in poorly ventilated areas.

Incubation period: Typically, 2–5 days (range 2–14 days).

Case Definitions

Suspected case: Acute respiratory illness (fever + cough/shortness of breath) with history of travel to/transmission area in last 14 days, OR contact with confirmed/probable case in last 14 days, OR severe acute respiratory illness requiring hospitalization (no alternative diagnosis).

Probable case: Suspect with inconclusive/no test, epidemiologic link to confirmed case/outbreak, or typical COVID-19 chest imaging (CT/X-ray).

Confirmed case: Positive laboratory test (e.g., PCR/NAAT), or antigen/serology positive in suspect with strong epidemiologic link.

Case Definitions (WHO, last major update 2022–2023; still current):

- Suspected: Acute respiratory illness (fever + cough/SOB) with travel to/transmission area, OR contact with confirmed/probable case (last 14 days), OR severe illness requiring hospitalization (no alternative diagnosis).
- Probable: Suspect with inconclusive/no test, epidemiologic link to confirmed case/outbreak, or typical COVID imaging (CT/X-ray).
- Confirmed: Positive Nucleic Acid Amplification Test (NAAT) such as PCR, OR positive antigen/serology in suspect cases with strong epidemiologic link.

Clinical Diagnosis

SARS-CoV-2 invades respiratory (and other) cells; symptoms vary by severity.

- Most common: Fever, dry cough, tiredness.
- Less common: Headache, sore throat, loss of taste/smell, chills, runny nose, muscle aches, chest pain, diarrhea, conjunctivitis, skin rash, finger/toe discoloration.
- Serious (SARI): Difficulty breathing, shortness of breath, chest pain/pressure, loss of speech/movement.

Risk factors for severe illness

Comorbidities (heart disease, cancer, COPD, diabetes, asthma, liver/kidney disease, obesity, sickle cell, immunocompromised e.g., HIV, transplants, cancer therapy).
Severity Categories (WHO-aligned):

- Asymptomatic/Pre-symptomatic: Positive test, no symptoms.
- Mild: Symptoms present, no dyspnea/hypoxia/abnormal imaging.
- Moderate: Lower respiratory disease, SpO_2 ≥94% on room air.
- Severe: SpO_2 <94%, RR >30/min, PaO_2/FiO_2 <300 mmHg, infiltrates >50%.
- Critical: Respiratory failure, septic shock, multi-organ dysfunction.

Laboratory Investigation & Testing

- Respiratory samples: URT (nasopharyngeal/oropharyngeal) ± LRT (sputum, endotracheal aspirate, BAL) Collect before antimicrobials if possible; do not delay treatment.
- Use viral swabs and transport media; appropriate PPE (droplet/contact for URT, airborne for LRT).
- Rule out other pathogens (e.g., bacterial pneumonia, influenza, RSV).
- Virologic testing: NAAT (rRT-PCR) or antigen test to confirm SARS-CoV-2 infection.
- Test for other respiratory viruses if feasible like Influenza A and B (including zoonotic influenza A), Respiratory syncytial virus, Parainfluenza viruses, Rhinoviruses, Adenoviruses, Enteroviruses (e.g., EVD68), Human meta pneumovirus, and Endemic human coronaviruses (i.e. HKU1, OC43, NL63, and 229E).
- Blood tests: Full blood count, CRP, liver and renal function; serum electrolytes, consider D-dimer, Pro-BNP, Troponin, LDH, ferritin if severe disease.
- Microbiology: MRDT, Blood cultures if pneumonia or sepsis suspected (do not delay treatment).
- Imaging: Chest X-ray, CT chest, ECG, ECHO (when indicated)

Non-Pharmacological Management
(Supportive; follow national protocols/MoH updates)
Non-severe/Mild (home care if stable):

- Self-isolation, monitor danger signs.
- Supportive: Hydration, nutrition,
- No routine antibiotics/antivirals unless bacterial co-infection.

Moderate/Severe (admit to designated area with oxygen):

- Oxygen: Target SpO_2 ≥90% (≥92–95% pregnant); start 5 L/min, titrate.

Pharmacological Management

Clinical Severity / Indication	Management
Non-severe / Mild	**A:** paracetamol 1 g PO **AND** **A:** prednisolone 0.5–1 mg/kg PO 24 hourly **OR** **B:** dexamethasone 6–8 mg IV 24 hourly (up to 10 days) **OR** **D:** dexamethasone 6–8 mg PO 24 hourly (up to 10 days)
Moderate / Severe	**A:** prednisolone 0.5–1 mg/kg PO 24 hourly **OR** **B:** dexamethasone 6–8 mg IV 24 hourly (up to 10 days) **OR** **D:** dexamethasone 6–8 mg PO 24 hourly (up to 10 days) **AND** **D:** low molecular weight heparin (1 mg/kg SC 24 hourly **OR** **S:** rivaroxaban 10 mg PO 24 hourly
Bacterial Co-infection (add to the above regimen when indicated)	**S:** piperacillin + tazobactam 4.5 g IV 6 hourly for 5–7 days **OR** **S:** ceftriaxone + sulbactam 1.5 g IV 12 hourly for 5–7 days **THEN** **B:** azithromycin 500 mg PO 24 hourly for 5–7 days **OR** **C:** clarithromycin 500 mg PO 12 hourly for 5–7 days

Note:

- Antibiotic should be changed according to Culture and Sensitivity Results (whenever available)
- Maintain hydration through cautious IVF administration.

Adjunctive Therapy (where indicated)

Therapeutic Intervention	Management
PPI Administration	**A:** omeprazole 20 mg PO 12 hourly **OR** **S:** esomeprazole 40 mg PO 12 hourly **OR** **C:** pantoprazole 40 mg IV 12 hourly for 5–7 days
Supportive Treatment	**A:** ascorbic acid 500–1000 mg PO 24 hourly for 7–14 days **AND** **A:** zinc Sulfate 40 mg PO 24 hourly for 7–14 days **AND** **C:** cholecalciferol (Vitamin D3) 1,000–5,000 IU PO 24 hourly for 7–14 days

Critical (ICU)
Treat the same as severe category with the
following additions:

- Acute Respiratory Distress Syndrome (ARDS): Respiratory support including mechanical Ventilation
- Shock and Septic shock: Ionotropic-support: Norepinephrine/epinephrine (adrenaline)/dopamine
- Hydration-Give IV fluids for shock until SBP>90mmHg or MAP >65mmH.
- Administer IV fluids cautiously and assess responsiveness to avoid overload.
- Additional Supportive treatment: Manage hypomagnesemia, as may increases the cytokine storm and prolongs QTc

A: magnesium 2g stat IV (serum magnesium 2.0-2.4mmol) then magnesium 400mg or 300Mg 24hourly for 5days

(Monitor Serum magnesium regularly)

- Ensure patient receive appropriate and adequate nutrition (see chapter 10 for details on nutrition).
- Provide chest physiotherapy on daily basis
- Provide psychosocial support to patient and close relatives

4.2.6 Mpox
Mpox, previously known as monkeypox, is a viral illness caused by the monkeypox virus, a species of the genus Orthopoxvirus. There are two distinct clades of the virus: clade I (with subclades Ia and Ib) and clade II (with subclades IIa and IIb).

Clinical Presentation
Mpox causes signs and symptoms which usually begin within a week but can start 1–21days after exposure. Symptoms typically last 2–4 weeks but may last longer in someone with a weakened immune system. They include acute onset of fever (>38.5°C) and chills, headache, sore throat, myalgia (muscle pain/body aches), back pain, profound weakness, or fatigue, acute skin rash, mucosal lesions or lymphadenopathy (swollen lymph nodes).

- The skin rash may include single or multiple lesions in the ano-genital region or elsewhere on the body.
- Mucosal lesions may include single or multiple oral, conjunctival, urethral, penile, vaginal, or anorectal lesions.
- Ano-rectal lesions can also manifest as ano-rectal inflammation (proctitis), pain and/or bleeding

Case Definitions

Suspect: A suspect case of Mpox can present with either of the following spectrum of symptoms.
Acute onset of fever (>38.5°C), headache, myalgia (muscle pain/body aches), back pain, profound weakness, or fatigue
OR
A person presenting with an unexplained acute skin rash, mucosal lesions or lymphadenopathy (swollen lymph nodes). Ano-rectal lesions can also manifest as ano-rectal inflammation (proctitis), pain and/or bleeding

Probable: A suspected case with one or more of the following:

- Has an epidemiological link to a probable or confirmed case of Mpox in the 21 days before symptom onset?
- Has had multiple and/or casual sexual partners in the 21 days before symptom onset
- Has a positive test result for orthopoxviral infection (e.g., OPXV-specific PCR without MPXV-specific PCR or sequencing).

Confirmed: A person with laboratory confirmed MPXV infection by detection of unique sequences of viral DNA by real-time polymerase chain reaction (PCR) and/or sequencing.

Transmission
Mpox spreads from person to person mainly through close contact with someone who has Mpox, including members of a household. Close contact includes skin-to-skin (such as touching or sex) and mouth-to-mouth or mouth-to-skin contact (such as kissing), and it can also include being face-to-face with someone who has Mpox (such as talking or breathing close to one another, which can generate infectious respiratory particles). People can also contract Mpox from contaminated objects such as clothing or linen, through needle injuries in health care, or in community settings such as tattoo parlours. During pregnancy or birth, the virus may be passed to the baby. Contracting Mpox during pregnancy can be dangerous for the fetus or newborn infant and can lead to loss of the pregnancy, stillbirth, death of the newborn, or complications for the parent.

Non-Pharmacological Management

All Cases

- Oral hydration and adequate nutrition (refer to Chapter 10)
- Skin care:
  - Gentle washing of lesions with soap and water
  - Keep lesions clean and dry
  - Avoid scratching
  - Apply moist dressings (e.g., Vaseline gauze)
  - Refer to Chapter 13 for detailed skin care management and prevention of secondary infections
- Monitor for secondary bacterial infections and manage promptly
- Oxygen therapy if hypoxic
- Advanced supportive care as needed, including nutritional support and wound care (refer to Chapters 10 and 13)
- Infection prevention and control measures, including isolation and avoidance of close contact until lesions have healed completely

Severe/Complicated Cases (Admit if indicated)

- Intravenous hydration using 0.9% Normal Saline or Ringer's Lactate, with monitoring for fluid overload
- Oxygen therapy if indicated
- Nutritional support
- Wound care and management of extensive skin lesions
- Monitoring and management of complications

Pharmacological Management

Clinical Indication	Medicine(s) and Dosage
Fever and Mild Pain	**A:** paracetamol 500 mg–1 g PO every 6–8 hours PRN (maximum 4 g/24 hours)
Moderate Pain	**A:** ibuprofen 400 mg PO every 8 hours PRN (if no contraindications) **OR** Escalate analgesia according to the Pain Management Section in these Guidelines
Severe Pain	**B:** tramadol 50–100 mg PO/IV every 6–8 hours PRN (maximum 400 mg/day) **OR** **C:** morphine 2.5–10 mg PO every 4 hours PRN **OR** **C:** morphine 2.5–5 mg IV every 4 hours PRN, titrated according to response
Pruritus (Itching)	**A:** chlorpheniramine 4 mg PO every 6–8 hours PRN
Secondary Bacterial Infection	Treat according to site of infection, culture and antimicrobial susceptibility results, and relevant treatment guidelines.

Note:

- Continue ART without interruption in people living with HIV.
- Initiate ART within 7 days of Mpox diagnosis in newly diagnosed HIV infection or after prolonged interruption.
- HIV testing should be offered to all suspected and confirmed Mpox cases.
- No routine antiviral therapy is currently recommended for Mpox.
- Refer to the Pain Management chapter for analgesic escalation.

Management considerations for severe/complicated disease

- Continue supportive treatment.
- Escalate analgesia according to the Pain Management Section in these Guidelines
- Treat confirmed secondary bacterial infections appropriately.
- No routine antiviral therapy for Mpox is currently recommended.

Mpox is treated with supportive care for symptoms such as pain and fever, with close attention to nutrition, hydration, skin care, prevention of secondary infections and treatment of co-infections, including HIV if present. Individuals with HIV and Mpox should continue taking their antiretroviral therapy (ART). ART should be initiated within 7 days of diagnosis of HIV.
Getting an Mpox vaccine can help prevent infection (pre-exposure prophylaxis). It is recommended for people at high-risk of getting Mpox, especially during an outbreak. The vaccine can also be administered after a person has been in contact with someone who has Mpox (post-exposure prophylaxis). In these cases, the vaccine should be given less than 4 days after contact with someone who has Mpox. The vaccine can be given for up to 14 days if the person has not developed symptoms.

Public Health Control Measures

- Isolate at home (if mild and per healthcare provider guidance) or in hospital (if severe or high-risk transmission concerns) for the full infectious period — from onset of symptoms until all lesions have crusted, scabs have fallen off, and new skin has formed (typically 2–4 weeks).
- Cover all lesions with clean, dry bandages/clothing when around others. Wear a well-fitting medical mask

(surgical or respirator) when in the presence of others. Avoid close physical contact, including sexual activity, until fully recovered and cleared by a healthcare provider.

- Advise the public to take a break from sexual activity with new or multiple partners during periods of increased transmission to reduce risk.
- Those with close contact (household, sexual, healthcare, or prolonged face to face) with a confirmed/probable case should self-monitor for signs/symptoms (fever, rash, headache, muscle aches, lymphadenopathy, etc.) for 21 days after last exposure. During this period, avoid sexual activity, close physical contact, and high-risk settings; report symptoms immediately for testing and isolation if needed.
- Use appropriate PPE when caring for patients: gloves, gown, eye protection (goggles/face shield), and respirator (N95 or equivalent). Follow strict protocols for lesion swabbing (use sterile technique), safe handling of sharps/needles, waste management, and environmental cleaning. Train staff on donning/doffing PPE, airborne and contact precautions (droplet if respiratory symptoms present).

Additional measures (as applicable):

- Promote hand hygiene, respiratory etiquette, and disinfection of frequently touched surfaces.
- Conduct contact tracing and risk assessment for close contacts; consider post-exposure prophylaxis (e.g., vaccine) for high-risk contacts per national/WHO guidance (if vaccine available).
- Engage communities in awareness: symptoms recognition, early care-seeking, avoiding self-medication, and reducing stigma.
- Notify suspected/confirmed cases within 24 hours via IDSR; line list cases and link to lab results (PCR preferred)

4.2.7 Influenza

Influenza is an acute respiratory viral infection caused by influenza viruses and readily spread from person to person, via infectious respiratory particles (IRP), which are transmitted through the air when an infected person coughs or sneezes. There are four types of influenza viruses: types A, B, C and D. Seasonal influenza A and B viruses circulate among humans worldwide. However, a novel influenza A virus's subtypes of animal origin (zoonotic influenza), such as avian influenza A virus and swine influenza A virus can sporadically affect humans and are known to cause pandemics.

- Influenza A viruses are further classified into subtypes according to the combinations of the proteins H for Hemagglutinin and N for Neuraminidase on the surface of the virus (e.g., H1N1, H5N1, H3N2, etc.)
- Influenza B viruses are not classified into subtypes but can be subclassified into two lineages. Currently circulating influenza type B viruses belong to either the B/Yamagata or B/Victoria lineages.

Clinical Presentation

Clinical diagnosis of influenza is challenging as the signs and symptoms of the disease can be non-specific (many respiratory pathogens can cause a similar illness) and can vary depending on virus type as well as patient host characteristics and other factors. Most people with non-severe influenza illness recover from the fever and other symptoms within a week, without requiring medical attention. Typically ranges from 2 to 7 days, though it can extend to 10 days for some subtypes (e.g., H5N1). Symptoms: fever, sudden onset of cough, headache, muscle and joint pain, severe malaise, sore throat, rhinorrhea, chills and sweating

Signs: elevated body temperature, pharyngeal erythema, nasal congestion or discharge, cervical lymphadenopathy, lung wheezing or crackles if complications like pneumonia develop, tachycardia and general appearance of malaise or fatigue

Complications: septicemia, septic shock, severe pneumonia, acute respiratory distress syndrome (ARDS), multi-organ failure, exacerbation of chronic medical conditions or even death.

Case Definitions

Suspected case: Any person presenting with unexplained acute lower respiratory illness with fever (>38 ºC) and cough, sore throat, shortness of breath or difficulty breathing AND at least one of the following exposures within the 7 days prior to

- Infected animals (e.g., poultry, swine, or wild birds) or their environments (e.g., live animal markets, farms, or slaughterhouses).
- A confirmed human case of zoonotic influenza.

Probable Case: A suspected case with:

- A positive laboratory test for influenza A, but the subtype is not identified or is inconclusive (e.g., influenza A positive but not H1N1, H3N2, or other common human subtypes).
- Epidemiological evidence strongly suggesting zoonotic exposure (e.g., direct contact with infected animals or their products).
- No definitive confirmation of a novel influenza A subtype.

Confirmed Case: A suspected or probable case with:
Laboratory confirmation of infection with a novel influenza A virus of animal origin, such as:

- Detection of a specific novel influenza A subtype (e.g., H5N1, H7N9, H3N2v) by reverse transcription-polymerase chain reaction (RT-PCR) or other nucleic acid amplification tests.
- Virus isolation or sequencing confirming a novel influenza A virus not typically found in humans.
- Significant rise in subtype-specific antibodies (e.g., via serologic testing like hemagglutination inhibition or microneutralization assays).
- Laboratory testing must be conducted by a recognized public health laboratory, such as a WHO Collaborating Centre or a national reference laboratory.

Non-Pharmacological Management

- Encourage adequate rest to support recovery.
- Ensure sufficient fluid intake to prevent dehydration.
- Some severe and critical cases will need oxygen, mechanical ventilation (invasive or non-invasive) and/ or vasopressor therapy.
- Monitor for worsening symptoms (shortness of breath, persistent high fever, chest pain)

Pharmacological Management
A: paracetamol 500 mg – 1 g PO every 6–8 hours PRN for fever/pain (max 4 g/24h)
OR
A: ibuprofen 400 mg PO every 8 hours PRN for fever and body aches (avoid in peptic ulcer disease, renal impairment, or bleeding risk)

For nasal congestion:
B: ephedrine 60 mg PO every 6–8 hours PRN (maximum 240 mg/day; avoid in hypertension, heart disease)

For runny nose/itching/sneezing:
A: chlorpheniramine 4 mg PO every 6–8 hours PRN
OR
C: loratadine 10 mg PO OD

For dry cough
A: dextromethorphan 15–30 mg PO every 6–8 hours PRN (antitussive cough suppressants)

Antibiotics only if bacterial superinfection is suspected (e.g., secondary pneumonia). Use per culture/sensitivity results or empirically as per pneumonia guidelines

A: amoxicillin 500 mg PO TDS for 5–7 days
OR
B: azithromycin 500 mg PO OD for 3–5 days
High-Risk or Severe Influenza (Admit if indicated):

Non-Pharmacological Management

- Oxygen therapy if SpO_2 <94% (target ≥90–92%)
- IV hydration if unable to take oral: 0.9% Normal Saline or Ringer's Lactate (cautious titration, monitor fluid balance)
- Monitor closely for complications

Pharmacological Management
A: paracetamol 500 mg – 1 g PO every 6–8 hours PRN for fever/pain (max 4 g/24h)
OR
A: ibuprofen 400 mg PO every 8 hours PRN for fever and body aches (avoid in peptic ulcer disease, renal impairment, or bleeding risk)

Stronger analgesia if required per pain ladder
Antibiotics for confirmed or suspected bacterial superinfection (Refer Chapter 9)

Note:

- Asthma or COPD exacerbation: Refer to Chapter 9 for specific management (e.g., bronchodilators, inhaled corticosteroids, oxygen)
- Heart failure: Refer to Chapter 20 for specific management (avoid fluid overload, use diuretics cautiously)
- Children: Avoid aspirin entirely due to risk of Reye's syndrome. Use Paracetamol or Ibuprofen at weight-based doses.
- No routine antiviral is recommended

Public Health Control Measures

- Notify the public health authorities immediately (within 24 hours) through IDSR
- Conduct contact tracing and follow-up for all identified contacts.
- Initiate a line listing of suspected and confirmed cases and ensure laboratory results are linked with cases

- Conduct case identification and perform Rapid Diagnostic Testing (RDT) and send specimens for confirmatory testing using RT-PCR at the designated Laboratories
- Conduct syndromic surveillance to identify community clusters and monitor disease trends.
- Implement genomic surveillance to detect emerging variants.
- Strengthen Infection Prevention and Control (IPC) measures in both health facility settings and community environments.
- Promote and implement social and behavioral interventions, such as physical distancing and proper cough and sneeze etiquette, especially during periods of high transmission
- Increase public and community awareness through health education on symptoms, modes of transmission, and prevention measures.

4.2.8 Viral Keratoconjunctivitis (VKC)

It is a viral eye infection accounting for over 80% of cases of epidemic keratoconjunctivitis (EKC)/Red eye with more than 75% attributed specifically to adenovirus infection. Epidemic keratoconjunctivitis (EKC) is an eye condition primarily characterized by dilation of the conjunctival blood vessels (hyperemia), conjunctival edema (chemosis), and ocular discharge. It may be unilateral but usually bilateral.

Adenovirus serotypes Ad 5, 8, 11, 13, 19, and 37 are frequently implicated in outbreaks of EKC and are known to cause severe conjunctivitis. Adenoviruses are highly resilient, capable of surviving on inanimate surfaces for up to 30 days, which contributes significantly to their potential for widespread transmission.

The incubation period for adenoviral EKC ranges from 2 to 14 days, with most individuals developing signs and symptoms within 5 to 6 days' post-exposure. Importantly, viral shedding can occur in asymptomatic individuals, and infected persons may remain contagious for 10 to 14 days after symptom onset, posing a substantial risk for community and healthcare-associated transmission.

Clinical Presentation

A typical case of VKC is presented by:

- Conjunctival injection (redness).
- Follicular conjunctivitis (small, raised bumps on the conjunctiva).
- Preauricular lymphadenopathy (swollen lymph nodes near the ear).
- Corneal involvement (e.g., subepithelial infiltrates or epithelial keratitis) in severe cases.
- Pseudo membrane formation in epidemic keratoconjunctivitis (EKC), a severe adenoviral form.
- Acute onset of unilateral or bilateral red eyes.
- Watery or mucoid discharge.
- Foreign body sensation, burning, or itching.
- Photophobia (sensitivity to light) in cases with corneal involvement (keratitis).
- Possible associated upper respiratory symptoms (e.g., sore throat, fever) due to systemic viral infection.

Transmission

Epidemic viral keratoconjunctivitis/Red eye is very contagious and mostly spread from human to human or inanimate objects to human through hand-to-eye contact by hands or objects that are contaminated with the virus. Other ways include contact with: Infectious tears, Eye discharge, Fecal matter, Respiratory discharge and large respiratory tract droplets.

Case definitions

Suspected Case: Any person presenting with acute red eye with watery discharge and without an alternative diagnosis (e.g., bacterial conjunctivitis or allergy) OR with history of exposure to a confirmed case or outbreak setting (e.g., schools, hospitals) within 7-14 days.

Probable Case: A suspected case with clinical signs like follicular conjunctivitis or preauricular lymphadenopathy with epidemiological link (e.g., contact with a confirmed case).

Confirmed Case: A suspected or probable case with a laboratory confirmation (e.g., positive PCR or immunochromatography for adenovirus).

Differential Diagnosis

The above case definitions distinguish VKC from:

- Bacterial conjunctivitis which presents with purulent discharge without follicular response.
- Allergic conjunctivitis which presents with itching, seasonal, without lymphadenopathy.
- Herpes simplex virus (HSV) which present with keratitis (dendritic corneal lesions, unilateral).

Complications

- Persistent corneal infiltrates or secondary bacterial infections may require additional treatments, such as antibiotics for superinfections.
- Severe cases with vision-threatening complications need urgent ophthalmology referral.

Note:

- Treatment is nonspecific, mainly is supportive and symptoms relief, preventing complications, and limiting spread, as there is no specific antiviral cure for most cases. Most cases resolve in 1-3 weeks without specific treatment.
- Topical Antihistamines or Decongestants: For itching or redness. Use cautiously to avoid rebound redness.
- Topical NSAIDs: In cases with significant discomfort or photophobia, such as ketorolac drops, but only under medical supervision.
- Oral Analgesics: Over-the-counter pain relievers

Non-Pharmacological Management

Supportive Care

- Cold Compresses: Reduce swelling and soothe irritation.
- Hygiene: Strict handwashing and avoiding touching eyes to prevent secondary infections and transmission.
- Avoid Contact Lenses: Discontinue use until symptoms resolve to prevent worsening or bacterial superinfection.

Pharmacological Management

Children > 6 years and adults

A: paracetamol (PO) 1g 8hourly (Pediatric 10–15mg/kg/dose 8hourly) when required, for 3-5days

AND

C: oxymetazoline 0.025% eye drops, instill 1–2drops 6hourly for a maximum of 7days.

Note:

- Antibiotics are ineffective for viral causes and only used if bacterial superinfection is confirmed.
- Always consult an eye care specialist for persistent symptoms, vision changes, or severe pain.
- Viral conjunctivitis is very contagious so report immediately using the electronic IDSR system, alert patients and members of the family
- For more information refer to chapter 14

Prevention

Preventive measures are essential to reduce the spread of epidemic keratoconjunctivitis. These include:

- Frequent handwashing with soap and clean running water. Using antiseptics, such as alcohol-based hand sanitizers, when soap and water are not available
- Avoiding touching or rubbing the eyes, especially with unwashed hands
- Self-isolation - Avoid school, work, or public places for 7-14 days or until symptoms resolve to prevent spread
- Avoid sharing personal items, such as towels, washcloths, eye makeup, pillows, eye drops, or contact lenses.
- Regularly clean high-touch surfaces (e.g., doorknobs, phones) with disinfectants effective against adenovirus (e.g., bleach solutions).
- Wash bedding, towels and clothing in hot water to kill the virus.
- Practicing proper cough and sneeze etiquette, such as covering the mouth and nose with a tissue or elbow and washing hands afterward
- Discontinue contact lens use during outbreaks or if symptoms appear
- Ensure proper lens cleaning and storage to avoid contamination.
- Stay away from individuals with active VKC symptoms (red eyes, discharge).
- Use protective eyewear in high-risk settings (e.g., healthcare facilities during outbreaks).

4.3. Protozoa and Others

4.3.1. Human African Trypanosomiasis (HAT), (Sleeping Sickness)

Human African Trypanosomiasis (HAT), also known as sleeping sickness, is a vector-borne parasitic disease caused by *Trypanosoma brucei* parasites, transmitted by tsetse flies (Glossina species). It occurs in two forms: Trypanosoma brucei gambiense (chronic, West and Central Africa) and Trypanosoma brucei rhodesiense (acute, East and Southern Africa). The disease is endemic in sub-Saharan Africa and is nearly 100% fatal if untreated.

Clinical Presentation

Symptoms and signs

HAT progresses in two stages: Stage one, No CNS involvement (CSF: ≤5 white blood cells/μL, no trypanosomes) and stage two, CNS involvement (CSF: >5 white blood cells/μL, trypanosomes detected, or elevated protein).

Haemolymphatic Stage (Stage 1):
Early phase after infection, when parasites multiply in blood and lymphatic system. Symptoms are non-specific, often leading to misdiagnosis

- Symptoms: Fever (intermittent), Headache, Joint and muscle pain, Fatigue, Swollen lymph nodes (notably Winterbottom's sign: posterior cervical lymph node enlargement in T.b. gambiense), Skin rash or chancre at bite site (more common in T.b. rhodesiense), Itching and/or Anaemia

Meningoencephalitis Stage (Stage 2):
Parasites invade the central nervous system (CNS). T.b. rhodesiense progresses rapidly (weeks to months), while T.b. gambiense may take months to years

- Symptoms: Sleep disturbances (daytime sleepiness, nighttime insomnia, hence "sleeping sickness"), Confusion, irritability, or personality changes, Tremors, motor weakness, or difficulty walking, Seizures and Coma (if untreated)

Case Definitions
Suspected Case: Any person living in or visiting an endemic area with:

- Clinical symptoms (e.g., fever, lymphadenopathy, neurological signs).
- History of tsetse fly exposure.

Probable Case: Suspected case with positive serological tests (e.g., Card Agglutination Test for Trypanosomiasis, CATT) for T.b. gambiense or clinical/epidemiological suspicion for T.b. rhodesiense.

Confirmed Case: Suspected case with laboratory confirmation of trypanosomes in blood, lymph node aspirate or cerebrospinal fluid OR positive serology with clinical signs and CSF abnormalities (e.g., increased white blood cells or protein) for stage 2.

Pharmacological Management
Treatment depends on the parasite type and disease stage.

Trypanosoma brucei gambiense: Stage 1:
D: pentamidine 4 mg/kg (IM/ IV) 24 hourly for 7 days, Maximum 300 mg per dose. Well-tolerated, effective for early stage.

Trypanosoma brucei gambiense: Stage 2:
D: fexinidazole: Oral treatment (given 24hourly for up to 10 days),
effective for both stages but preferred for stage 2 in adults and children >6 years (weight ≥20 kg). Simpler administration than older regimens.

Body Weight	Days 1-4	Days 5-10
20 – 35 kg	1200mg/day	600mg/day
35 – 50 kg	1200mg/day	1200mg/day
≥ 50kg (Most Adults	1800mg/day	

OR
Nifurtimox-Eflornithine Combination Therapy (NECT): Eflornithine (IV, 7 days) + nifurtimox (oral, 10 days). Used when fexinidazole is contraindicated.
S: nifurtimox (PO) 15 mg/kg/day, given 8hourly for 10days
AND
S: eflornithine (IV) 400 mg/kg/day, given 12hourly for 7days (weight based, same dose in adults & children)
OR
S: melarsoprol (IV) 2.2 mg/kg 24hourly for 10 days,
Reserved for fexinidazole/NECT failures. Requires hospitalization due to high risk of encephalopathic reaction

Trypanosoma brucei rhodesiense: Stage 1
S: suramin (IV): Test dose: 100–200mg 24hourly, then: 20 mg/kg IV on days 1, 3, 7, 14, and 21 (Maximum 1 g per dose)

- Same dosing for adults and children
- Renal function monitoring required.

Trypanosoma brucei rhodesiense: Stage 2:
S: Melarsoprol (IV) 2.2 mg/kg 24hourly for 10 days,
Follow-Up
Patients require follow-up for 18–24 months (CSF analysis every 6 months) to confirm cure, as relapses can occur).

4.3.2. Leishmaniasis

Leishmaniasis is a parasitic disease caused by protozoans of the genus Leishmania, transmitted primarily by the bite of infected female phlebotomine sandflies. It presents in three main forms cutaneous, mucocutaneous, and visceral.

- Visceral leishmaniasis (VL), also known as kala-azar, is fatal if left untreated in over 95% of cases. It is characterized by irregular bouts of fever, weight loss, enlargement of the spleen and liver, and anaemia. Most cases occur in Brazil, east Africa and India.
- Cutaneous leishmaniasis (CL) is the most common form and causes skin lesions, mainly ulcers, on exposed parts of the body. These can leave life-long scars and cause serious disability or stigma. About 95% of CL cases occur in the Americas, the Mediterranean basin, the Middle East and central Asia. Mucocutaneous leishmaniasis (MCL) leads to partial or total destruction of mucous membranes of the nose, mouth and throat. Over 90% of mucocutaneous leishmaniasis cases occur in Bolivia, Brazil, Ethiopia and Peru.

Case Definitions

Suspected Case:

- CL: Presence of characteristic skin lesions in a person from an endemic area, persisting for weeks to months, with or without a history of sandfly exposure.
- MCL: Mucosal lesions (nasal, oral, or pharyngeal) with or without a history of CL, in an endemic area.
- VL: Prolonged fever (>2 weeks), weight loss, and splenomegaly in a person from an endemic area or with travel history to such areas.

Probable Case: Suspected case with epidemiological link (e.g., travel to endemic area) and positive serology (e.g., rK39 rapid test for VL) or suggestive histopathology.

Confirmed Case:

- CL/MCL: Demonstration of Leishmania parasites in tissue samples (e.g., skin biopsy, smear, or culture) or positive PCR.
- VL: Parasites identified in bone marrow, spleen, or lymph node aspirates, or positive PCR or serology (e.g., direct agglutination test, rK39) in the presence of clinical signs.
- PKDL: Clinical signs with parasitological or molecular confirmation, often in a patient with a history of VL.

Pharmacological Management

The treatment of leishmaniasis depends on several factors including type of disease, concomitant pathologies, parasite species and geographic location. Leishmaniasis is a treatable and curable disease, which requires an immunocompetent system because medicines will not get rid of the parasite from the body, thus the risk of relapse if immunosuppression occurs. All patients diagnosed with visceral leishmaniasis require prompt and complete treatment.

Visceral leishmaniasis caused by L. donovani in East Africa

S: liposomal amphotericin B(IV):3–5mg/kg 24hourly by infusion given over 6–10days to a maximum 30 mg/kg

OR

S: amphotericin B deoxycholate (IV):0.75–1mg/kg 24hourly by infusion, or on alternate days, for 15–20doses

Post-kala-azar dermal leishmaniasis in East Africa

S: liposomal amphotericin B: 2.5mg/kg 24hourly by infusion for 20 days, when indicated

Recommended treatment regimens for cutaneous leishmaniasis, Local therapy, all species

S: paromomycin 15% topical ointment apply 12 hourly (BD) to the lesion(s) for 20 days.

AND

S: methylbenzethonium chloride 12% ointment apply 12 hourly (BD) to the lesion(s) for 20 days.

AND/OR

S: thermotherapy Localized heat therapy (50 °C for 30 seconds) — 1–3 sessions (spaced as needed).

AND/OR

S: sodium stibogluconate injection 100 mg/mL (intralesional). Inject directly into the lesion until complete blanching is achieved; repeat once weekly for 3–6 weeks or until clinical healing occurs.

OR

S: meglumine antimoniate infiltrate 1–5 ml per session into the base and edges of each lesion every 3–7 days for a total of 1–5 infiltrations. (Inject until the lesion blanches; volume depends on lesion size.)

Systemic depending on the confirmed species the following treatment can be executed:
S: miltefosine (PO): 2.5 mg/kg 24hourly for 28days
OR
S: amphotericin B deoxycholate (IV): 0.7mg/kg 24hourly, by infusion, for 25–30 days
OR
S: liposomal amphotericin B(IV): 2–3mg/kg 24hourly, by infusion, up to 20–40 mg/kg total dose
(For patients who cannot tolerate Amphotericin B deoxycholate)

Relapse treatment:
S: amphotericin B deoxycholate (IV), as above
OR
S: liposomal amphotericin B(IV): 3 mg/kg per day, by infusion, up to 20–40 mg/kg total dose may be considered

Recommended treatment regimens for mucocutaneous leishmaniasis All species
S: amphotericin B deoxycholate (IV): 0.7–1mg/kg by infusion every other day up to 25–45doses
OR
S: liposomal Amphotericin B(IV): 2–3 mg/kg daily by infusion up to a total dose of 40–60 mg/kg

Complications
- Treat anemia, malnutrition, and secondary infections.
- Monitor for toxicity (e.g., nephrotoxicity with amphotericin, hepatotoxicity with antimonial).

Special Populations:
- Pregnancy: Avoid miltefosine (teratogenic); liposomal amphotericin B is preferred.
- HIV Co-infection: Requires higher doses and longer treatment (e.g., liposomal amphotericin B, 40 mg/kg total dose). Secondary prophylaxis may be needed to prevent relapse.
- Children: Adjust doses by weight; liposomal amphotericin B is safe and preferred.

4.3.3. Snake Bites

A snakebite can be life-threatening if the snake is venomous. Less than 10% of 3500 snake species are venomous and they include different species of Cobras, Mambas and Adders which are endemic in Tanzania. Clinical Presentation of a snakebite varies depending on the type of envenomation a snake causes. The severity of the symptoms depends on the amount of venom the snake injects into the victim. Some snakebites (10-30%) can be considered as dry bites where no venom is injected. As a late appearance if symptoms after a snakebite is possible up to 24 hours a close monitoring needs to be conducted in this time frame.
Types of Envenomation are:
- Neurotoxic Envenomation: in non-spitting cobras, mambas and sea snakes
- Hemotoxic Envenomation: in vipers, boomslang and Vine Snake
- Cytotoxic Envenomation: in Puffadder, Gaboon Adder, Night Adder, Stiletto Snake and Spitting Cobras
- Mixed Cytotoxic and Hemotoxic Envenomation: in Spitting Cobras and Puff Adder

A snakebite should be considered in any patient, presenting with severe pain or swelling of a limb or in any unexplained illness presenting with bleeding or abnormal neurological signs. Some cobras spit venom into the eyes of victims causing pain and inflammation.

Table 4.4 Most common venomous snake species in Tanzania, cause of envenomation

Neurotoxic Envenomation	Cytotoxic Envenomation	Hemotoxic Envenomation
Black Mamba (*Dendroaspis polylepis)*	Puff Adder (*Bitis arietans)*	Boomslang (*Dispholidus typus*)
Green Mamba (*Dendroaspis angusticeps*)	Gaboon Adder (*Bitis gabonica*)	Eastern Vine Snake *Thelotornis spp.)*
Jameson's Mamba (*Dendroaspis jemesoni)*	Common Night Adder (*Caus. rhombeatus)*	
Egyptian Cobra (*Naja haje*)	Rhino-horned Viper (*Bitis nasicornis*)	
	Mozambique Spitting Cobra (*Naja mossambica*)	
	Ashe's Spitting Cobra (*Naja ashei*)	
	Red Spitting Cobra (*Naja pallida*)	
	Black-necked Spitting Cobra (*Naja nigricollis*)	
	Stilleto Snake (*Atractaspis spp*.)	

Clinical Presentation

Table 4.5 Clinical Presentation & Severity of a snakebite

Level of envenomation	Presentation
No envenomation	"Dry bite" without local or systemic reaction, +/- fang marks
Mild envenomation	Fang marks (+), mild local reaction, no systemic reaction
Moderate Envenomation	Fang marks (+), moderate local reaction + systemic reaction, non-life- threatening
Severe Envenomation	Fang marks (+), moderate – severe local reaction, severe systemic life-threatening reaction

Neurotoxic Envenomation: Progressive Weakness

- Severe Envenomation: profuse sweating, excessive salivation and > 2 other neurological signs from the 5P and 5S (Pain, Paresthesia, Ptosis, Pupillary abnormalities, Descending Paralysis; Swallowing difficulties, Slurred Speech, Sweating, abnormal Secretion and abnormal Salivation)
- Life Threatening Envenomation: Shortness of breath due to weakness; Inability to swallow saliva, generalized severe weakness, Bradycardia < 50 bpm; Apnea, Hypotension and Fasciculations, Bulbar paralysis.

Hemotoxic Envenomation:

- Severe Envenomation: Unstoppable bleeding from fang marks / bite marks, Bleeding from older wounds, Dizziness, Fainting
- Life Threatening Envenomation: Systemic Bleeding, bruising of more than one limb, abnormal WBC20 Test, Increasing Anemia, Laboratory evidence of clotting abnormality, Shock, black urine.

Cytotoxic Envenomation:

- Severe Envenomation: Swelling Extending 10cm or more per hour; Swelling reaches wrist or ankle within one hour; Swelling reaches knee or elbow within 4 hours; Increasing swelling in the face, throat or genitals.
- Life Threatening Envenomation: Swelling Exceeding 15cm or more per hour; Progressive Swelling of a whole limb within 8 hours; Unexplained shortness of breath, Abnormal WBC20 Test, Compartment Syndrome.

Investigation:

- No specific investigations
- Mandatory for every snakebite: Assessment with detailed patients' history
- The whole blood clotting test after 20 minutes (WBC20 Test).
- Enzyme linked immunosorbent assay (ELISA)

Supportive Investigations

- Vital signs: Including RR, BP, HR, GCS, ECG
- Electrocardiogram (ECG): ST-Depression, Bradycardia, AV-Block can be observed. Monitor for real cardiac ischemia due to stress.
- Hemogram: Presence of neutrophilic leukocytosis signifies the systemic presence of an envenomation.
  Thrombocytopenia may be present in viper envenomation.
- Kidney Function Tests: Serum Creatinine and Urine Output monitoring
- Muscle Destruction: Serum Amylase and CK & CK-MB should be monitored.
- Prothrombin Time, (PT), activated partial thromboplastin time (aPTT) and INR. Prolonged time in hemotoxic bites.
- Arterial blood gas analysis for all patients with systemic or respiratory symptoms.
- Urine examination: Can reveal hematuria, kidney injury proteinuria, myoglobinuria or hemoglobinuria.

Non-Pharmacological Management

- Reassure the patient and try to calm the patient down.
- Immobilize the extremity where the patient was bitten to reduce the spread and absorption of venom, Use a Splint or Pressure Immobilization Bandage.
- Elevate the bitten limb if there is a moderate-severe swelling.
- Clean the bite site with sterile swabs and do a wound dressing. Respect that dressing should never delay treatment with Polyvalent Snake Antivenom.
- Every snakebite is a medical emergency unless you can certainly identify a harmless snake. Every snakebite should be assessed in a hospital.
- Supportive Treatments may be required and include intubation & ventilation in neurotoxic snakebite patients, wound debridement in cytotoxic snakebite patients and blood transfusion in hemotoxic snakebite cases.

Symptoms might last for days and require permanent monitoring.

- Do endotracheal intubation +/- elective tracheotomy if respiratory distress due to weakness occurs.
- Monitor the patient closely for a minimum time of 24 hours after the snakebite. Symptoms can appear late, and envenomation can progress rapidly.

Surgical Intervention:

- Dead tissue should be removed from the wound.
- If there are signs of compartment syndrome a surgical intervention is required. Incisions to relieve pressure in the limb might be required.
- Skin grafting, if there is an extensive necrosis present.
- Tracheotomy if paralysis of muscles involved in swallowing occurs.

Pharmacological Management
Fluid resuscitation for patients in shock

A: sodium chloride 0.9% (IV) 10-20ml/kg. Repeat the dose after 30 minutes if shock is still present. Use Vasopressors if the shock is persistent. Keep monitoring the Fluid intake and output.

If criteria of Polyvalent Snake Antivenom administration are present (see table 4.6 below), give Antivenom.

A: snake venom antiserum are potent polyvalent immunoglobulins prepared to control venom of poisonous snakes) using indications shown below. Polyvalent means, that the Antivenom is effective against envenomation from various snake species Antivenom preparation.

Dilute antivenom in 500 mls of 0.9% Sodium Chloride (Normal saline) and give intravenously in a slow continuous infusion. over 20-40 minutes and monitor closely for anaphylaxis or other serious adverse reactions.

Table 4.6: Clinical Criteria of Polyvalent Snake Antivenom Administration

Envenomation	Presentation
Cytotoxic	Oedema > Grade I, increasing swelling > 5cm per hour, swelling in the Face or Neck endangering the airway, Swelling in the genitals; Extremity: Swelling reaches wrist or ankle within 1 hour, knee or elbow within four hours or shoulder, groin, torso within 8 hours.
Hemotoxic	Positive WBC20-Test, Increasing Anemia, Bleeding from older wounds, Laboratory confirmed evidence of coagulopathy
Neurotoxic	Inability to swallow saliva; Progressive Weakness causing loss of consciousness or respiratory distress; > 2 of the following symptoms: Profuse sweating, increasing salivation, Paresthesia, Ptosis, Pain, Pupillary abnormalities, Paralysis, Slurred speech, abnormal secretion; Bradycardia; Apnea; Hypotension and Fasciculations
Mixed Hemotoxic & Cytotoxic	Positive WBC20-Test, Increasing Anemia, Bleeding from older wounds, Laboratory confirmed evidence of coagulopathy with signs of Cytotoxic envenomation.

If there is no improvement of the patient within 2 hours after the initial dose of Polyvalent Snake Antivenom give a repetitive dose of Polyvalent Snake Antivenom. Dosage depends on the grade of envenomation and severity of the symptoms.
For mild degree of envenomation give 5 vials (50 ml)
For moderate degree of envenomation give 5–10 vials (50–100 ml)
Fore severe degree of envenomation gives 10–20 vials (100–200 ml)

Note:

- Polyvalent snake antivenom should always be used as directed on the packing list. Effectiveness against certain species of snakes and the recommended dosage vary.
- Polyvalent Snake Antivenom should not be administered 48 hours after the snakebite. In some severe envenomation Polyvalent Snake Antivenom might be effective up to 72 hours after the bite.

Severe Snake Envenomation or Where Polyvalent Snake Antivenom is Unavailable

Clinical Indication	Management
Tetanus Prophylaxis	**A:** anti-tetanus prophylaxis according to national immunization and wound management guidelines.
Neurotoxic Envenomation (Cobra Bite)	**B:** neostigmine IV 1.5–2 mg initial dose, followed by 0.01 mg/kg every 30 minutes as clinically indicated **AND** **A:** atropine IV 0.6 mg initial dose, followed by 0.05 mg/kg every 30 minutes as clinically indicated.

Clinical Indication	Management
Neurotoxic Envenomation (Mamba Bite)	**A:** atropine IV 0.6 mg initial dose, followed by 0.05 mg/kg every 30 minutes as clinically indicated **AND** **A:** paracetamol 1 g PO/IV every 8 hours for 24 hours in adults **OR** **A:** paracetamol 15 mg/kg PO/IV every 8 hours for 24 hours in children.

For Mamba Bite

- A tourniquet or, preferably, a pressure immobilization bandage may be applied where appropriate and by trained personnel while arranging urgent transfer for definitive care.
- Continuous monitoring of respiratory function is essential.
- Provide ventilatory support if respiratory paralysis develops.

Note:

- These measures are adjunctive and do not replace administration of Polyvalent Snake Antivenom when indicated and available.
- Patients with neurotoxic envenomation should be managed in a facility capable of airway management and respiratory support.
- Frequent reassessment of neurological status, respiratory effort, and oxygen saturation is required.

Adverse reaction due to Polyvalent Snake Antivenom

In case of Polyvalent Snake Antivenom administration mild anaphylaxis can occur in around 20-30% of the cases and severe anaphylaxis can occur in around 5-10% of the cases. Other than that, serum sickness, a late reaction to the Polyvalent Snake Antivenom can occur 7-21 days after the administration. Anaphylaxis is treated with Epinephrine (adrenaline) (IM).

A: epinephrine (adrenaline) (IM) dose of 1:1000 (Repeat after 3-5 minutes if no improvement)

- Children < 6 years old: 150mcg IM (0,15ml)
- Children 6-12 years old: 300mcg IM (0,3ml)
- Children > 12 years old & Adults 500mcg IM (0,5ml)

AND

A: chlorpheniramine (PO) (be ready if allergic reaction occurs). Dosage as below

- Children under 6years: 4mg 8hourly as needed
- 6–12 years: 8mg 12hourly as needed.
- >12 years and older 12mg 12hourly as needed

Note:

- If itching/rash, restlessness, cough, respiratory distress or hypotension develops stop Polyvalent Snake Antivenom and give:
  A: epinephrine (adrenaline) (SC) 0.01 ml/kg of 1/1000 or 0.1 ml/kg of 1/10,000 solution
  AND
  A: chlorpheniramine (IM/ IV/SC) 250 micrograms/kg.
- When the patient is stable restart the Polyvalent Snake Antivenom infusion.
- Antivenom can be given every two hours until the patient's condition improves, or the progression of the symptoms has stopped.
- Blood transfusion may be required if HB drops < 7mg/dl.
- Serum sickness usually occurs within 7-21 days and is treated with Steroids.
- Response of abnormal neurological signs to antivenom is more variable and depends on type of venom.

4.3.3.1 Venom Ophthalmia

Spitting Cobras, like the Black-necked Spitting Cobra, the Ashe's Spitting Cobra and the Red Spitting Cobra can spit the venom into the eyes or onto the skin of a patient. Venom on intact skin can just be washed with water. Venom which was spilt into the eyes of a patient can cause severe complications including blindness.

Clinical Presentation

Symptoms of venom ophthalmia include: Photophobia, Burning, Watering, Redness, Extreme Pain, Blurred Vision or Blindness.

Non-Pharmacological Management

- The victim should be advised not to rub their eyes.
- Victim should be advised to wash the eyes with clean water.
- Ensure the venom doesn't enter the mouth of the victim.
- The victim should be instructed to open and close the eyes under water.
- Assess the patient under the slit lamp and check for corneal erosions.

Pharmacological Management

When Corneal Erosion is Present

Clinical Indication	Management
Prevention of Secondary Infection	**A:** chloramphenicol 1% eye ointment, apply 1–1.5 cm ribbon into affected eye(s) 3–4 times daily until healed and for an additional 48 hours **OR** **A:** oxytetracycline 1% eye ointment, apply 1–1.5 cm ribbon 2–4 times daily for 5–7 days **OR** **A:** erythromycin 0.5% eye ointment, apply 1–1.5 cm ribbon 4 times daily for 3–5 days
Pain and Photophobia	**S:** homatropine 2% eye drops, 1 drop twice daily for 2–3 days **OR** **D:** cyclopentolate 1% eye drops, 1 drop twice daily for 2–3 days
Systemic Analgesia	**A:** paracetamol 500 mg–1 g PO every 6–8 hours PRN (maximum 4 g/day) **OR** **A:** ibuprofen 400 mg PO every 8 hours PRN (if no contraindications)
Lubrication	**C:** hydroxypropyl methylcellulose 0.3% 1–2 drops as needed

When No Corneal Erosion is Present

Clinical Indication	Management
Prophylaxis and Symptom Relief	**A:** chloramphenicol 1% eye ointment, apply 1–1.5 cm ribbon 3–4 times daily for 48 hours **OR**
	A: oxytetracycline 1% eye ointment, apply 1–1.5 cm ribbon 2–4 times daily for 48 hours
Pain Relief (if required)	**A:** paracetamol 500 mg–1 g PO every 6–8 hours PRN
Lubrication	**C:** hydroxypropyl methylcellulose 0.3% 1–2 drops as needed

Note:

- No Polyvalent Snake Antivenom is required for venom ophthalmia.
- Venom ophthalmia is a form of envenoming which can present with visual symptoms only and can lead to blindness if left untreated.
- Encourage the patient not to rub the eye.
- Routine use of topical corticosteroids is **not recommended**.
- Routine eye patching is **not recommended**.
- Patients with persistent pain, visual impairment, corneal ulceration, or non-healing epithelial defects should be referred urgently for ophthalmological assessment.
- Re-examine patients daily when corneal erosion is present until epithelial healing is complete.

4.4 Lymphatic Filariasis

Lymphatic filariasis is a parasitic disease caused by thread-like filarial worms (*Wuchereria bancrofti*, *Brugia malayi*, and *Brugia timori*) transmitted through mosquito bites. The parasites lodge in the lymphatic system, causing damage that leads to abnormal enlargement of body parts and disability.

Clinical Presentation

- Acute episodes of fever with painful swelling of lymph nodes, typically in the groin or armpit
- Swelling of limbs (lymphoedema) or genitals (hydrocele in men, swelling of vulva in women)
- Chronic manifestations include elephantiasis (extreme swelling and thickening of skin), particularly affecting legs, arms, breasts, or genitalia
- Chyluria (passage of lymphatic fluid in urine, giving it a milky appearance)
- May be asymptomatic for years despite active infection

Case Definition

Suspected case: Any person presenting with chronic lymphoedema of limbs, hydrocele, or other signs of lymphatic obstruction in endemic areas.

Confirmed case: A suspected case with microfilariae detected in blood smear or positive circulating filarial antigen test.

Laboratory Investigation

- Specimen: Thick blood smear collected at night (10 PM - 2 AM when microfilariae are most abundant in peripheral blood)
- Diagnostic test: Microscopic examination of Giemsa-stained thick blood smear to detect microfilariae
- Rapid diagnostic test: Immunochromatographic test (ICT) for circulating filarial antigen detection (can be done any time of day)
- Alternative: PCR for detection of filarial DNA

Prevention

- Sleep under insecticide-treated bed nets (ITNs) to prevent mosquito bites
- Use mosquito repellents on exposed skin
- Eliminate mosquito breeding sites by clearing stagnant water around homes
- Participate in mass drug administration (MDA) programs when implemented in endemic areas
- Wear protective clothing (long sleeves and trousers) during peak mosquito biting times

Pharmacological Management

Mass Drug Administration (MDA) for endemic communities:

A: ivermectin (PO) 150-200 mcg/kg as a single dose

AND

A: albendazole (PO) 400mg as a single dose

Individual Treatment for confirmed cases:

Adults:

A: diethylcarbamazine (DEC) (PO) 6mg/kg 24hourly for 12days

OR

A: ivermectin (PO) 200 mcg/kg as a single dose, repeated every 6-12 months

AND

A: albendazole (PO) 400 mg as a single dose

Children:

A: diethylcarbamazine (PO) 6mg/kg 24hourly for 12 days

OR

A: ivermectin (PO) 150-200mcg/kg as a single dose

Note:
Diethylcarbamazine should not be used in areas co-endemic with Onchocerca volvulus (river blindness) due to risk of severe adverse reactions.
A: albendazole (PO) 400mg (for children >2 years) or 200mg (for children <2 years) as a single dose

Management of Chronic Complications for lymphoedema:

- Daily washing of affected limbs with soap and clean water
- Elevation of affected limbs when resting
- Exercise and movement to promote lymph flow
- Use of appropriate footwear to prevent injury and secondary infections
- Treat secondary bacterial and fungal infections promptly with antibiotics and antifungals

For hydrocele:

- Refer for surgical correction if severe or causing disability

Note: For all notifiable diseases public health control measures will be regularly provided and updated by the Ministry of Health in collaboration with local authorities and relevant stakeholders

CHAPTER FIVE

MALARIA

Malaria case definition

A malaria case is a person with malaria infection, confirmed by microscopy or mRDT, regardless of whether fever and other clinical symptoms are present.

5.1 Asymptomatic Malaria Case

Asymptomatic malaria case can be found during Active Case Detection (ACD) by health workers in the community and in households. Therefore, all patients with parasitemia are considered “malaria cases”, regardless of whether clinical symptoms are present or not.

5.2 Symptomatic Malaria Case

5.2.1 Uncomplicated Malaria

Uncomplicated malaria is defined as symptomatic malaria without signs of severity or evidence (clinical or laboratory) of vital organ dysfunction.

Clinical Presentation

Fever**,** Headache**,** Joint pains**,** Malaise**,** Vomiting, Diarrhoea, Body ache, body weakness, Poor appetite, Pallor, enlarged spleen

Investigations

The recommended investigations are: Quality malaria microscopy or quality malaria Rapid Diagnostic Tests (mRDT)

Note

- It is compulsory to test and confirm all suspected malaria patients. Give antimalarial only to those who test positive.
- In cases where non-response to malaria treatment (treatment failure) is suspected in patients who initially tested positive, microscopy is the recommended laboratory procedure as mRDTs are not recommended because parasite antigens persist up to 4 weeks after parasitaemia has cleared.

Non-Pharmacological Management

- Continue with feeding and fluid intake
- Followed up immediately if the condition worsens or on the fourth day if symptoms persist.

Pharmacological Management

Drug of choice for treatment of uncomplicated malaria is:

A: artemether + lumefantrine (PO) 20mg+120mg

Common fixed dose (FDC) formulations of Artemether +Lumefantrine (ALU):

- Artemether 20mg+Lumefantrine120mg; 6, 12, 18 and 24 tablets blister
- Artemether 80mg+Lumefantrine 480mg; 6 tablets blister

Dispersible tablets: Fixed formulation for children

A: artemether 20mg + Lumefantrine120mg; 6 tablets blister

Table 5.1: Dosage regimen for ALU (artemether 20mg/lumefantrine 120mg)

Weight (Kg)		**Day 1**		**Day 2**		**Day 3**	
	Dose	1st	2nd	3rd	4th	5th	6th
	Hours	0(*)	8	24	36	48	60
	Age (years)	Tablets	Tablets	Tablets	Tablets	Tablets	Tablets
Up to 15 kg	**0-3**	1	1	1	1	1	1
15 – 25 kg	**3-8**	2	2	2	2	2	2
25 – 35 kg	**8-12**	3	3	3	3	3	3
35kg and above	**12 and above**	4	4	4	4	4	4
(*) 0 hours means the time of starting medication							

Table 5.2: The recommended dosing schedule for ALU strength 80/480 mg

Weight (Kg)		Day 1		Day 2		Day 3	
	Dose	1st	2nd	3rd	4th	5th	6th
	Hours	0(*)	8	24	36	48	60
	Age (years)	Tablets	Tablets	Tablets	Tablets	Tablets	Tablets
35kg and above	**12 and above**	1	1	1	1	1	1
(*) 0 hours means the time of starting medication							

OR

B: artesunate + amodiaquine (ASAQ) Fixed dose combination (PO)

Artesunate-Amodiaquine (ASAQ) is a another first-line medicine of choice for the treatment of uncomplicated malaria. Its therapeutic efficacy, remains above 90% (evaluated at Day 28, with PCR correction, following WHO standard protocol.

Common fixed dose formulations of Artesunate +Amodiaquine (ASAQ)

- Artesunate 25mg+Amodiaquine 67.5mg,
- Artesunate 50mg+Amodiaquine 135mg,
- Artesunate 100mg+ Amodiaquine 270 mg,

Separate tablets: containing 50 mg of Artesunate and 135 mg base of Amodiaquine.

Dosage regimen

A target dose artesunate: 4mg/kg/day and 10 mg/kg/day Amodiaquine once a day for 3 days (see Table 5.3).

Table 5.3: The recommended dosing schedule for Artesunate-Amodiaquine

Body weight ranges (Kg)	Age ranges	Co-blistered 50mg Artesunate (AS) and 135mg Amodiaquine (AQ) Number of tablets per dose per day for 3 days	Fixed dose combination artesunate / amodiaquine Formulation strength	Number of tablets per Dose/day(For 3 days)
≥4.5kg to<9 kg	**2 to 11 months**	½ tablet of AS and ½ tablet of AQ	25mg artesunate and 67.5mg amodiaquine	1 tablet
≥9kg to <18kg	**1 to 5 years**	1 tablet of AS and 1 tablet of AQ	50mg artesunate and 135mg amodiaquine	1 tablet
≥18kg to <36kg	**6 to 13 years)**	2 tablets of AS and 2 tablets of AQ	100mg artesunate and 270mg amodiaquine	1 tablet
≥ 36kg	**(14 years and above)**	4tablets of AS and 4 tablets of AQ	100mg artesunate and 270mg amodiaquine	2 tablets

The alternative medicines for the treatment of uncomplicated malaria (where there is no response to ALU and ASAQ or whenever they are contraindicated) is a fixed dose formulation of Dihydroartemisinin-Piperaquine.

C: dihydroartemisinin + piperaquine (PO).

- Adult formulation each tablet contains 40mg Dihydroartemisinin+320mg Piperaquine.
- Paediatrics formulation each tablet contains Dihydroartemisinin 20mg+Piperaquine 160mg

Table 5.4: Dose Schedule for Dihydroartemisinin + Piperaquine

Body Weight (Kg)	Daily Dose (mg)		Tablet strength	Number of tablets per dose/day (for 3 days)
	dihydroartemisinin	piperaquine		
5 to < 8	20	160	20/160mg	1 tablet
8 to < 11	30	240	20/160mg	1 1/2 tablet
11 to < 17	40	320	40/320mg	1 tablet
17 to < 25	60	480	40/320mg	1 1/2 tablet
25 to < 36	80	640	40/320mg	2 tablets
36 to < 60	120	960	40/320mg	3 tablets
60 to < 80	160	1280	40/320mg	4 tablets
> 80	200	1600	40/320mg	5 tablets

Treatment of Malaria using ACT plus Primaquine.
To reduce transmissibility of treated malaria infection in a very low transmission area. A single low dose of 0.25mg/kg primaquine with ACT is given to malaria patients.

The addition of a low single dose of Primaquine (0.25mg/kg maximum of 15mg in adults) to ACTs should be given to all eligible patients because it affects the transmissibility of mature gametocytes of P. falciparum by minimizing further transmission of the disease.

Formulation: Primaquine is available in the formulation of tablets 7.5 mg and 15 mg.
Dosage:

A: primaquine single 0.25mg/kg/dose (Table 5.5) should be given to all qualified patients with parasitological confirmed malaria
Indications
Primaquine should be given on the first day of treatment in addition to an ACT, preferably under Directly Observed Therapy **(DOT).**

Contraindications
Not recommended in pregnant women, women in the first 6 months of breastfeeding and children less than 6 months of age.

Adverse Events
Haemolytic Anemia, especially in G6PD individuals, is the major adverse event reported. Although, single low dose of Primaquine is considered to be safe.

Table 5.5: Dosage of Primaquine single dose (0.25mg/kg)

Weight (Kg)	Age(Months/ Years)	Single dosage tablet	
		7.5mg	15mg
	< 6 months	Contraindicated	-
≤ 10 kg	6 <12 months (Infants)	¼ tablet	-
10-20 kg	1-6 years (Young Children)	½ tablet	-
21-40 kg	7-13 years (Children)	1 tablet	½ tablet
>40 Kgs	Adults 14 years and above	2 tablets	1 tablet

5.2.2: Malaria Chemoprevention medicine in Elimination Area.

Intermittent preventive treatment of malaria in pregnancy (IPTp) with Sulfadoxine +Pyrimethamine (SP) is recommended for all pregnant women (except in very low transmission areas) in councils according to the malaria risk stratification and engaged in Malaria Case Based Surveillance (mCBS).

The Medicine of choice for IPTp is SP. It is recommended at each scheduled antenatal care visit. The first IPTp-SP dose should be administered as early as possible during the 2nd trimester of pregnancy and repeated at four weekly intervals until the time of delivery

5.2.3: Chemoprophylaxis options for special risk groups

The term chemoprophylaxis is used to describe the administration of an antimalarial drug or drug combination in such a way that blood levels are maintained above the inhibitory level of survival of the local strains of parasite for the whole of the period at risk and, in the case of travelers, for an appropriate period afterwards in order to kill emerging liver forms. The recommended medicines are atovaquone-proguanil, doxycycline, and mefloquine.

Table 5.6: Medicines indicated for chemoprophylaxis

Medicine	Indications	Adult	Paediatric	Pregnancy	Start	Finish
C: mefloquine	Non-immune stay <3months	250mg weekly	5mg/kg weekly	Yes	4 weeks before	4 weeks after
C: atovaquone + proguanil	Up to 28 days	1 tablet daily	See table 5.7	Contraindicated	1-2 days before	1week after
A: doxycycline	Up to 6 months	100mg daily	>12 years	Contraindicated	1week before	4weeks after

Table 5.7: Atovaquone/Proguanil prophylaxis dose for Children

Weight (Kg)	Atovaquone/Proguanil total daily dose	Atovaquone/Proguanil tablet strength	
		62.5mg/25mg (Paediatric tablet)	250mg/100mg (Adult tablet)
11-20kg	62.5mg/25mg	1 tablet	-
21-30kg	125mg/50mg	2 tablets	-
31-40kg	187.5mg/75mg	3 tablets	-
>40 Kg	250mg/100mg	-	1 tablet

5.2.4: Malaria chemoprophylaxis in sickle cell disease

Sickle cell disease (SCD) is an inherited condition where the sickle cell gene responsible for the production of abnormal haemoglobin S is inherited from both parents.
In areas where malaria is common, SCD patients have low risk or malaria infection. However, when they do get malaria, it is associated with high risk of morbidity and mortality.

It is recommended to give routine malaria prevention medicines (chemoprophylaxis) to individuals with SCD in areas where malaria is endemic. This helps to reduce SCD crises and all other related complications.
The recommended chemoprophylaxis in Tanzania is:
C: atovaquone + proguanil: daily administration according to body weight
OR
C: dihydroartemisinin + piperaquine (FDC) (PO): monthly administration according to body weight

Due to available safe and effective pharmacological action every SCD patient who require protection must receive a suitable chemoprevention treatment.

Management of fever
Patients with high fever (38.50C and above) should be given appropriate dose of anti-pyretic medicine like paracetamol or acetylsalicylic acid(aspirin) 6-8hourly (maximum 4doses in 24hours) until symptoms resolve, usually after 2-3days.

Table 5.8: Treatment Schedule for Paracetamol (500mg) Tablets Children 10-15mg/kg body weight

Age (years)	Weight range (Kg)	Dose
2 months up to 3 years	4-14 kg	¼
3-5 years	14-19 kg	½
5-12 years	19-35 kg	1
12-14 years	35-45 kg	1½
14 years and above	45 kg and above	2

Note:
Children below 12 years should NOT be given acetylsalicylic acid (Aspirin) because of the risk of developing Reye's syndrome.

5.2.5 Severe Malaria

In a patient with P. falciparum asexual parasitaemia and no other obvious cause of symptoms the presence of one or more of features listed below classify the patient as suffering from severe malaria.

Clinical Presentation

- Prostration/extreme weakness
- Impaired consciousness
- Change of behavior
- Convulsions
- Respiratory distress (due to lactic acidosis and/or pulmonary oedema)
- Jaundice
- Circulatory collapse/shock
- Vomiting everything
- Inability to drink or breast feed
- Bleeding tendency/DIC

Investigations

In severe malaria, blood slide (BS) is a recommended malaria test as it quantifies parasitemia. In severe ill patients receiving injectable antimalarial, serial BS investigations monitors level of parasitemia to verify malaria recovery, or if clinical condition is not improving to rule out another serious condition.

- Blood film for malaria parasites
- Blood glucose estimation in patients with altered consciousness
- Haematocrit and/or haemoglobin estimation
- Lumbar puncture to exclude meningitis (if facilities for LP assessment are available)
- Serum creatinine or urea– to assess Kidney function
- Electrolytes– for early detection of acute renal failure
- Full blood cell count and differential white cell count for additional diagnosis of other infectious diseases
- Blood gases, pH and anion gap– to diagnose acidosis
- Radiological investigation: Chest X–ray; look for pulmonary oedema or lobar consolidation
- Blood culture and sensitivity where feasible

Non-Pharmacological Management

A rapid assessment must be conducted including airway, breathing, circulation, coma, convulsion, and dehydration status.

Referral: If effective management of severe malaria and supportive care for complications is not possible, patients should be given pre-referral treatment and referred immediately to an appropriate facility for continued treatment.

Pharmacological Management

A: artesunate (IV/IM) 2.4 mg/kg in body weight on admission (time =0hour), then at 12hours and 24 hours for a minimum of 3doses in 24 hours regardless of patient's recovery.

Children weighing less than 20 kg: 3mg/kg/dose (or higher). at 0, 12 and 24 hours

Complete artesunate injection treatment by giving a complete course (3days) of artemether-lumefantrine (ALU) or other ACT. Consider broad spectrum antibiotic in case of septicemia.

Administration and dosage (30 mg, 60mg and 120mg strength): Injectable artesunate has 2-steps dilutions.

Step 1: The powder for injection should be diluted with 1ml of sodium bicarbonate 5% solution (provided in each box) and shaken vigorously 2–3 minutes for better dissolving until the solution becomes clear.

Step 2: For slow intravenous infusion (3–4minutes), add 5ml of dextrose 5% or Sodium chloride 0.9%, to obtain artesunate concentration of 10mg/ml. For deep intra–muscular injection, add 2ml of dextrose 5% or Sodium chloride 0.9% to obtain artesunate concentration of 20 mg/ml.

Table 5.9: Dilution of Artesunate for Injection

Route	IV injection			IM injection		
Strength	**30 mg**	**60 mg**	**120 mg**	**30 mg**	**60 mg**	**120 mg**
Sodium bicarbonate 5%	0.5	1	2	0.5	1	2
Sodium chloride 0.9% /dextrose 5%	2.5	5	10	1	2	4
Total (ml)	3	6	12	1.5	3	6
Artesunate concentration (mg/ml)	10	10	10	20	20	20

Table 5.10: Dosage Schedule for Artesunate Injection

Weight	Dose	ml per dose strength 60mg		Vials of Artesunate 60mg needed**
Kg	**mg/kg**	**IV**	**IM***	
		10 mg/ml	**20 mg/ml**	
<5	3.0	1.5	1	1
5 - 8	3.0	2	1	1
9 - 12	3.0	4	2	1
13 - 16	3.0	5	3	1
17 - 20	3.0	6	3	1
21 - 25	2.4	6	3	1
26 - 29	2.4	7	4	2
30 - 33	2.4	8	4	2
34 - 37	2.4	9	5	2
38 - 41	2.4	10	5	2
42 - 45	2.4	11	6	2
46 - 50	2.4	12	6	2
51 - 54	2.4	13	7	3

Weight	Dose	ml per dose strength 60mg		Vials of Artesunate 60mg needed**
Kg	mg/kg	IV	IM*	
		10 mg/ml	20 mg/ml	
55 - 58	2.4	14	7	3
59 - 62	2.4	15	8	3
63 - 66	2.4	16	8	3
67 - 70	2.4	17	9	3
71 - 75	2.4	18	9	3
76 - 79	2.4	19	10	4
80 - 83	2.4	20	10	4
84 - 87	2.4	21	11	4
88 - 91	2.4	22	11	4
92 - 95	2.4	23	12	4
96 - 100	2.4	24	12	4

*Half the dose is rounded up to 1ml; **Full vial (s) might not be required for a given weight band. The left–over solution must be discarded within 1hr of preparation and must not be reused.

If the patient can tolerate oral medication after 24 hours provide a full treatment course of ALU/Other ACT. Initiate the first dose of ALU/other ACT 8hours after the last injection.

Alternative

A: artemether (IM) 3.2mg/kg loading dose stat (0hour) then 1.6mg/kg (24hours and 48hours).

Injectable Artemether is to be used when Artesunate is contraindicated (in case of allergy, medicine interaction or non-response) or when Artesunate is not available.

Table 5.11: Dosage Schedule for Artemether intramuscular Injection

Weight (Kg)	Loading dose			Second and Subsequent doses		
	Hours	Dose	Strength	Hours	Dose	Strength
	0 hour	3.2 mg/Kg	80mg/ml	24,48	1.6mg/kg	80mg/ml
		mg	ml		mg	ml
<5		16	0.2		8	0.1
5 - 8		26	0.3		13	0.2
9 - 12		38	0.5		19	0.2
13 - 16		51	0.6		26	0.3
17 - 20		64	0.8		32	0.4
21 - 25		80	1.0		40	0.5
26 - 29		93	1.2		46	0.6
30 - 33		106	1.3		53	0.7
34 - 37		118	1.5		59	0.7
38 - 41		131	1.6		66	0.8
42 - 45		144	1.8		72	0.9
>45		160	2.0		80	1.0

If the patient can tolerate oral medication after 24 hours provide a full treatment course of ALU. Initiate the first dose of ALU 8hours after the last injection.

Management of complications

To reduce the unacceptably high mortality of severe malaria, patients require intensive care. Clinical observations should be made as frequently as possible. Airway maintenance, nurse on side, fanning if hyperpyrexia is present, fluid balance review:

Coma (cerebral malaria): maintain airway, nurse on side, and exclude other causes of coma (e.g. hypoglycemia, bacterial meningitis); avoid giving corticosteroids.

Dehydration: Correct dehydration appropriately

Hyperpyrexia: fanning, paracetamol if patient can swallow

Convulsions: maintain airways;

Adult

A: diazepam (IV) 0.15mg/ kg (maximum 10 mg) slow bolus IV injection.

Children

C: diazepam (rectal) 0.5–1.0 mg/ kg1.

If convulsions persist after 10 minutes repeat rectal diazepam treatment as above. Should convulsions continue despite a second dose, give a further dose of rectal diazepam

OR

A: phenobarbitone (IM/IV) 20 mg/ kg after another 10 minutes.
Hypoglycemia: remains a major problem in the management of severe malaria especially in young children and pregnant women. It should be deliberately looked for and treated accordingly. Urgent and repeated blood glucose screening.
In children:
B: dextrose 10% (IV) 5 ml/kg
OR
B: dextrose 25% (IV) 2.5ml/kg as bolus;
If 50%dextrose solution is available, it should be diluted to make 25% by adding an equal volume of water for injection or normal saline.
In adults:
B: dextrose 10% (IV) 125ml
OR
B: dextrose 25% (IV) 50ml as bolus.
Where dextrose is not available, sugar-water solution should be prepared by mixing 20g of sugar (4–level teaspoons) with 200ml of clean water. 50ml of this solution is given ORALLY or by nasogastric tube if semiconscious/unconscious.

Severe anaemia: Refer to haematology **chapter 3**
Acute pulmonary oedema: Refer to respiratory diseases conditions **chapter 9**
Acute renal failure: Refer to cardiovascular disease condition **chapter 20**
Shock: Refer to emergency and critical care **chapter 1**

5.3 Management of Malaria in Special Groups

5.3.1 Malaria in Pregnancy

The effects of malaria in pregnancy are related to the malaria endemicity, with abortion more common in areas of low endemicity and intrauterine growth retardation more common in areas of high endemicity.

5.3.1.1 Uncomplicated Malaria in Pregnancy

In high-transmission areas (moderate to high immunity); malaria is usually asymptomatic in pregnancy or is associated with only mild, non-specific symptoms. (See section 5.1 above)

Pharmacological Management
Artemether/Lumefantrine (ALU) is the recommended treatment of choice of a confirmed uncomplicated malaria to pregnant women in all trimesters. See table 5.1 above

5.3.1.2 Severe Malaria in Pregnancy

In low-transmission areas (low malaria immunity); women in the second and third trimesters of pregnancy are more likely to develop severe malaria than other adults, often complicated by pulmonary oedema and hypoglycaemia.

Clinical Presentation

- Pulmonary oedema
- High fever
- Hyper parasitemia
- Low blood sugar
- Haemolytic anaemia
- Cerebral malaria

Pharmacological Management
A: Artesunate is the drug of choice for treatment of severe malaria in all trimesters. Refer table 5.10 for dosage

5.3.1.3 Intermittent Preventive Treatment in Pregnancy (IPTp)

Malaria parasites can easily accumulate and multiply in the placenta leading to placenta malaria infections, resulting to complications such as maternal anaemia, low birth weight, premature delivery, congenital infection and/or perinatal death.

The medicine of choice for IPTp
A: sulfadoxine + pyrimethamine (PO) 500mg +25mg as a fixed dose combination

- The dose is 3 tablets once
- A minimum of 3 doses in entire pregnancy period
- The first dose should be administered from 14 weeks of pregnancy onwards
- Each dose should be given at least 4 weeks apart
- The last dose can be administered up to the time of delivery, without safety concerns

5.3.2 Management of Malaria in Neonates

Neonatal malaria is defined as symptoms attributable to malaria with evidence of ring forms of malaria parasite in the blood of an infant within the first twenty-eight days (4 weeks) of life. Congenital malaria is defined as symptoms attributable to malaria with evidence of ring forms of malaria parasite in the blood of an infant within the first seven days (1 week) of life. The signs and symptoms resemble those seen in the new-born with septicemia

Clinical Presentation

- Fever
- Lethargy
- Unable to breastfeed
- Vomiting
- Irritability
- Respiratory distress
- Seizures
- Jaundice
- Pallor
- Hepatosplenomegaly
- Laboratory findings will include the presence of malaria parasites.

Investigations

- Full blood picture
- blood sugar
- blood culture and sensitivity, blood smear for malaria parasite, serum electrolytes
- CSF for analysis

Management of neonatal malaria

Neonatal malaria should always be considered as severe malaria**.** Neonates with suspected malaria should be admitted to hospital immediately as they can deteriorate quickly and die at home

Pharmacological Management

A: artesunate (IV/IM) is recommended treatment of choice for neonates.

OR

A: artemether (IM) can be used as an alternative if Artesunate is not available

See table 5.10 and table 5.11 above for dosage

Broad spectrum antibiotic as majority of severe malaria accompanied with septicemia. Refer septicemia treatment section.

Nursing care and monitoring

- Monitor vital signs (PR, RR & Temperature)
- Monitor input/output
- Check BS for malaria parasite daily
- Ensure feeding
- Advise on use of Long-lasting insecticidal nets(LLINs)

5.3.3 Management of Malaria in HIV and AIDS Patients

If malaria is diagnosed, depending on classification of the malaria diagnosis, a full treatment with antimalarial should be given according to the malaria classification.

However, it should be noted that, clearance of parasitaemia may not necessarily be accompanied by clearance of symptoms (fever) due to the presence of other underlying opportunistic infections. HIV and AIDS infected adults with low CD4 cell counts may be more susceptible to treatment failure of anti-malaria drugs.

Note:
In suspected cerebral malaria in a HIV and AIDS patient, cerebrospinal fluid (CSF) examination to rule out other life-threatening conditions such as bacterial and cryptococcal meningitis

CHAPTER SIX

MANAGEMENT OF HIV AND AIDS

HIV is an RNA retrovirus which enters and multiplies in the host cells in a multistep process. In Tanzania HIV infection is mainly caused by HIV-1, dominated by sub-types, A, C, D, and their recombinants. Clinical features are usually due to immune system suppression.

Clinical Presentation

Fever, diarrhoea, weight loss, skin rashes, sores, generalized pruritis, altered mental status, persistent severe headache, oral thrush or Kaposi's sarcoma may be found in patients with advanced disease, Opportunistic infections e.g., tuberculosis, candidiasis or pyogenic infections, Advanced HIV Disease

6.1 Management of Adult and Adolescent Living with HIV with Antiretroviral Therapy

- All individuals confirmed to have HIV infection are eligible for ART, regardless of CD4 count, WHO clinical stage, or any other criteria, provided that the individual is willing and ready to initiate ART and adhere to follow-up visits.
- ART should be initiated within 7days (same-day initiation), except when there is an increased risk of IRIS. RoC with advanced HIV disease should be closely screened for opportunistic infections (OIs) and may need ART initiation delay to prevent life threatening immune reconstitution inflammatory syndrome (IRIS).
- Goal of Combination antiretroviral therapy is to achieve; Undetectable viral load(<50copies/ml), restoration and/or preservation of immunologic function by attainment of CD4 recovery to normal thresholds ≥500 cells/mm³, reduction of HIV-related morbidity and mortality, improvement of survival and quality of life and prevention of new HIV infection (Undetectable=Untransmissible).

Initiating ART for Adult and Adolescent 15 years and above

ART should be initiated (to all adult and adolescents who are HIV infected) by qualified Health Care Providers in both facility and community settings after a comprehensive medical history and physical examination, irrespective of CD4 count and WHO clinical staging.

Table 6.1 : Baseline Laboratory tests for Adolescent and adults at ART initiation

Laboratory test	Rationale
CD4 count	Categorization of RoC into Early and Late Presenters To determine eligibility for AHD package of care To determine severity of immune deficiency To determine Eligibility for CPT and CrAg screening
Serum creatinine	To determine kidney dysfunction by eGFR*
Liver enzyme markers (ALAT, ASAT)	To determine liver dysfunction
HBsAg	To determine co-infection with HBV
Haemoglobin (Hb)	To rule out anaemia
Random Blood Glucose	To rule out diabetes mellitus

Table 6.2: Conditions that require delay of Antiretroviral Therapy Initiation

Opportunistic Infection	Immunological Status	Action
TB Meningitis	Any CD4 cell count	• Initiate ART within 4weeks of starting TB treatment, when the client's symptoms are improving, and TB treatment is tolerated. • Corticosteroids should be given for 4 weeks as adjuvant treatment for TB meningitis
Pulmonary TB and Extra pulmonary TB other than TB Meningitis	Any CD4 cell count	• Initiate ART within 2weeks of starting TB treatment, when the client's symptoms are improving, and TB treatment is tolerated
Cryptococcal Infection (CI)	CD4<200 cells/mm3	• Initiate ART 2weeks after completion of induction phase of Pre-emptive Fluconazole treatment
Cryptococcal Meningitis (CM)	CD4<200 cells/mm3	• Initiate ART 5weeks following initiation of treatment for Cryptococcal Meningitis (beginning of 4th week of consolidation phase)
Pneumocystis Jirovecii Pneumonia	Any CD4 count	• Do not delay ART initiation

6.1.1 First-Line Regimens for Adults and Adolescents

Table 6.3 Recommended First-Line Regimens for Adults and Adolescents

Recipient of care group	Default 1st line Regimen	Alternative Regimen
Adults and adolescents (≥15years), Pregnant and Lactating mothers, HIV and HBV co-infection ≥30kg	**A:** TDF/3TC /DTG (TLD)	**A:** ABC/3TC+ DTG *TDF/3TC/EFV (TLE400) Special situation **TDF/FTC + LPV/r
Elderly (≥ 50years), RoC with CKD, co-morbidities (DM, HTN) with increased risk of renal dysfunction & post-menopausal women	**A:** TAF/(3TC or FTC) + DTG	**A:** ABC/3TC+ DTG
HIV and TB co-infections	**A:** TDF/3TC/DTG (Double dosage of DTG)	**A:** TDF/3TC/EFV (TLE400)
		A: ABC/3TC+ DTG (Double dosage of DTG)
People who Inject Drugs (PWID)	**A:** TDF + 3TC +DTG	**A:** ABC/3TC+ DTG **A:** TAF/(3TC or FTC) + DTG **A:** TDF/FTC +ATV/r

Note:

- *TDF/3TC/EFV (TLE400) should only be used in cases of DTG intolerance because NNRTI based transmitted drug resistance is reported to be ≥10% in East Africa which is above the recommended threshold for using NNRTIs.
- **LPV/r should be used in the first line if DTG can't be used due to intolerance and when there is resistance to EFV
- TAF is contraindicated in TB/HIV co-infection as Rifampicin lowers TAF concentration below the therapeutic level.
- TAF use in pregnancy is currently not recommended due to limited data on its safety.
- For recipients of care with weight <30kg, avoid TDF and use ABC based regimen.
- Consider PI based ARV if unable to use DTG and EFV
- DTG does not interact with methadone; therefore, it is a suitable drug for regimens in PWID. Initiate treatment after the Recipient of Care (RoC) has been stabilized, usually 2-3months after starting MAT.
- Administer DTG50mg twice a day for RoC on Rifampicin based regimen to reach DTG therapeutic levels.
- ARV drugs have the potential to decrease the bioavailability of hormonal contraceptives especially with oral contraceptives. Dual contraception with condoms and injectable contraceptives is therefore recommended.

6.1.2 Prevention of vertical transmission of HIV, Syphilis and Hepatitis B

The PMTCT program aims to eliminate vertical transmission of HIV, Syphilis, and Hepatitis B by using effective interventions such as antenatal screening, treatment, and vaccination. The risks of vertical transmission without intervention are significant, and multiple risk factors increase the chance of a mother transmitting HIV, Syphilis and Hepatitis B virus to her child. The goal is to achieve aMTCT rate of less than 4% for HIV, less than 50cases of congenital syphilis per 100,000 live births, and less than 0.1% prevalence of HBsAg among children.

Four elements of a comprehensive approach

1. Primary prevention of HIV, Syphilis and HBV infections among women of childbearing age and their partners
2. Prevention of unintended pregnancies amongst women living with HIV and HBV and linkage with other Sexual Reproductive Health services including STIs
3. Prevention of vertical transmission of HIV, Syphilis and HBV from infected women to their infants
4. Provision of treatment, care and support to women infected with HIV, Syphilis and HBV and their partners, infants, and families.

6.1.3 HIV, Syphilis and Hepatitis B Testing and Counselling for Pregnant and Breast-feeding women

All pregnant women and their partners should be counselled and tested for HIV (unless known to be HIV positive), Syphilis and Hepatitis B during their first ANC visit. If a client is diagnosed positive for any of the diseases i.e., HIV or Syphilis or Hepatitis B manage the client accordingly.

High risk exposed infants: these are the infants with increased risk of transmission, it includes infants whose mother is one of the following:

- Diagnosed with HIV during pregnancy or breastfeeding period
- Known to be living with HIV but not on ART
- Started on ART with less than four weeks before delivery.
- On ART with high viral load (≥50copies per ml of blood)

Low risk exposed infants: these are the infants whose mothers are already on ART and have achieved viral load of <50copies/ml (obtained at least 4weeks apart or within 4weeks prior to delivery)

Low risk status can change to high risk and vice versa upon availability of HVL test results. For ARV prophylaxis and the management of HIV exposed infants refer to Chapter IV on immediate post-delivery care.

Care for HIV-exposed infants

- Prophylaxis for Low-risk HIV Exposed Infants: Administer NVP syrup immediately after birth (preferably within 72hours) and continue until 6weeks of age.
- Nevirapine prophylaxis should not be initiated for infants presenting after 4weeks of age.

Table 6.4 Nevirapine Dosing as Prophylaxis for Low-risk HIV Exposed Infants

Infant NVP dosing recommendations from Birth to 6-weeks	
Birth	**A: NVP daily dosing**
Birth weight <2000g	2mg/kg 24 hourly as starting dose (0.2ml/kg)
Birth weight 2000–2499g	10mg 24 hourly (1ml)
Birth weight ≥2500g	15mg 24 hourly (1.5ml)

Prophylaxis for High-Risk HIV Exposed Infants

In case a high-risk HIV exposed infant is identified, give enhanced postnatal prophylaxis (ePNP) for a total of 12 weeks as shown below.

Table 6.5: Enhanced postnatal prophylaxis (ePNP) for high-risk HEI

Recommended Regimen	Infant Age	Dosage
A: AZT/3TC+NVP	Dose 0-6 weeks	**A:** AZT / 3TC (60/30mg); ¼ tab 12 hourly and NVP syrup 24 hourly (based on body weight).
	Dose 6-12 weeks NVP	**A:** NVP-24 hourly (based on body weight)

6.1.4 Care for Syphilis-exposed infants

All infants born to mothers with Syphilis infection should:

- Carefully be assessed for manifestations of congenital syphilis.
- Ensure proper treatment to infants diagnosed with congenital syphilis (Refer section 5.8.2.1 for management of Congenital Syphilis in National Guideline for Management of HIV, STIs and Hepatitis)

6.1.5 Care for Hepatitis B-exposed infants

All infants born to mothers with HBV infection should receive.

- A birth dose of HBV monovalent vaccine within 24hours post delivery
- If available, a single dose of 100 IU HBIG intramuscularly should be given together with HBV vaccine birth dose. This should be given to all exposed infants born to mothers with high Hepatitis B DNA viral load (More than 200,000 IU/ML) preferably within 12 hours.'
- Subsequent 3doses of HBV vaccine during immunization schedule at 6, 10 and 14weeks of age
- Verify if:
    - Mother with high HBV DNA viral load (>200,000IU/ml) is on Tenofovir prophylaxis.
    - Mother with HIV/HBV coinfection is on Tenofovir based regimen.

6.1.6 Cotrimoxazole Preventive therapy

All HIV-exposed infants should begin cotrimoxazole Preventive Therapy (PT) at the age of six weeks until the end of HIV exposure. Cotrimoxazole should continue up to seven days after being confirmed HIV negative.

Table 6.6: Infant sulfamethoxazole + trimethoprim (Cotrimoxazole) (240mg/5ml) syrup PT Dosing recommendations

Age	Sulfamethoxazole + Trimethoprim syrup dose
6 weeks-6months	2.5mls once a day (120mg)
6 months-end of exposure	5mls once a day (240mg)

6.1.7 Maternal HIV Care and Treatment

PBFW living with HIV should be started on lifelong ART at the time of diagnosis. The recommended first line regimen is once a day fixed dose regimen of Tenofovir disoproxil fumarate (TDF) +Lamivudine (3TC) + Dolutegravir (DTG). Alternatively, Tenofovir disoproxil fumarate (TDF) +Lamivudine (3TC) + Efavirenz (EFV400mg) may be an option for use on events of or DTG side effects and adverse events.
Before ART initiation, health care provider should discuss health benefits of lifelong ART, including ART impact in preventing mother to child transmission of HIV. A client should understand and comprehend all possible side effects of ARVs. For clients on 2nd and 3rd line ART regimens should continue with their current regimens.

Table 6.7 Maternal HIV Care and Treatment

Pregnant and Lactating women	1st line therapy	2nd line therapy
Preferred Option	**A:** TDF + 3TC+ DTG	If TDF was used as first line, use ABC plus 3TC plus ATV/r or LPV/r
Alternative Options	**A:** ABC + 3TC + DTG TDF+3TC+EFV (400mg)	If TDF was used as first line, use ABC plus 3TC plus ATV/r or LPV/r If ABC was used as first line, use TDF plus 3TC plus ATV/r or LPV/r If TLE was used as first line, use ABC plus 3TC plus DTG

Note:

- Tenofovir alafenamide **(**TAF) is currently not recommended in pregnancy due to unknown safety profile.
- It is recommended that all women on DTG should routinely receive high dose Folic acid (5mg) pre-conception and during pregnancy. Clients with DTG intolerance such as severe liver diseases should not be given DTG containing regimens

Whenever possible all women on ART should receive routine LFT and RFT as per guideline on monitoring of individuals on ART

6.1.8 Second-line ART in Adults and Adolescents

A combination of a Protease Inhibitor (PI) and at least one new NRTI not previously used in first-line therapy are recommended for second-line treatment for adults and adolescents PLHIV aged 15 and above, as shown in Table 6.3. Lamivudine (3TC) or Emtricitabine (FTC) should be continued in subsequent regimens as it lowers viral fitness and increases susceptibility to AZT.

Table 6.8 Recommended Second-Line Regimens for Adults and Adolescents

Population	Preferred 2nd line regimen	Alternative 2nd line regimen
Adults, adolescents (>15 years), Pregnant women / breastfeeding mothers and PWID	**A:** AZT/3TC+ATV/r	**A:** AZT/3TC+LPV/r
HIV and TB co-infection	**A:** AZT/3TC+ LPV/r* *Double dose of LPV/r to 800/200 mg	

Note:

- Addition of DTG to failing PI based 2nd line regimen is not recommended because the client is considered to be on DTG monotherapy leading to development of DTG resistance, which compromises DTG efficacy and its future use
- Delayed diagnosis of treatment failure results in accumulation of resistance associated mutations (RAMs). Some of these RAMs compromise efficacy of drugs with similar resistance patterns for future use such as cross resistance between Abacavir (ABC) and TDF, and Atazanavir (ATV) and Darunavir (DRV). HCP should therefore exercise early detection and manage treatment failure.
- RoC who received a PI-based regimen as their first line of treatment can be switched to a DTG-based regimen as a potential option for their second line of treatment.

6.1.9 Third-line Antiretroviral Therapy

RoC failing second line may have substantial NRTI and NNRTI-associated resistance mutations (RAMs), limiting their usage in the third line regimen. Third-line regimens should include at least two, preferably three, effective drugs, constructed using second-generation formulations of preceding antiretrovirals with low or no cross-resistance. These second-generation drugs have a greater genetic barrier to resistance, and their efficacy is rarely jeopardized by RAMs associated with first-generation formulations.

Third line ARVs recommended regimens include:

- Integrase Strand Transfer Inhibitors (INSTIs): Dolutegravir (DTG) and Raltegravir (RAL)
- Second generation PI: Boosted Darunavir (DRV/r)
- Susceptible NRTI after Genotypic Antiretroviral Resistance Testing and
- Recycled Lamivudine or Emtricitabine regardless of presence and level of RAMs selected by these ARVs

Table 6.9 Recommended Third-Line Regimens for Adults and Adolescents

Population	Preferred 3rd line regimen	Alternative 3rd line regimen
Adults, adolescents (>15 years), and Pregnant women / breastfeeding mothers and PWID	**A:** DRV/r + DTG + 3TC or FTC+1NRTIs (Based on genotypic antiretroviral resistance testing results)	**A:** DRV/r + DTG /3TC+1 NRTI (Based on genotypic resistance results) 2 NRTIs + DTG e.g.: TDF/3TC/DTG
HIV and TB co-infection	**A:** LPV/r + DTG +3TC or FTC +1NRTI (Based on genotypic antiretroviral resistance testing results) *Double dose of LPV/r to 800/200mg	**A:** LPV/r + RAL + 3TC or FTC +1NRTIs (Based on genotypic resistance results) *Double dose of LPV/r to 800/200mg 2NRTIs + DTG e.g.: TDF/3TC/DTG (Double dose of DTG)

Note:

- For TB and HIV co-infected RoC on LPV/r should be switched back to DRV/r after completion of TB treatment
- For second- and third-line regimens which are non TDF/TAF based, in case of new Hepatitis B co-infection TDF/TAF should be added to the new regimen as treatment of Hepatitis B. If single tab TDF/TAF is not available, a fixed dose combination of TDF/FTC or TAF/FTC can be used

6.1.10 Changing Antiretroviral Therapy

There are multiple reasons that may prompt the need to change antiretroviral therapy. These can be grouped into two major categories:

- ARV specific adverse events (toxicity)
- Treatment failure

When changing treatment due to toxicity, Change or substitute only the ARV suspected to be causing the toxicity on the other hand If changing due to treatment failure, the following should be observed;

- It is never recommended to switch to monotherapy
- Change at least two ARVs, preferably change all three ARVs (Do NOT retain the backbone)
- When making ARV selection, opt for drugs that haven't been previously used and don't have cross-resistance, overlapping toxicities, or drug-drug interactions
- Lamivudine has the advantage of reducing HIV viral fitness and increasing susceptibility to AZT and therefore should be retained when changing the failing regimen

6.1.11 Changing ART due to Treatment Failure

Treatment failure can have categorized due to

- Virological failure
- Immunological failure
- Clinical failure

Table 6.10; WHO definitions of treatment failure in chronological order of occurrence: virological, immunological and clinical failure for the decision to switch ART regimens

Failure	Definition	Comments
Virological	Plasma viral load above 1000 copies/ ml with a log drop <0.5 based on two consecutive viral load measurements after 3months, with adherence support	An individual must be taking ART for at least six months before it can be determined that a regimen has failed.
Immunological	CD4 count at 250cells/mm3 with stage 3 or 4 WHO clinical condition. OR CD4 count consistently below 100cells/mm3	Without concomitant or recent infection or steroid use to cause a transient decline in the CD4 cell count
Clinical	New or recurrent clinical event indicating severe immunodeficiency (WHO clinical stage 4 conditions) after 6 months of effective treatment.	The condition must be differentiated from IRIS

Note:

- Virologic blip is an isolated detectable transient rise in viral load after attaining virologic suppression, followed by a return to virologic suppression. It is not due to treatment failure and should not raise any concern.
- Treatment failure should be distinguished from IRIS which is a paradoxical reaction which occurs in RoC starting or restarting ART with advanced disease. In IRIS there is clinical deterioration while on ART but improving CD4 count.

6.1.12 Switching to Second-Line ART

Switching to second-line ART should be considered for all recipients of care (RoC) on first-line ART who meet the following criteria:

- Unsuppressed viral load (≥1,000 copies/ml) after three or more successful Enhanced Adherence Counseling (EAC) sessions, as per the established algorithm. Before switching, recipients must demonstrate good adherence (>95%).
- Routine Genotypic Antiretroviral Resistance Testing (GART) is not required when switching from a first-line to a second-line antiretroviral regimen, as it does not significantly improve HIV viral re-suppression rates.

6.1.13 Switching to Third-Line ART Regimens

Before confirming virological failure of a second-line regimen, a Multidisciplinary Team (MDT) must convene to:

- Rule out other causes of high viremia, including suboptimal adherence.
- Plan for Enhanced Adherence Counseling (EAC) and provide necessary support to address adherence barriers.

If adherence barriers are fully resolved, viral re-suppression may occur, avoiding an unnecessary switch to a third-line regimen.

Criteria for Switching to a Third-Line Regimen

When the decision to switch to a third-line regimen is made: Genotypic Antiretroviral Resistance Testing (GART) should be performed to:

- Rule out cross-resistance between first- and second-generation ARVs.
- Confirm drug resistance as the cause of treatment failure.
- Inform the selection of an effective third-line regimen, including the potential
- Recycling of drugs from previous regimens.

A comprehensive evaluation must be conducted to determine the cause of treatment failure, including:

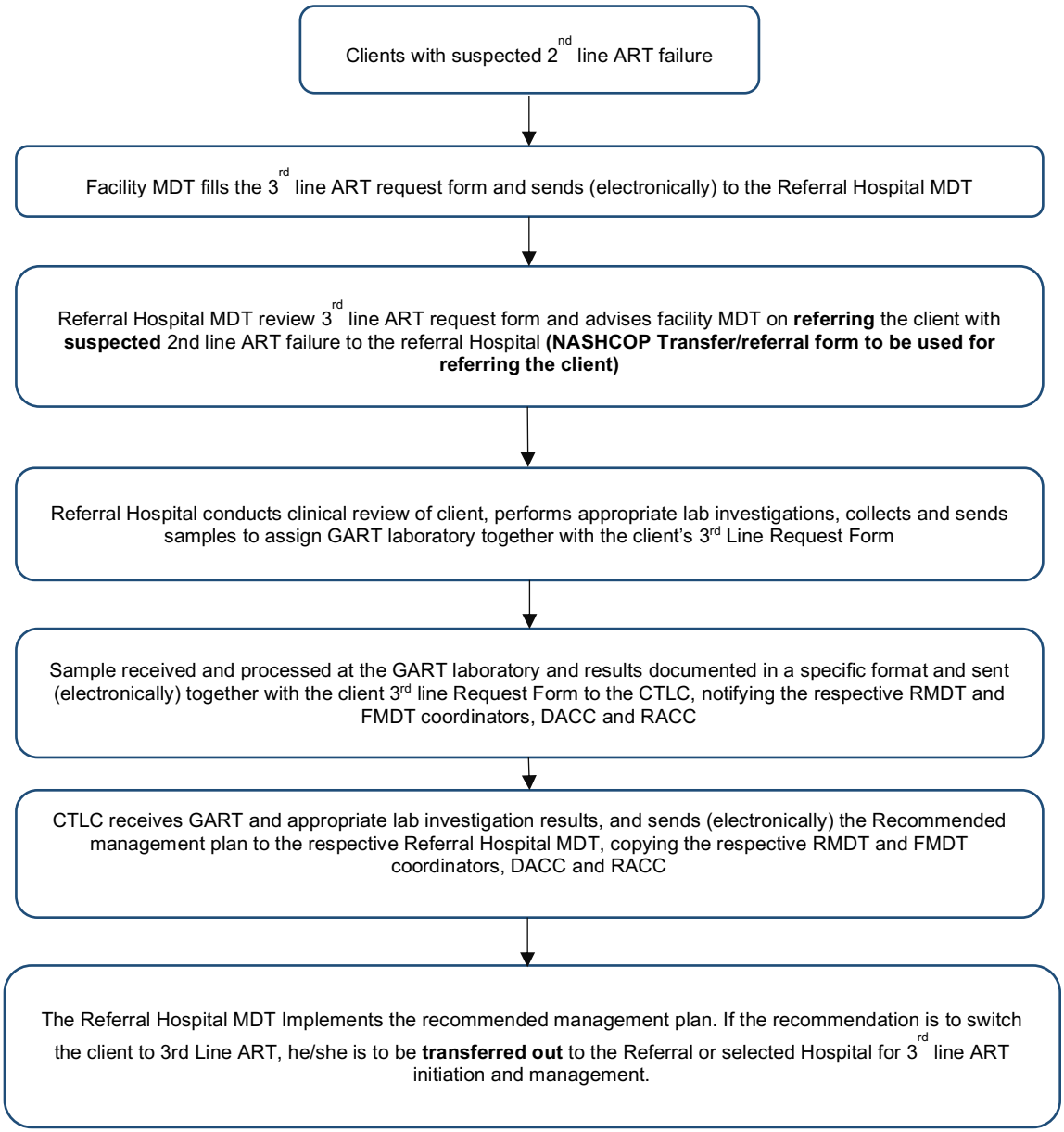
- Assessing and optimizing adherence.
- Ruling out drug interactions and adverse effects.

If treatment failure is confirmed, a new regimen should be initiated, consisting of at least two effective antiretroviral drugs. The Central Third Line Committee (CTLC): will review GART results and provide third-line regimen recommendations to the respective health facilities.

Requirements for Switching RoC to Third-Line ART

- RoC must be failing second-line ART.
- RoC must have completed EAC sessions and demonstrate good adherence.
- There must be documented virological failure (VL ≥1,000 copies/ml) post-EAC.

Figure 6.1 Process flow for Third line ART Initiation



Note: GART is recommended for RoCs on a second line regimen for more than 2 years with Persistent Low-Level Viremia (>500copies/ml) and good adherence.

Table 6.11: Types of toxicities associated with first, second-line and third-line ARV drugs

ARV	Major types of toxicity	Risk factors	Suggested management
TDF	Tubular renal dysfunction, Fanconi syndrome	• Underlying renal disease • Older age • BMI<18.5 or body weight <50kg) • Untreated diabetes mellitus • Untreated hypertension • Concomitant use of nephrotoxic drugs or a boosted PI	• If TDF is being used in first-line ART, substitute it with ABC or TAF in special circumstances (see the section on using TAF in first line ART) • Do not initiate TDF at an estimated glomerular filtration rate of <50mL/min, uncontrolled hypertension, untreated diabetes or kidney failure • If TDF is being used in second-line ART, substitute it with AZT or ABC.
	Decreases in bone mineral density	• History of osteomalacia and pathological fracture • Risk factors for osteoporosis or bone loss	
	Lactic acidosis or severe hepatomegaly with steatosis	• Prolonged exposure to nucleoside analogues • Obesity • Liver disease	
	Exacerbation of hepatitis B (hepatic flares)	Discontinuation of TDF due to toxicity	No available alternative drug in the country for treatment of hepatitis B (e.g. Entecavir)
ABC	Hypersensitivity reaction	Genetic predisposition (HLA-B 5701 gene)	If ABC is being used in first or second-line ART, substitute with TDF or AZT
TAF	Dyslipidaemia Body weight gain	Female sex Concomitant use of DTG	Monitor body weight and promote anti-obesity measures (such as diet, physical exercise). If significant increase despite measures, consider substituting EFV or boosted PI
AZT	Anaemia, neutropoenia,	• Baseline anaemia or Neutropoenia • CD4 cell count ≤200 cells/mm^3	If AZT is being substitute with TDF or ABC consider using low dose AZT
	Lactic acidosis or severe hepatomegaly with steatosis Lipoatrophy, lipodystrophy Myopathy	• BMI >25 (or bodyweight >75 kg) • Prolonged exposure to nucleoside analogues	Substitute TDF or ABC

ARV	Major types of toxicity	Risk factors	Suggested management
EFV	Persistent central nervous system toxicity (such as dizziness, insomnia and abnormal dreams) or mental symptoms (anxiety, depression and mental confusion)	• Depression or other mental disorder (previous or at baseline) • Daytime dosing	For central nervous system symptoms, dosing at bedtime. Consider using EFV at a lower dose (400 mg/day or an integrase inhibitor (DTG) if EFV 400 mg is not effective in reducing symptoms.
	Convulsions	History of seizure	
	Hepatotoxicity	• Underlying hepatic disease • Coinfection with hepatitis B/C • Concomitant use of hepatotoxic drugs	For severe hepatotoxicity on hypersensitivity reactions, substitute with another therapeutic class (integrase inhibitors or boosted PIs).
	Severe skin and hypersensitivity reactions	Risk factors unknown	
	Gynaecomastia	Risk factors unknown	Substitute with another therapeutic class (integrase inhibitors or boosted PIs).
NVP	Hepatotoxicity	• Underlying hepatic disease • Coinfection with hepatitis B or C • Concomitant use of hepatotoxic drugs • High baseline CD4 cell count(CD4 count >250 cells/mm3 for women or >400 cells/mm3 for men)	• If hepatotoxicity is mild, consider substituting with EFV, including for children three years and older. • For severe hepatotoxicity and hypersensitivity, and for children younger than three years, substitute with another therapeutic class (integrase inhibitors or boosted PIs).
	Severe skin rash and Hypersensitivity reaction, including Stevens- Johnson syndrome		
LPV/r	Hepatotoxicity	• Underlying hepatic disease • HBV and HCV co- infection • Concomitant use of hepatotoxic drugs	Replace it with ATV/r
	Pancreatitis	Advanced HIV disease	
	Electrocardiographic abnormalities (PR and QRS interval prolongation, torsades de pointes	People with pre-existing conduction system disease Concomitant use of other drugs that may prolong the PR or QRS intervals Congenital long QT syndrome Hypokalaemia	Use with caution for people with pre-existing conduction disease or taking concomitant drugs that may prolong the PR or QRS intervals
	Lipoatrophy or metabolic syndrome dyslipidaemia	Cardiovascular risk factors such as obesity and diabetes	Substitute another therapeutic class (INSTIs)
	severe diarrhoea and risk of prematurity	Risk factor is unknown	Substitute with atazanavir/r, darunavir/r or INSTIs

ARV	Major types of toxicity	Risk factors	Suggested management
ATV/r	Indirect hyper bilirubinaemia (clinical jaundice)	• Underlying hepatic disease • HBV and HCV co- infection • Concomitant use of hepatotoxic drugs • Presence of UDP glucuronoglysyl transferase 1-1 (UGT1A1) enzyme (UGT1A1*28 gene)	• Indirect hyperbilirubinemia is usually transient and ATV/r can be continued, however, if severe jaundice develops and is associated with significantly raised transaminases, then ATV/r should be replaced with LPV/r • This phenomenon is clinically benign but potentially stigmatizing. Substitute only if adherence is compromised.
	Nephrolithiasis and risk of prematurity	History of Nephrolithiasis	Replace it with LPV/r or DR/r. If boosted PIs are contraindicated and NNRTIs have failed in first line ART, consider substituting INSTIs
	Electrocardiographic abnormalities (PR and QRS interval prolongation	People with pre-existing conduction system disease Concomitant use of other drugs that may prolong the PR or QRS intervals Congenital long QT syndrome	Use with caution for people with pre-existing conduction disease or who are taking concomitant drugs that may prolong the PR or QRS intervals
DTG	Increase in cholesterol levels; mild elevated liver enzymes; significant rises in creatinine levels; and headache may also be experienced	History of dyslipidaemia, diabetes, hypertension	• Monitor cholesterol levels; monitor Liver function especially in HBV and HCV. • Provide symptomatic treatment
	Insomnia Body weight gain or obesity	Older than 60 years Low CD4 or high viral load Female African ethnicity Concomitant use of TAF	Consider morning dose or substitute EFV, boosted PI or RAL Monitor body weight and promote anti-obesity measures (such as diet and physical exercise). If significant increase despite measures, consider substituting EFV or boosted PI
	Hepatotoxicity Hypersensitivity reaction	Coinfection with hepatitis B or C Liver disease	Substitute another therapeutic class: EFV or boosted PIs
ETR	Common: Skin rash, allergic reactions, Nausea, increased low density Lipids, Gastrointestinal disorders and Fatigue Rare: Severe skin rash, Peripheral neuropathy and renal failure	No known risk factors	• Monitor severity and occurrence of fever and other symptoms. • Provide symptomatic treatment

ARV	Major types of toxicity	Risk factors	Suggested management
RAL	Increased Cholesterol levels, Glucose, Aspartate Amino Transferase (AST), Bilirubin. Rash, Cough, Fatigue, dizziness and insomnia	History of dyslipidaemia, diabetes, hypertension	In case of severe adverse effects, switch to DTG if RoC is >12 years old
	Rhabdomyolysis, myopathy and myalgia	Concomitant use of other drugs that increase the risk of myopathy and rhabdomyolysis, including statin.	Stop ART. When symptoms are resolved, substitute another therapeutic class (NNRTIs, boosted PIs)
	Hepatitis and hepatic failure Severe skin rash and hypersensitivity reaction	Risk factor(s) unknown	
DRV/r	Increased Cholesterol levels, triglycerides; Diarrhoea, Headache, Rash, Abdominal pain and Nausea	History of dyslipidaemia	• Monitor severity and occurrence of fever and other symptoms. • Provide symptomatic treatment
	Hepatotoxicity	Underlying hepatic disease Coinfection with hepatitis B or C and cconcomitant use of hepatotoxic drug	Substitute with ATV/r or LPV/r. When it is used in third-line ART, limited options are available for hypersensitivity reactions, substitute another therapeutic class.
	Severe skin and hypersensitivity reactions	Sulphonamide allergy	

6.2 Monitoring Patients on Antiretroviral Therapy

Monitoring of patients on ART is based on clinical and laboratory parameters. Refer table 6.12

Table 6.12 Clinical and laboratory monitoring of patients on first line drug regimen

Monitoring Tests	Frequency	Rationale
HVL (All Recipients of care)	• Refer to HVL algorithm	ART monitoring
CD4 (All Recipients of Care)	• At Baseline (All) • After every six months till CD4 count is above 350 cells/mm^3 • Suspected treatment failure • Development of AHD	ART monitoring
FBP/Hb (All Recipients of Care)	• At Baseline,	Hb monitoring
	If a RoC has Hb,8.5g/dl • At one month, thereafter • Every Six months	Avoid AZT if Hb<8.5g/dl
Serum Creatinine (for Recipients of Care on TDF or TAF)	• At Baseline, after every 6months and whenever symptomatic	Screening for early renal toxicity
ALT (For recipient of cares on DTG)	• At Baseline, one month, after every 6months and whenever symptomatic	Screening for early Liver toxicity
Cholesterol and RBG	• At 6months then yearly	Identify/detect TAF, DTG or PI adverse effects
Bilirubin (for all Recipients of Care on ATV/r	• At 6months • Whenever symptomatic	Indirect hyperbilirubinemia
Urinalysis (proteinuria, glycosuria)	• Every 6months	Monitor Renal dysfunction

Note:
- Frequent laboratory tests will be determined by clinical evaluation.
- The frequency of CD4 and viral load monitoring may be less than six months when IRIS or treatment failure is suspected.

Laboratory monitoring of patients on second line drugs
The following laboratory tests are recommended for Monitoring of patients on second line drugs:
- FBC, baseline, then monthly for 3months, then after every 6months (with CD4 and viral load)
- Fasting cholesterol and triglyceride, baseline, 6months and thereafter every 12months
- Liver function tests, (ALT) 6monthly
- Fasting glucose, every 12months
- Urinalysis at baseline and after every 3months
- Serum creatinine at baseline and once a year.

When changing treatment, the following should be observed:
- Never change a single drug in the combination if the reason for changing is treatment failure. Change at least two drugs, preferably change all three drugs
- If changing due to toxicity, change only the drug suspected to be causing the problem.
- Never change to monotherapy (i.e. single drug)
- When selecting drugs, choose drugs that have not been used before, drugs which do not have cross-resistance/or no overlapping toxicities or drug-drug interactions.
- Lamivudine has advantage of decreasing viral fitness therefore it may be retained when changing the failing regimen

6.3 Immune Reconstitution Inflammatory Syndrome (IRIS)

IRIS is a phenomenon associated with the occurrence or worsening of opportunistic infections/malignancies which can occur early after initiation of ART or at later (several months) during ART. There is an increased risk for occurrence of IRIS in the following situations:
- Treatment naïve patients
- Patients with advanced HIV disease with CD4 cell count <50cells/mm3
- Patients with undiagnosed and untreated opportunistic conditions
- Patients who have been introduced on ART before or shortly after initiation of treatment of opportunistic infection/malignancy
- In the advent of DTG use, there is increased likelihood for IRIS because of rapid HIV viral load suppression.

Note: Any OI, malignancy and autoimmune diseases may present as IRIS

Diagnostic Criteria:
The criteria for making a diagnosis of IRIS are delineated below

Major criteria
A typical presentation of "opportunistic infections or tumors" in patients responding to anti- retroviral therapy (ART) includes:
- Localized disease e.g., lymph nodes, liver, spleen
- Exaggerated inflammatory reaction e.g., severe fever, with exclusion of other causes of painful lesions
- Atypical inflammatory response in affected tissues e.g., granulomas, suppuration, necrosis, perivascular lymphocytic inflammatory cell infiltrate
- Progression of organ dysfunction or enlargement of pre-existing lesions after definite, clinical improvement with pathogen specific therapy prior to commencement of ART and exclusion of treatment toxicity and new diagnoses
- Development or enlargement of cerebral space occupying lesions after treatment for cerebral cryptococcus or toxoplasmosis
- Progressive pneumonitis or the development of organizing pneumonia after treatment of pulmonary-TB or PCP
- New onset or worsening of uveitis/vitritis after resolution of CMV retinitis
- Fever and cytopenia after treatment for disseminated Mycobacterium avium complex disease
- Enlargement of Kaposi's sarcoma lesions and subsequent resolution or partial regression without
- Commencement of radiotherapy, systemic chemotherapy or intralesional therapy

Decrease in plasma HIV-RNA level by > 1 log base ten copies/ml (1 log drop = 9/10 of Baseline VL copies). This applies in settings where baseline VL is performed.
Minor criteria
- Increased blood CD4+ cell count after initiation of ART
- Increase in immune response specific to the relevant pathogen e.g. delayed type hypersensitivity to mycobacterial antigens (PPD conversion)
- Spontaneous resolution of disease without specific antimicrobial therapy or tumour chemotherapy with continuation of anti-retroviral therapy.

Non- Pharmacological Management

Mild to moderate forms:

- Reassure the patient and do not stop ART
- Provide specific treatment for the opportunistic infections/malignancies or other diseases

Severe life-threatening IRIS

- Reassure the patient and Stop ART temporarily
- Provide other appropriate supportive measures such as management of fever, oxygen therapy, i.e., fluids

Pharmacological Management

A: prednisolone (PO) 1mg/kg (maximum 80mg daily) for 4weeks then taper down the dose.

Note: When using high dose steroids, it is important to rule out Strogyloides stecolaris infection to avoid disseminated strongyloidiasis.

Restart ART when the patient stabilizes.

6.4 Antiretroviral Therapy in Children and Adolescents Living with HIV

The goals of ART:

- Maximally and durably suppress plasma HIV RNA (to <50 copies/ml)
- Restore and preserve immunologic function.
- Reduce HIV-associated morbidity and prolong the duration and quality of survival.
- Prevent HIV transmission.

ART in children has been proven to increase survival and decrease HIV-related morbidity and mortality. Children should be started on ART as soon they are diagnosed including those who are presumably diagnosed.

Table 6.13 When to start ART in Children Under 15 Years

Age	When you start
Children 0-15years	Treat all of them regardless of WHO clinical stage or CD4 cell count
Children below 18months old who qualify for presumptive diagnosis	Start ART while waiting for DNA-PCR confirmation test results.
Children <18months of age with a positive DNA/RNA PCR test	Start ART while waiting for the second DNA/RNAPCR test result

Table 6.14: First-Line ARV Regimens in Infants and Children under 15 years

Age	Weight	Preferred first line	Alternative
Neonates	<3kg	**A:** AZT60/3TC30 + NVP 10mg/ml	
Infant ≥4weeks	3-14.9Kg	**A:** ABC60/3TC30/DTG5mg (pALD)	
	15-19.9kg	**A:** ABC60/3TC30/DTG5mg (pALD)	**A:** ABC120/3TC60+LPV/r200/50mg
	20-24.9g	**A:** ABC120/3TC60+DTG50mg	**A:** ABC120/3TC60+LPV/r200/50mg
	25-29.9Kg	**A:** ABC600/3TC300+DTG50mg	**A:** ABC600/3TC300+ LPV/r 200/50mg In Special Circumstances: **A:** AZT/3TC300/150 +LPV/r 200/50mg **A:** AZT/3TC300/150 +DTG
	≥30Kg	A: TDF/3TC/DTG (TLD)	**A:** ABC120/3TC60+ DTG *TDF/3TC/EFV (TLE400) Special situation **TDF/FTC + LPV/r 200/50mg

Note

- TAF is contraindicated in TB/HIV co-infection as Rifampicin lowers TAF concentration below the therapeutic level.
- Consider PI based ARV regimen if unable to use DTG and EFV
- When a child is taking a Rifampicin-based TB regimen, the DTG dose should be administered 12 hourly to reach therapeutic levels.
- *TDF/3TC/EFV (TLE400) should only be used in cases of DTG intolerance as NNRTI associated transmitted drug resistance is reported to be above the recommended threshold (≥10%) for not using NNRTIs.
- **LPV/r should be used in first line only if both DTG and EFV cannot be tolerated.

Dosing of paediatric ARV regimens

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Table 6.15 (a): Paediatric Antiretroviral Dosing

Medicine Description	ABC/3TC/DTG (60/30/5mg) Ped Tablet (pALD)	ABC/3TC (120/60mg) Ped Tablet	ABC/3TC (600/300mg) Adult Tablet	AZT/3TC (60/30mg) Ped Tablet	AZT/3TC (300/150mg) Adult Tablet	Dolutegravir 10mg Tablet (pDTG)	Dolutegravir 50mg Tablet	TDF/3TC/EFV (300/300/400mg) Tablet (TLE)	TDF/FTC (300/200mg) Tablet	TDF/3TC/DTG (300/300/50mg) Tablet (TLD)
Frequency	24 hourly	24 hourly	24 hourly	12 hourly	12 hourly	24 hourly	24 hourly	24 hourly	24 hourly	24 hourly
Weight range (kg)										
3-5.9	1 tab OD	1 tab OD		1 tab BD		0.5-tab OD				
6-9.9	3 tabs OD	1.5 tabs OD		1.5 tabs BD		1.5 tabs OD				
10-13.9	4 tabs OD	2 tabs OD		2 tabs BD		2 tabs OD				
14-19.9	5 tabs OD	2.5 tabs OD		2.5 tabs BD		2.5 tabs OD				
20-24.9		3 tabs OD		3 tabs BD			1 tab OD			
25-29.9			1 tab OD		1 tab BD		1 tab OD			
30-34.9			1 tab OD		1 tab BD		1tab OD	1 tab OD	1 tab OD	1tab OD
≥35			1 tab OD		1 tab BD		1tab OD	1 tab OD	1 tab OD	1tab OD

Table 6.15 (b): Neonatal Antiretroviral Dosing

Neonate ≥2kg and < 4 weeks of age				
Medicine Description	ABC/3TC (120/60mg) Dispersible double scored tablet	Dolutegravir 10mg Tablet (pDTG) Dispersible single scored tablet	AZT/3TC (60/30mg) Ped Tablet	Nevirapine Syrup 10mg/ml
Birth - <2 weeks	¼ tab once every 2nd day (alternate days)	½ tab once every 2nd day (alternate days)		
2 weeks - <4 weeks	¼ tab 24 hourly	½ tab 24 hourly		
	Neonates and infants <2kg			
<2kg (Preterm)			¼ tab BD	2mg/kg
<2kg (Term)			¼ tab BD	4mg/kg

Note:

- Children on Anti TB and TB preventive treatment (3HR) should receive an addition of pDTG with a dosage according to body weight
- TDF is only approved for children above 12 years with weight ≥ 30 kg because of TDF-associated reduction in bone density
- DTG 50mg is recommended for children with weight ≥ 20 kgs
- Neonate should be given ART as per table 6.15b above until they reach 4 weeks of age and 3 kg then transition to pALD
- pALD is not recommended for children below 3kg and for those with below 3kg, provide ABC/3TC 120/60mg (double scored) plus DTG 10mg (single scored)
- DTG 50mg is recommended for children more than 20kgs

Table 6.15 (c): Paediatric Antiretroviral Dosing (LPV/r, ATV/r and DRV/r) based regimen

Medicine Description	Lopinavir/ritonavir (200/50mg) Adult Tablet (LPV/r)	Atazanavir/ ritonavir (300/100mg) Adult Tablet (ATV/r)	Darunavir/ritonavir (400/50mg) Adult Tablet (DRV/r)
Frequency	**12 hourly**	**24 hourly**	**24 hourly**
Weight range (kg)			
14-19.9	**1 tab BD**		**1 tab OD**
20-24.9	**1 tab BD**		**2 tabs OD**
25-29.9	**2 tabs AM 1 tab PM**	**1tab OD**	**2 tabs OD**
30-34.9	**2 tabs AM 1 tab PM**	**1 tab OD**	**2 tabs OD**
≥35	**2 tabs BD**	**1 tab OD**	**2 tabs OD**

Note:

- LPV/r tablet must be swallowed whole and should not be split, chewed, dissolved or crushed as it loses effectiveness.
- ATV/r 300mg tabs can be used in children with body weight ≥ 25kgs.
- ATV/r is not recommended in children on Anti TB

6.5 Changing ART in Children Under 15 Years

Changing ART in Children is triggered by Drug Toxicity or Treatment failure

Drug toxicity

The principles for changing ARVs and the managing drug toxicity in children are like those applied to adults. **Refer section 6.1.10 and 6.1.11**

Treatment failure

Virological treatment failure: Viral load is the most reliable method to detect early treatment failure. Virological treatment failure is recognized if the child is adherent to the current ART regimen, for 6months or more and has two consecutive viral load measurements of over 1000copies/ml at 3months apart.

Immunological treatment failure: If adherence is good, immunological criteria indicating that a change to second-line therapy is warranted where/when HVL test is not available includes the following:

Table 6.16: CD4 Criteria Suggesting Immunological Failure [a]

Immunological failure is recognized as developing or returning to the following age-related immunological thresholds after at least 6months on ART, in a treatment-adherent child:	
<5years of age	CD4 count of <200 cells/mm^3 or CD4 <10%
≥5years of age	CD4 count of <100 cells/mm^3

[a] Preferably, at least two CD4 measurements should be available

Use of CD4 in children <5years and absolute CD4 cell counts in those ≥5 years of age is preferred.

If serial CD4 values are available, the rate of CD4 cell count declines from the peak, CD4 cell count reached should be taken into consideration.

Note: CD4 cell percent should not be measured during an inter-current infection but can be determined when the child has recovered.

If there is a modest decline in CD4 cell count or percent (<5%); and if there is no failure to thrive do not change medication, instead maintain close monitoring.

Clinical Treatment Failure: Clinical conditions indicating that a change to second-line therapy is warranted include:

- Poor growth (failure to gain weight, declining or stagnant weight) over a 6month period, after excluding other causes, such as TB, feeding problems and food/nutritional deficiency
- No improvement of neuro-developmental milestones
- Development of HIV encephalopathy
- Recurrent infections, such as oral candidiasis, persistent diarrhoea, recurrent severe bacterial pneumonia
- Advancement from one clinical stage to another or new evidence of new WHO stage 3 or 4 disease

Note:

- Short inter-current episodes of pneumonia, LRTI and gastroenteritis should not be regarded as clinical failure
- Pulmonary or lymph node TB, which are clinical stage 3 conditions, are not indications of treatment failure, and thus may not require consideration of second-line therapy
- The response to TB therapy should be used to evaluate the need for switching therapy
- Before an ARV regimen is thought to be failing based on clinical criteria, the child should have received the regimen for at least 6months.
- The condition must be differentiated from immune reconstitution inflammatory syndrome. (IRIS)

Table 6.17 Laboratory parameters for monitoring infants and children under 15 years at baseline, before and during ART

Laboratory tests for diagnosis and monitoring	Baseline (at entry into care)	At initiation of first-line or second-line ART regimen	Every six months	As required or symptom-directed
HIV diagnostic testing	√			
Haemoglobin	√	√		√
WBC and differential count	√			√
%CD4+ or absolute CD4 cell count	√		√[b]	√
Pregnancy testing in adolescent girls		√		√
Full chemistry (including, but not restricted to, liver enzymes, renal function, glucose, lipids, amylase, lipase and serum electrolytes)[e]		√	√e	√
HIV VL measurement			√[d]	√
OI screening (where possible)	√	√	√	√

- HIV re-testing for verification before ART initiation, re-testing is not indicated when switching to 2nd or 3rd line
- For children of <5years continue CD4 monitoring every 6months
- CD4 cell count should be taken on emergence of WHO stage 3 or 4 disease
- Viral load monitoring is done annually if the first two VL results 6th month apart are ≤1000 copies/mL
- Regular monitoring (every 6 months) of full chemistry, particularly lipid levels, liver enzymes and renal functions, should be considered for infants and children on ART.

6.5.1 Assessment of Infants and Children receiving ARV Therapy

Important clinical signs of response to ARV therapy in children include improvement in growth and development and decreased frequency of infections (bacterial infections, oral thrush, and/or other opportunistic infections).

Clinical monitoring of ARV treatment in children should include:

- Feeding practice and nutritional status
- Growth monitoring: weight, height, MUAC (mid-upper arm circumference)
- Head circumference should be monitored in children under 3 years old
- Neurologic symptoms and developmental milestones
- Cotrimoxazole prophylaxis taken daily
- Adjustment of ARV dose based on weight/body surface area
- WHO disease clinical staging
- Immunization status
- Other medical conditions
- Screening for malaria and TB.

Table 6.18 Recommended Second-line ARV regimens for children under 15 years

Body weight (kg)	If is on the following regimen	Preferred 2nd line regimen	Alternative 2nd line regimen
3 -14.9	**A:** ABC60/3TC30/DTG5mg (pALD)		
15 -19.9	**A:** ABC60/3TC30/DTG5mg (pALD)		
20 -24.9	**A:** ABC120/3TC60/DTG50mg	**A:** AZT+3TC +LPV/r200/50mg	
25 -29.9	**A:** ABC600/3TC300+DTG50mg	**A:** AZT+3TC +LPV/r 200/50mg	**A:** AZT+3TC300/150 +ATV/r
≥ 30Kg	**A:** TDF+3TC+DTG50mg (TLD)	**A:** AZT+3TC+ATV/r	**A:** AZT+3TC300/150 +LPV/r 200/50mg
			A: ABC+3TC +ATV/r
			A: ABC+3TC +LPV/r 200/50mg
For TB/HIV co-infection already on LPV/r	**A:** ABC + 3TC +LPV/r (200/50mg)	If <20Kg give AZT+3TC+ LPV/r (Tabs) (double dose LPV/r)	
		If ≥20KgAZT+3TC+DTG (Double the dose of DTG)	
			If ≥30KgTDF+3TC+DTG (Double the dose of DTG)
For TB/HIV co-infected on TLD	**A:** TDF+3TC+DTG	**A:** AZT + 3TC + LPV/r (200/50) (double LPV/r dose)	**A:** ABC+3TC+LPV/r (200/50) (double LPV/r dose)

Note: Children on Rifampicin based TPT medication should receive double dose of DTG or Lopinavir.

Note

- Infant and children take longer time to attain adequate viral suppression. Before confirming treatment failure, calculate drop in VL (using 0.5 log two years and above, 0.7 log below 2 years- for further details on how to convert VL into numbers.
- ATV/r can be used as an alternative to LPV/r in children above 6years old if paediatric formulation is available but adolescents >30kg can take adult formulation.

6.5.2 Third-Line ARV regimens in children under 15 years and adolescents

RoCs failing 2nd line regimen have extensive NRTI and NNRTIs associated resistance mutations which minimize their use in third-line regimens. Third-line regimen is constructed using new classes of drugs or second-generation formulations, in order to have at least two or three effective drugs. For examples, Darunavir (DRV) is a second-generation PI without cross resistance to Lopinavir/r used in the previous regimens.

Criteria for Change to Third line Failing any 2nd line regimen

- Referral to specialist care is recommended where third line regimen can be chosen according to genotype resistance testing and managed by an expert panel at tertiary care facilities.
- The criteria for diagnosing second-line failure are the same as those used for diagnosing first-line failure.

Eligibility for Third Line Evaluation*:*

All clients should have undergone an Enhanced Adherence Counselling

- Failing 2nd line regimens
- Documented virologic failure (VL >1000) on a PI regimen; except children below 3 years

Third-line Regimens for Children and Adolescents

Selection of third-line regimen should consider genotype resistance test results as well as treatment history.

Table 6.19 Third-line Regimens for Children and Adolescents

RoC group	Third line options
Children <20kg	**A:** DTG10mg + DRV/r* + 3TC + other NRTI**
Children >20kg and above	**A:** DTG 50mg + DRV/r* + 2NRTI**

*Darunavir/ritonavir (DRV/r) should be used for children ≥14kg

**2NRTI will be guided by GART

Practice points

Confirmed HIV-positive infants born to mothers with confirmed PI or DTG resistance mutation should have GART done to exclude transmitted mutations to formulate an appropriate first-line ART regimen. While waiting for GART results, newly confirmed positive infants should be initiated on the default first-line regimen.

The genotypic resistance test should be used to determine the third-line regimen to be used.

Adverse reactions in children and adolescents
Drug-related adverse reactions while on ART can occur immediately (soon after a drug has been administered), early (within the first days or weeks of treatment) or later (after months of treatment). Adverse reactions can vary in severity from mild to severe to life-threatening and may be specific to the drug or general to the class of drugs in use.

Table 6.20 Major Types of ARV Toxicity in Children and Adolescents

ABC	ABC is associated with hypersensitivity reactions. Patients may have severe skin rashes or other non-specific symptoms such as fever, arthralgia and lymph node enlargement.
AZT	AZT is associated with risk of haematological toxicity which can include anaemia neutropenia and thrombocytopenia. Measuring haemoglobin is recommended before initiating ART among children with low body weight, low CD4 cell counts and advanced HIV disease. Patients with severe anaemia at baseline (haemoglobin <7.5 g/dL) should avoid AZT as first line therapy.
TDF	TDF is associated with nephrotoxicity. Nephrotoxicity is more common in elderly patients, but it also occurs in children, especially if co-administered with PI based therapy. Monitoring of creatinine clearance is recommended.
LPV/r	LPV/r's major toxicity includes hepatotoxicity, pancreatitis, diarrhoea and lipoatrophy. The risk of hepatotoxicity is increased in patients with underlying hepatic disease and the risk of pancreatitis is increased in patients with advanced HIV disease. Electro-cardiac abnormalities are also possible; patients with pre-existing conduction system disease are at increased risk
ATV/r	Toxicities of ATV/r are like those of LPV/r. ATV/r can cause jaundice (indirect hyperbilirubinemia). Jaundice (indirect hyperbilirubinemia) is usually transient and ATV/r can be continued. If severe jaundice develops and there are significantly raised transaminases, then ATV/r should be stopped.
DRV/r	DRV/r's major toxicity is hepatotoxicity. Patients with underlying hepatic disease, hepatitis B/C co-infection or who are taking other hepatotoxic drugs are at higher risk. The other side effect is severe skin and hypersensitivity reactions. Patients with sulphonamides allergy are at higher risk
RAL	RAL's potential toxicity includes rhabdomyolysis, myopathy and myalgia as well as hepatitis and hepatic failure and severe skin rash and hypersensitivity reactions.
DTG	DTG major toxicity is hepatotoxicity and hypersensitivity reactions. Patients with underlying liver disease or hepatitis B/C co-infection are at higher risk.

6.5.3 Principles in the management of ARV drug toxicity

Severe life-threatening reactions*:* Immediately discontinue all ARV drugs, manage the medical event (i.e. provide symptomatic and supportive therapy) and reintroduce ARV drugs using a modified regimen (i.e. with an ARV substitution for the offending drug) when the patient is stabilized.

Severe reactions*:* Substitute the offending drug without stopping ART
Moderate reactions*:* Consider continuation of ART if it is feasible. If the patient does not improve on symptomatic therapy, consider single-drug substitution

Mild reactions: Reassure a child and caregiver that while the reaction may be bothersome, it does not require a change in therapy; provide counselling and support to mitigate adverse reactions.
Emphasize on the maintenance of adherence despite mild and moderate reactions.

Table 6.21 Suggested ARV Substitutions

Toxicity events	Responsible ARV	Suggested first-line ARV drug substitution
Hypersensitivity reaction	ABC	AZT
Lipoatrophy/metabolic syndrome	LPV/r	If LPV/r is used in first line ART for children, use an age appropriate NNRTI (NVP for children below 3 years and EFV for children with 3 years and above) ATV/r can be used for children above 6 years
Severe anaemia or neutropenia	AZT	Substitute with ABC if <35 kg
Severe gastrointestinal intolerance		Substitute with TDF if >35 kg
Tubular renal dysfunction	TDF	If TDF is being used in first line ART, substitute with AZT or ABC If TDF is being used in second line ART, substitute with ABC

Note: Patients on third line ARV regimen who develop toxicities should be referred to next level facility with adequate expertise and facilities

6.5.4 Advanced HIV Disease (AHD)

- AHD is defined as CD4 cell count <200 cells/mm3 or WHO HIV clinical stage 3 or 4 in adults, adolescents and children aged 5years and above.
- All HIV infected children younger than 5years old are considered as having AHD.

Priority Groups for AHD Screening

- Newly diagnosed individuals
- Individuals returning after interruption of treatment for more than 6 months.
- Those failing treatment (VL>1000 copies after EAC)
- RoC newly categorized as WHO stage 3 or 4

Management of advanced HIV disease (AHD) and common opportunistic infections
All PLHIV aged 5years and above with baseline CD4 cell count<200 cells/mm3 or WHO HIV clinical stage 3 or 4 are considered to have AHD. All children younger than 5years are considered to have AHD, given their increased risk of disease progression and mortality. CD4 testing is the gateway to identification of RoC with AHD among PLHIV aged 5years old and above.

Note: Routine cryptococcal antigen screening and pre-emptive therapy are not recommended for children younger than 10years because of the low prevalence of cryptococcal meningitis in this age group. However, if a child younger than 10years presents with signs and symptoms of meningitis, cryptococcal meningitis should still be considered and the appropriate investigations and treatment must be done.

Figure 6.2 AHD screening algorithm

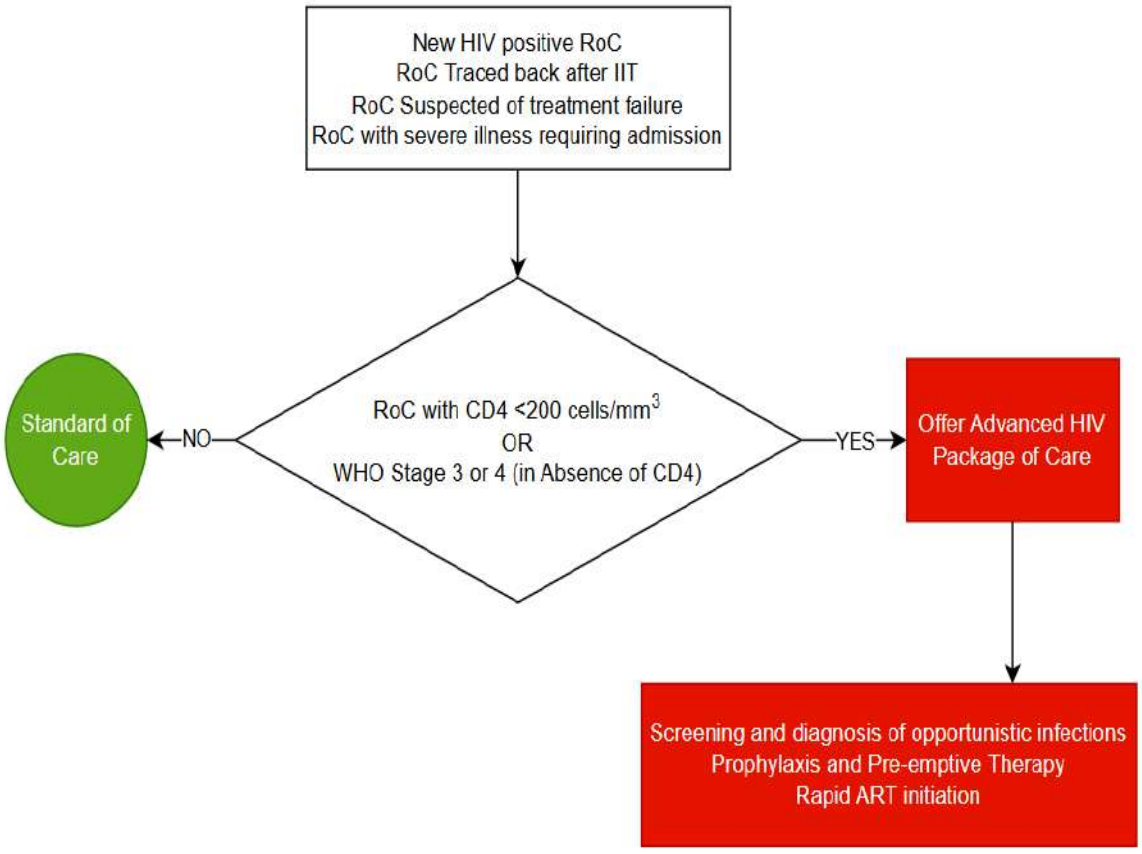


Table 6.22 Advanced HIV Disease package in different age groups

AHD services	Interventions	CD4 Cell count/ WHO HIV clinical staging.	Adults and Adolescents (10years and above)	Children (0-9years)
Screening and Diagnosis	• TB screening questionnaires (TSQs) • Chest X-ray where available. • Sputum for microscopy and molecular test (Xpert/TruNat) for TB diagnosis among symptomatic PLHIV.	All PLHIV	YES	YES
	• Urine Lateral Flow-LAM for TB	CD4<200 cells/mm3 or WHO clinical stage 3 or 4	YES	YES
	Cryptococcal antigen Screening (CrAg)	<200 cells/mm3 or WHO HIV clinical stage 3 or 4	YES	NO (unless presents with signs and symptoms of meningitis)
Prophylaxis	Sulfamethoxazole + Trimethoprim prophylaxis	≤350 cells/mm3 or WHO clinical stage 3 and 4.	YES	YES
	TB preventive treatment	All PLHIV	YES	YES
	Fluconazole pre-emptive therapy for serum CrAg – positive PLHIV without evidence of meningitis. N.B: When Lumbar puncture services are available, Pre-emptive therapy among serum CrAg positive should be initiated upon confirmed CSF CrAg negative but should not delay initiation of Pre-emptive therapy.	<200 cells/mm3	YES	NA
ART Initiation	Rapid ART initiation	All newly diagnosed HIV positive RoC.	YES	YES
	Delay ART initiation if clinical symptoms suggest TB or cryptococcal meningitis	• Start ART within two weeks after starting anti TB treatment/Fluconazole Pre-emptive therapy. • At least 5 weeks after starting treatment for cryptococcal meningitis	YES	YES
Adherence support	Tailored counselling to ensure optimal adherence to the AHD package, including home visits if feasible	<200 cells/mm3 or WHO Clinical stage 3 or 4	YES	YES

Note: Lumbar puncture should be done in all PLHIV with a positive CRAG test in serum/plasma/blood with signs and symptoms of meningitis. Additionally, lumbar puncture is recommended for all PLHIV with a CD4 count of <100cells/mm3 regardless of signs and symptoms.

Table6.23 Management of children with AHD: Screen, Treat, Optimize and Prevent AIDS among Children- (0-9 years) (STOP)

Interventions	Diseases	Description
Screen	Tuberculosis	● Screen for TB using available screening tools as indicated. Stages for those who screen positive, use the following diagnostic tests to confirm TB as applicable. ● Rapid molecular diagnostic on (induced)sputum, stool, gastric aspirate, or nasopharyngeal aspirate or other extra pulmonary samples if relevant -LF LAM assay
	Cryptococcal infection among adolescents	● Serum or plasma or blood CrAg screening ● Lumbar puncture if serum CrAg positive and symptomatic
	Malnutrition	● Weight for height ● Height for age ● Mid upper arm circumference among children 2-5years old
Treat	TB, severe pneumonia, severe bacterial infections, cryptococcal meningitis and severe acute malnutrition	
	Optimize	In accordance with existing national guideline
Optimize	Rapid ART initiation	
	ART counselling	Preferably same day after the diagnosis
	Bacterial infections and *P. Jirovecii Pneumonia*	In accordance with National guideline
	TB	TB preventive treatment
	Cryptococcal meningitis among adolescents	Fluconazole pre-emptive therapy if cryptococcal antigen positive or cryptococcal antigen unavailable
	Vaccinations	
Prevent	Bacterial infections and *P. jirovecii pneumonia*	Sulfamethoxazole + Trimethoprim prophylaxis
	TB	TB preventive treatment
	Cryptococcal meningitis among adolescents	Fluconazole pre-emptive therapy if cryptococcal antigen positive or cryptococcal antigen unavailable
	Vaccinations	● Pneumococcal vaccine ● Human papillomavirus ● Measles ● BCG

6.5.5 Screening, Diagnosis and Management of Common Opportunistic Infections in RoC with AHD

Opportunistic Infections (OIs) are more frequent and severe among PLHIV because of their weakened immune system from the HIV infection, and they are the leading cause of mortality in this population. The risk of getting OIs increases with lower CD4 counts, especially among those with CD4<200 cells/mm3.

Screening and diagnosis of Cryptococcal infection and disease

Even though Cryptococcal infection (CI) can also cause pneumonitis and skin lesions, Cryptococcal meningitis (CM) is the most common manifestation of cryptococcosis and is a leading cause of mortality among hospitalized adults living with HIV. However, it is less common among children below 10years of age living with HIV. The risk of developing cryptococcal meningitis increases with a fall of CD4 count below 200cells/mm3.

Note: Not all RoC with Cryptococcal infection develop disease (e.g., meningitis, pneumonitis, skin lesions), some of them remain asymptomatic and CrAg screening with prompt initiation of pre-emptive therapy are key to prevent them from developing CM and other severe forms of cryptococcosis.

a) Cryptococcal Screening

Serum CrAg testing is recommended for all adults and adolescents living with HIV who have a CD4 cell count <200 cells/mm^{3}at any point during their management. If CD4 testing is not available on site, refer the sample/client to a nearby hub/facility for testing. If CD4 testing, sample referral or client referral is not feasible in a seriously sick RoC who is in WHO stage 3 or 4, the RoC should be screened for serum CrAg and managed based on the Clinical Presentation as plans for virtual consultation are made with the hub facility.

Asymptomatic recipient of care who are serum CrAg positive should be managed as CI while those with signs and symptoms of CM and are serum CrAg positive should be further evaluated for CM.

The most common signs and symptoms of cryptococcal meningitis are:

- Fever
- Severe headache
- Neck stiffness
- Confusion (Altered mental status)
- Cranial nerve palsy
- Focal neurological deficit (Blurred vision, Photophobia, Decreased hearing and Difficult in walking

b) Diagnosis

The recommended diagnostic approach for adults, adolescents and children living with HIV suspected of having CM is a prompt lumbar puncture with measurement of cerebrospinal fluid (CSF) opening pressure and a CSF CrAg test. Alternatives to the CrAg test in CSF are the India ink test and CSF culture for Cryptococcus neoformans.
In health facilities where a lumbar puncture cannot be performed or when a lumbar puncture is contraindicated, prompt referral to a nearby health facility following a positive serum CrAgf or further investigations and management is recommended.

Common contraindications to Lumbar Puncture are:

- Significant coagulopathy
- Suspected CNS space-occupying lesion based on:(Focal nervous system signs excluding cranial nerve VI palsy, Recurrent seizures and, where possible, confirmed by computed tomography.)

Note:

- Signs of raised intracranial pressure does not contraindicate lumbar puncture in (suspected) cryptococcal meningitis once a space-occupying lesion is ruled out. Lumbar puncture helps relieve the intracranial pressure and severe headache in CM.
- Other diseases that can present with signs and symptoms similar to cryptococcal meningitis (such as viral, bacterial or tuberculosis meningitis) should also be investigated.

Treatment approaches

a) Pre-emptive therapy for Cryptococcal Infection

Pre-emptive therapy is recommended for asymptomatic CrAg–positive RoC to prevent CM. Initiate fluconazole pre-emptive therapy as illustrated in Table below, if the RoC has no clinical signs and symptoms of CM.

Table 6.24 Fluconazole Pre-emptive therapy

Infection	Prophylaxis
Cryptococcal infection (antigenemia) (pre-emptive therapy)	Pre-emptive therapy should be done in 3 phases: Phase 1: **Induction phase** **A:** fluconazole (IV/PO) 800 mg/day for adults for 2 weeks. Phase 2: **Consolidation phase** **A:** fluconazole (IV/PO) 400mg/ day for 8 weeks. Phase 3: **Maintenance phase** **A:** fluconazole (PO) 200mg/day for at least 1 year. Discontinue if client is adherent to ART and fluconazole and CD4 ≥100 and viral load is undetectable (<50 copies/mL) OR CD4 ≥200 cells/mm3 (if viral load monitoring is not available) after being on treatment for at least one year.

b) Treatment of cryptococcal meningitis

Early treatment of CM is a key intervention to reduce mortality from cryptococcal meningitis. It is recommended that the use of triple therapy (amphotericin B, flucytosine, and fluconazole), antifungal medications shown to improve survival in RoC with cryptococcal meningitis.

Table 6.25 Pharmacological Management of cryptococcal meningitis

Disease	Treatment
Cryptococcal meningitis	The treatment should be done in 3 phases: **Phase 1: Induction phase** **S:** liposomal amphotericin B (IV) on day 1(a single high dose (10 mg/kg)) **AND** **S:** flucytosine (PO) 25mg/kg 6hourly **AND** **A:** fluconazole (IV/PO) (1200mg daily for 14 days for adults,12mg/kg per day, maximum 800mg daily for children and adolescents), should be used as the preferred induction regimen for treating patients with cryptococcal meningitis. **If liposomal amphotericin B is not available** **D:** amphotericin B deoxycholate (IV) 0.7-1mg/kg 24 hourly **AND** **S:** flucytosine 25mg/kg 6hourly for 7days followed by seven days of fluconazole (1200mg daily for adults,12mg/kg per day for children & adolescents, maximum of 800mg daily).
	If amphotericin B is not available **A:** fluconazole (IV/PO)1200mg for adults 12mg/kg for children and adolescents) daily, **AND** **S:** flucytosine (PO) 25mg/kg 6hourly for 14days **Note:** Fluconazole & flucytosine is the only recommended oral combination regimen and has been associated with lower mortality compared with amphotericin B deoxycholate and Fluconazole.
	If flucytosine is not available **S:** liposomal amphotericin B(IV)3–4mg/kg per day **AND** **A:** fluconazole (IV/PO) (1200mg daily for adults: 12mg/kg per day for children and adolescents up to a maximum of 800mg daily). for 14days **If liposomal amphotericin B and flucytosine are not available** **D:** amphotericin B deoxycholate (IV) 0.7-1mg/kg per day **AND** **A:** fluconazole (IV/PO) (1200mg daily for adults:12mg/kg per day for children and adolescents up to a maximum of 800mg daily) for 14days **Note:** flucytosine-containing regimens are superior, and steps should be taken to ensure access to this drug. **Phase 2: Consolidation phase** **A:** fluconazole (PO) 800mg daily for adults;6–12 mg/kg per day for children and adolescents up to a maximum of 800mg daily; for 8weeks following the induction phase. **Phase 3: Maintenance phase** **A:** fluconazole (PO) 200mg/day for at least 1year. Discontinue if client is adherent to ART and Fluconazole and CD4 ≥100 and viral load is undetectable (<50 copies/mL) **OR** CD4 ≥200 if viral load monitoring is not available) after being on treatment for at least one year.

Note:

- Routine use of adjunctive corticosteroid therapy during the induction phase is not recommended in treating adults, adolescents and children who have HIV-associated cryptococcal meningitis.
- **Therapeutic lumbar puncture:** Draining 20-30ml of cerebrospinal fluid is recommended to sufficiently reduce the raised intracranial pressure in setting where lumbar puncture is possible.

c) Timing of ART

For new RoC, ART initiation should be delayed to at least 5 weeks from initiation of treatment for Cryptococcal Meningitis and 2 weeks from initiation of treatment for Cryptococcal infection. Immediate ART initiation is not recommended because of the risk of increased mortality.

6.6 HIV Prevention

6.6.1 Post Exposure Prophylaxis (PEP)

Post Exposure Prophylaxis (PEP) is the immediate provision of preventive measures and medication following exposure to potentially infected blood or other bodily fluids in order to minimize the risk of acquiring infection. Several clinical studies have demonstrated that HIV transmission can be reduced by 81% following immediate administration of antiretroviral agents.

Effective post-exposure management entails the following elements:

- Management of exposure site
- Exposure reporting
- Assessment of infection risk
- Appropriate treatment
- Follow-up and counselling.

When an exposure occurs, the circumstances and post exposure management procedure applied should be recorded in the exposed person's confidential form for easy follow up and management.

Evaluation of the Exposed Individuals

Individuals exposed to HIV should be evaluated within two hours and no later than 72 hours. A starter pack should be initiated within 2 hours after exposure and before testing the exposed person. Exposed healthcare workers should be counselled and tested for HIV at baseline in order to establish infection status at the time of exposure. PEP should be discontinued if an exposed healthcare worker refuses to test. Vaccination against Hepatitis B should be considered.

In addition, rape survivors should be:

- Offered counselling, crisis prevention and provision of an on-going psychosocial support to reduce/minimize immediate rape trauma disorder and long-term post-traumatic stress disorder should be offered.
- Referred to mental care, police and legal services, according to the law and regulations.

Evaluation of the Source Person

Evaluation of the source person should be performed when the exposed individual agrees to take PEP.

- If the HIV, HBV and HCV status of the source person is unknown perform these tests after obtaining consent. The exposed healthcare worker should not be involved in obtaining consent from the source person.
- If the source person is unknown, evaluation will depend on other risk criteria.
- Do not test discarded needles or syringes for viral contamination.

ARVs used for HIV PEP

Adults
A: TDF 300mg+3TC 300mg+DTG 50mg (FDC) (PO) 24hourly for 4weeks
Children (based on body weight)
A: ABC+3TC+DTG (PO) (based on body weight) for 4weeks

Note: If the source is using PI based regimen, then the PEP regimen should be PI based. (Similar to the source's regimen)

Follow-up of HIV Exposed individuals

HIV antibody tests should be performed at least after 4–6 weeks' post-exposure (i.e.at 6 & 12 weeks). HIV testing should also be performed for any exposed person who has an illness that is compatible with an acute retroviral syndrome, irrespective of the interval since exposure.

If PEP is administered, the exposed person should be monitored for drug toxicity at baseline and 2 weeks after starting PEP. Minimally, it should include a Full Blood Count (FBC), renal function test (RFT-Serum creatinine and urinalysis) and hepatic function tests (LFT- ALT).

Exposed persons should be re-evaluated within 72 hours, after additional information about the source of exposure including serologic status, viral load, current treatment, any resistance test results (if available) or information about factors that would modify recommendations, is obtained.

PEP should be administered for 4weeks if tolerated. If not tolerated manage symptoms accordingly and if intolerance persists, change to more tolerable PI based regimen. If the patient seroconverts and the exposed person becomes HIV infected, he/she should be referred to a CTC for proper care and treatment service.

6.6.2 Pre-Exposure Prophylaxis (PrEP)

Pre-Exposure **P**rophylaxis **(PrEP)** is the use of ARV drugs daily by HIV uninfected persons to prevent acquisition of HIV before the person becomes exposed to HIV. PrEP is used by people who are at substantial risk for HIV acquisition to lower their chances of getting HIV infection.

Pre	• **Before**
Exposure	• **Activity that can lead to HIV infection**
Prophylaxis	• **Prevention**

Eligible clients for PrEP

- Aged 15 years and older
- HIV Sero negative
- At substantial risk* of HIV infection
- No suspicion of acute HIV infection
- Creatinine clearance >60ml/min**
- Willingness to consent for and use PrEP as prescribed
- HIV negative Sero discordant pregnant women

***Substantial risk of HIV infection means:**

- Vaginal or anal sex without a condom with more than one partner
- History of a new sexually transmitted infection
- Use of post exposure prophylaxis for sexual exposure
- Has a known HIV positive sexual partner(s) who is not on ART/on ART <6months or refuses to report a risk category but still requests PrEP

Clients who are not eligible for PrEP include:

- Acute HIV Infection (AHI)
- Client with eGFR* <60ml/min
- Significantly mobile persons that will not be able to attend visits as prescribed. (For example: clients who will not be in a region where PrEP can be provided at the next visit or clients who do not have contact information)
- Unwilling/unable to take daily medication
- Allergy or contraindication to any medication within PrEP regimen.

ARVs used for PrEP

Table 6.26 The recommended PrEP regimen in Tanzania

Oral PrEP	**A:** Emtricitabine (FTC) 200mg/Tenofovir Disoproxil Fumarate (TDF) 300mg PO Daily. 24 hourly until for seven days to achieve protective concentrations and continue 28days after the last exposure
Injectable PrEP	**C:** Lenacapavir an HIV-1 capsid inhibitor is another injectable PrEP which has shown the effectiveness of reducing risk for HIV infection among people at substantial risk of acquiring HIV. It is administered as subcutaneous injection every 6months.

Indications for PrEP discontinuation

Individuals taking PrEP require ongoing risk assessment and PrEP can be discontinued if individuals acquire HIV infection, are no longer at substantial risk for HIV infection or decide to use other effective prevention methods and poor adherence. Before discontinuation of PrEP, clients should be provided for at least 28 days after the last possible exposure to HIV. The client should return after completing the final prescription for an HIV test to confirm status. Refer the client to other relevant prevention services.

Integrated management of non-communicable diseases (NCDS) in HIV

With long-term antiretroviral therapy, RoC live longer and therefore HIV has become a chronic condition. The risk of developing non-communicable diseases due to HIV virus-related inflammatory and long-term medication effects increases. Integration of NCD screening and treatment with HIV care can reduce hospital visits, costs, and improve efficiency of services. The service integration will, focus on screening, prevention, and control of common NCDs among people living with HIV. To addresses the screening, prevention, and control of common NCDs (Hypertension, Diabetes, Cervical Cancer, and Kaposi's sarcoma) among PLHIV.

Screening, Diagnosis and Management of Hypertension

HIV infection and certain antiretroviral medications increase the risk of hypertension and cardiovascular disease in PLHIV. Regular screening for hypertension risk factors (smoking, obesity, physical inactivity, and unhealthy diet) is essential, along with measuring and recording blood pressure during clinic visits. A diagnosis of hypertension requires an average of three separate elevated readings on the same day, taken when the RoC is comfortable (e.g., on days 1, 3, and 5).

Drug Interaction between Antihypertensive and ARVs

Thiazide diuretics and ACE inhibitors do not interact with ARVs. Calcium channel blockers and beta-blockers may have their drug levels affected by PIs and NNRTIs, requiring potential dose adjustments. However, calcium channel blockers and beta-blockers do not affect ARV drug levels, eliminating the need for dose adjustments.

Table 6.27 Drug interactions between antihypertensive and ARVs

Hypertension Drug	Interaction with ART	Action Required
Dihydropyridines (amlodipine and Nifedipine)	Efavirenz and Nevirapine could potentially decrease drug levels	No dose adjustments are required
	LPV/r, ATV/r and DRV/r increase drug levels	Use Nifedipine with caution
Losartan	Efavirenz may reduce formation of active form of losartan	No dose adjustments are required
	Protease inhibitors reduce elimination of losartan	Use with caution, in recipient of cares with hepatic impairment
Valsartan (and other ARBs except losartan and Irbesartan)	No clinically significant drug-drug interactions	None
All ACE inhibitors (including captopril)	No clinically significant drug-drug interactions	None
All diuretics (including Hydrochlorothiazide and Bendroflumethiazide)	No clinically significant drug-drug interactions	None

Screening, diagnosis and management of Diabetes Mellitus among PLHIV

Traditional risk factors like age, BMI, and genetic predisposition contribute to diabetes development in people living with HIV (PLHIV). Some ARVs like lopinavir (LPV) have shown to be diabetogenic (stronger associations with diabetes) compared to others like tenofovir (TDF), emtricitabine (FTC), lamivudine (3TC), darunavir (DRV), and atazanavir (ATZ). Integrase stand transfer inhibitors, INSTI e.g., dolutegravir have been shown to cause metabolic syndrome (central obesity, HTN, Insulin resistance) in some patients. HIV infection and co-infection with hepatitis C virus (HCV) can also increase the risk of diabetes. PLHIV should undergo regular blood glucose monitoring, with a baseline evaluation and subsequent assessments every 6months. RoC experiencing symptoms like polyuria, polydipsia, polyphagia, having a family history of diabetes, or having a BMI>30kg/m2 should be prioritized.

Note: Screening, diagnosis and management of Diabetes Mellitus among PLHIV, refer to the HIV, STIs and Hepatitis Guideline.

ART among PLHIV with Diabetes Mellitus

If a RoC develops diabetes while taking potentially diabetogenic ARVs, particularly thymidine based NRTIs (zidovudine), DTG and first-generation PIs (LPV, IDV), it is advisable to switch them to an alternative ART regimen if available. ARVs with a safer metabolic profile, such as TDF, ATZ, EFV and DRV, may be considered as part of the new regimen.

Drug Interactions of Diabetes Medicines with ARVs

Metformin and DTG**: a lower dose of metformin may be needed with closer monitoring of blood glucose.

** Do not initiate or Transition RoC to DTG if known or confirmed to have diabetes

Screening and management of Dyslipidemias among PLHIV

Baseline screening of fasting lipid profile (total cholesterol, LDL, and triglycerides) should be done for all PLHIV. Diagnosis of dyslipidaemia is made when fasting total cholesterol is >5.2mmol/L, LDL>3.4mmol/L or triglycerides >2.2mmol/L.

Monitoring of lipid profile should be at 6 months after initiation of ART and then annually for normal test results.

PLHIV should be counselled on lifestyle modification both as a prevention and treatment option for dyslipidaemia. RoC on ARVs known to cause or exacerbate dyslipidaemia such as LPV/r should be switched to a more lipid-friendly drug such an ATV/r before adding a lipid-lowering drug. RoC with persistent dyslipidaemia despite the above interventions should be referred for further management.

Chronic Kidney Disease among PLHIV

CKD can develop as a complication of HIV, often due to certain ART therapies. Comorbid conditions such as Diabetes mellitus, Hypertension, Hepatitis B/C co infection and nephrotoxic drugs may lead to high-grade proteinuria, severely reduced eGFR increase the risk of progressing to chronic kidney disease (CKD). However, initiating ART early has been shown to improve kidney function in individuals with HIV-related CKD. Screening PLHIV for kidney disease is crucial for timely diagnosis and management. Baseline serum creatinine and urinalysis for protein, as well as regular follow-up, are recommended. If abnormal results are found, dose adjustment or avoidance of nephrotoxic ARVs (TDF) should be considered. For RoC on a TDF-based regimen, switching to a non-TDF-based regimen (TAF/ABC) is advised once CKD is diagnosed.

Cervical cancer

Tanzania has a high burden of cervical cancer, with approximately 10,241 new cases annually and a mortality rate of 42.7 deaths per 100,000 women. It is the leading cause of morbidity and mortality among women in the country. HIV-positive women face an increased risk and an earlier onset (10 years earlier) of cervical cancer compared to HIV-negative women, due to higher rates of persistent HPV co-infection. To address this, cervical cancer screening should be integrated into the routine care of HIV-positive women.

Screening and Treatment Approach for Cervical cancer via Programmatic intervention to prevent and/or Control cervical cancer

- **Screen-and-Treat Approach (SVA-Single Visit Approach).:** Treatment is provided based on a positive primary screening test alone, without triage (i.e., no second screening test and no histopathological diagnosis) and treatment is offered on the same day.
- When the patient is eligible for treatment of small and moderate size pre-cancer lesions, can use either Cryotherapy or Thermocoagulation (*Ablative Treatment*).
- Women who are not eligible for ablation can use Loop Electrosurgical Excision Procedure (LEEP). If LEEP is not available on-site, women should be referred.
- **Screen, Triage and Treat Approach**: The triage test is done if the primary screening test is positive, and the decision to treat is made when both the primary test and the triage test are positive with or without histologically confirmed diagnosis. Recommended primary screening test could be HPV DNA test and the triage test can be VIA.

Primary prevention	• Focuses on Girls 9-14 years** • HPV vaccination for Girls RoC should also be offered, according to IVD guidelines. • Health information and education. • Sex education tailored to age and culture. • Condom promotion and provision for those engaged in sexual activity • Advocate Male circumcision
Secondary Prevention	• Focuses on women living with HIV ≥25 years of age (Screen every 3years) • HPV DNA screening is recommended for women aged 25-60 years. • Screening with VIA for positive HPV DNA test, followed by immediate treatment as quickly as possible after identification of precancerous lesions. • Perform Pap smear test for women who are 60Years and above.
Tertiary Prevention	• All WLHIV as needed. • Treatment of invasive cancer at any age (Surgery, Radiotherapy, Chemotherapy, Palliative care)

**Girls 9-14 years living with HIV are given three HPV vaccine doses at month 0, 2 and 6.

(Refer to the "Tanzania Service Delivery Guidelines for Cervical Cancer Prevention and Control (2023)" for detailed information and guidance).

CHAPTER SEVEN

TUBERCULOSIS AND LEPROSY

7.1 General Management of Tuberculosis

Tuberculosis is chronic airborne infectious disease caused by Mycobacterium tuberculosis. It is transmitted from one person to another when a patient is cough, sneezing or singing.

Clinical Presentation

- Cough of more than two weeks or of any duration in among PLHIV
- Fever
- Excessive night sweats
- Haemoptysis (sputum mixed with blood stains)
- Loss of weight
- Others include swelling of lymph nodes, ascites, difficulty in breathing, chest pain, swelling of joints etc., depending on the site of the disease

Investigations

- Molecular test using GeneXpert MTB/ RIF Ultra or Truenat or TB LAMP. The use of TB LAMP will depend on its availability If no molecular test at the site, do a smear microscope, and refer the sample to the nearby molecular testing site
- Culture and sensitivity; this is done for diagnosis of drug resistance and surveillance
- Chest X-rays: done to assist clinical diagnosis of TB or in case of triaging presumptive

Note.

- Conduct HIV provider-initiated testing and counseling (PITC)for all TB patients and presumptive TB patients
- Conduct Provider Initiated TB screening (PITS) for all health facility outpatients and inpatients

For detailed diagnosis and investigation of TB refer to 'Manual for the Management of Tuberculosis and Leprosy in Tanzania.

Pharmacological Management

TB treatment is divided into two phases:

Initial /intensive phase, which consists of:

- RHZE for 2months-new and re-treatment cases

Continuation phase, which consists of:

- RH for 4months-new and re-treatment cases
- RH for 12months for severe forms TB such TB meningitis, Miliary TB and TB of the spine

Table 7.1 Recommended daily doses–regimens of first-line anti-TB drugs for adults and children

New/Retreatments	Initial Phase	Continuation Phase
New/previous treated patients	**A:** Rifampicin + Isoniazid + Pyrazinamide **AND** **A:** Ethambutol in fixed dose (RHZE) for 2months	**A:** Rifampicin + Isoniazid in fixed dose (RH) for 4months
Severe form of TB (TB meningitis, Miliary TB and TB of the spine)	**A:** Rifampicin + Isoniazid + Pyrazinamide **AND** **A:** Ethambutol in fixed dose (RHZE) for 2months	**A:** Rifampicin + Isoniazid in fixed dose (RH) for 12months

Table 7.2: Daily dosage of anti-TB drugs (FDCs) in new and retreatment adult patients

Body weight	Number of tablets in initial phase: 2 months (R150/H75/Z400/E275) mg	Number of tablets in continuation phase: 4 months (R150/H75) mg
21–30 kg	2	2
31–50 kg	3	3
51–74 kg	4	4
≥75 kg	5	5

Table 7.3: Daily dosages of anti-TB Drugs (FDCs) in new and re-treatment pediatric patients

Weight (kg)	Intensive phase * (2 months)		Continuation phase (4 months)
	RHZ (paediatric) 75/50/150 mg	Ethambutol 100mg	RH (paediatric) 75/50 mg
For infants below 2 kg, consult a paediatric specialist, DTLC, and RTLC for treatment advice			
2-2.9	½	½	½
3-3.9	1	½	1
4-7.9	1	1	1
8-11.9	2	2	2
12-15.9	3	3	3
16-24.9	4	4	4
>25	**Go to adult FDCs dosages**		

7.2 Treatment of Tuberculosis in Special Cases

7.2.1 Management of HIV Co-infection

HIV co-infection is a significant challenge for the prevention, diagnosis, and treatment of DS/DR-TB. However, the composition of the treatment regimen for DS/DR-TB does not usually differ substantially for PLHIV.

According to National AIDS, Sexual Transmitted Diseases, and Hepatitis Control Program (NaSHCOP), the following regimens are recommended for TB/HIV patients

Recipients of care group	Default 1st line Regimen	Alternative Regimen
HIV and TB co-infections	**A:** TDF/3TC/DTG (Double dosage of DTG)	**A:** TDF/3TC/EFV (TLE400)
		A: ABC/3TC+ DTG (Double dosage of DTG)

Also, the following should be considered in treatment of TB patients:

7.2.2 Pregnancy and Breastfeeding

TB medicines are safe during pregnancy and breastfeeding; therefore, all pregnant women confirmed with TB disease should receive the standard regimen accordingly

7.2.3 Oral contraceptives

Rifampicin interacts with oral contraceptives and reduces the efficacy of this contraception. higher dose of estrogen (50mcg) or a change to other contraceptive methods is recommended

7.2.4 People Who Inject Drugs (PWID)

PWID-TB patient who are on medication assisted therapy may require methadone dose adjustment. Rifampicin reduces methadone concentration, which may lead to rifampicin-induced methadone withdrawal. In that case, the methadone dose should be adjusted according to individual dosage (Refer to methadone treatment guidelines).

7.2.5 Liver disease:

Most of anti-TB medicines can cause liver damage. In case a patient develops jaundice, treatment should be stopped and restarted as soon as the jaundice resolves. In severely ill patients, start moxifloxacin and ethambutol only.

7.2.6 Renal failure:

The recommended initial treatment regimen for patients with renal failure or severe renal insufficiency is 2RHZE/4RH. Ethambutol and pyrazinamide should be used three times per week post dialysis according to the recommended dosage
For transplant patients, rifampicin should be replaced by rifabutin as it has less interaction with immunosuppressant therapy

Note:
- The oral drugs must be swallowed under observation from health facility staff or treatment supporter of his/her choice at home.
- The oral drugs should preferably be given on an empty stomach in a fixed dose combination.

TB Prevention Treatment (TPT);
The following are TB preventive treatment regimens recommended for use in Tanzania.

- 3months of isoniazid plus rifapentine weekly (3HP)

OR

- 3months of isoniazid plus rifampicin daily (3HR)

OR

- Isoniazid monotherapy for 6months (6H) as an alternative TPT regimen to those contraindicated to 3HP and 3HR

TPT regimen is offered to:

- Under 5 household contacts of bacteriologically confirmed PTB cases who have no active TB.
- All PLHIV who have no active TB.

Dosage
In adult and adolescent above 15years with more than 30Kgs
A: 3 Fixed Doses of Isoniazid/Rifapentine - 3HP (300mg/300mg) once per week for 3months

Children below 15years living with HIV and under 5years children of the household contacts of the TB patients without active TB will receive;

A: rifampicin (R) + isoniazid (H) 3HR 3 Fixed doses ((50mg/75mg) based on weight daily for 3months;
(For the children weighing above 25kg consider 3HR (75mg/150mg) daily for 3months)

OR

A: isoniazid (PO) 300mg 24hourly for 6months (For adults and children >30kg and above)
Isoniazid (PO) 7-15mg/kg maximum 300mg (In Children <30kg) 24hourly for 6months to complete one cycle of TPT

Note

- TPT can be repeated for People Living with HIV if the individual is at ongoing risk of TB exposure.
- People living with HIV who successfully completed their TB treatment should immediately receive TPT for three months.
- In case of neuropathy due to 3HP or 3HR, Pyridoxine should be used for treatment of neuropathy.
- TB Preventive Therapy is not contraindicated in pregnancy and it can be given during any trimester.

Breast feeding: In the mothers with pulmonary tuberculosis, the baby should receive INH preventive (5mg/kg) for 6 months followed by BCG vaccination

7.3 Drug Resistance Tuberculosis (DR-TB)

DR-TB is a laboratory diagnosis confirmed after culturing Mycobacterium tuberculosis strains and performing drug susceptibility tests (DST). WHO recommends the use of rapid genotypic tests such as Xpert MTB/RIF and TrueNat as initial diagnostic tests for TB as well as RR/MDR-TB cases that are eligible for MDR-TB treatment.

Clinical Presentation

The features are the same as susceptible tuberculosis but patient's shows resistance to the first line treatments. Signs and symptoms of DR-TB are like those of drug-susceptible TB (cough, bloody stained sputum, fever, night sweats and weight loss). Patients with the following features have high DR-TB risk (presumptive DR-TB patients)

- History of previous TB treatment
    - Treatment failure after using first-line anti-TB medicines
    - Relapse and return after loss to follow-up, without recent treatment failure
    - Patients who remain sputum smear-positive at month two or later during treatment of TB using first-line anti TB medicines
- Close contact of a known DR-TB case
- Healthcare workers presenting with TB symptoms.
- Vulnerable groups in congregate settings (prisoners, urban poor, miners, PWIDs)

All presumptive DR-TB cases adults and children must receive the Xpert MTB/RIF test as the initial diagnostic test to ensure universal coverage of DST

Pharmacological Management

When you diagnose RR/MDR TB communicate with DTLC for initiation of treatment.

Table 7.4: Proposed MDR TB treatment regimens

Age group	**Patient condition**	**Proposed regimens**	
		Intensive phase **----------** **Continuation phase***	If any of the medicines cannot be used, consult the DR-TB Consilium to consider replacement if needed using one or more of the following *based on DST, prior use and likelihood of efficacy* *(in order of priority)*
	MDR/RR-TB or with MDR/RR-TB and resistance to fluoroquinolones (pre-XDR-TB). Pulmonary DR-TB or all forms of extrapulmonary TB, except TB	**The 6-month regimen** (BPaLM/BPaL) BPaLM regimen should be administered orally for six months with a possible extension up to nine months. All 3 drugs to be given simultaneously: **S:** Bedaquiline 400 mg 24 hourly for 2 weeks, then 200 mg 3 times per week;	

Adults and children >14yrs	involving the CNS, osteoarticular TB and disseminated (military) TB. No evidence of resistance to Bedaquiline, Linezolid, Delamanid or Pretomanid, or patient has not been previously exposed to any of the component drugs for 4 weeks or longer. All people regardless of HIV status.	**AND** **S:** pretomanid 200 mg 24 hourly; **AND** **S:** linezolid 600 mg 24 hourly. **AND** **S:** moxifloxacin 400 mg 24 hourly	
	RR/MDR TB patients who are not eligible for BPaLM/BPaL due to pregnancy, breastfeeding and age below 14 years	**Alternative 6- months regimen** 6-month treatment regimen composed of Bedaquiline, Delamanid, linezolid, levofloxacin, and clofazimine (BDLLfxC)	
	Patients who are smear-negative and have good clinical and radiological responses will have a 3months duration of the continuation phase Patients with a positive smear at month four of treatment will receive an extended continuation phase of 5months	**The Modified 9- months** regimen (Lfx -Bdq - Lzd - Cfz - Cs – Z/ 3-5 Lfx- Cfz – Cs-Z)	[1]
	This is reserved for RR/MDR-TB patients who are not eligible for the 6-month and the 9-month regimen, Pre-XDR TB not eligible for 6-month regimen and all XDR-TB	**Longer MDR-TB regimens (18-20 months)** ● For RR/MDR-TB patients, use Bedaquiline (Bdq), Levofloxacin (Lfx), Linezolid (Lzd), Cycloserine (Cs), and Clofazimine (Cfz) in first six months of treatment and continuation of Levofloxacin (Lfx), Cycloserine (Cs), and Clofazimine (Cfz) for the remaining 12 months. ● For Pre-XDR TB/XDR TB, patients use Bedaquiline (Bdq), Delamanid (Dlm) Linezolid (Lzd), Cycloserine (Cs), and Clofazimine (Cfz) in first six months of treatment and continuation of Linezolid (Lzd), Cycloserine (Cs), and Clofazimine (Cfz) for the remaining 14 months	Consult Consilium on all pregnant cases. Consider strengthening the regimen post-partum with the addition of Bdq and Lzd (for 6 months; to replace Class C medicines if possible).

Paediatric treatment regimens for children <14 years with non-severe disease

All Second line anti-TB drugs should be dosed according to body weight (see PMDT management guidelines for Pediatric weight-based dosing)

All children should access the 6 months regimen comprised of Bedaquiline, Delamanid, Linezolid, Levofloxacin and Clofazimine **(BDLLfxC)**

- BDLLfxC initiated without delay in case of unknown FQ-resistance at the time of RR- TB diagnosis
- When results for FQ resistance are available, the following regimens should be modified
    - BDLLfx for FQ-sensitive TB;
    - BDLC for FQ-resistant TB.

Table 7.5: Paediatric treatment regimens for children <14 years with non-severe disease

Age group	Patient condition	Proposed regimens	
		Intensive phase **----------** **Continuation phase***	If any of the medicines cannot be used, consult the DR-TB Consilium to consider replacement if needed using one or more of the following *based on DST, prior use and likelihood of efficacy (in order of priority)*
0 – 14 yrs	RR/MDR TB susceptible to fluoroquinolone	**6 BDLLfx**	
	RR/MDR-TB with resistance to fluoroquinolone (pre- XDR) or extensive drug resistance (XDR- TB)	**6 BDLC**	
0 – 14 yrs	Children (and patients in other age groups) who do not have bacteriological confirmation of TB or resistance patterns but who do have a high likelihood of MDR/RR-TB (based on clinical signs and symptoms of TB, in combination with a history of contact with a patient with confirmed MDR/RR-TB).	**6 Lfx -Bdq - Lzd - Cfz - Cs – Z/ 3-5 Lfx- Cfz – Cs-Z**	

Corticosteroids

The use of corticosteroids in DR-TB patients can be beneficial in cases of severe respiratory insufficiency and severe extrapulmonary involvement. Prednisolone should be given in case by case at a starting dose of approximately 1mg/kg, (Maximum 80mg per day) with a gradual decrease in the daily dose by 10mg per week when a longer course is indicated.
In patients with an exacerbation of the obstructive pulmonary disease, prednisolone may be given in a short tapering course over 1–2 weeks, starting at approximately 1mg/kg and decreasing the dose by 5–10mg per day. Injectable corticosteroids are often used initially when an immediate response is needed

Post-TB Associated Disability (PTAD):

TB-associated long-term physical, mental, intellectual, or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others.
Post-TB Lung Disability (PTLD): Defined as a chronic respiratory abnormality that affects large and small airways (bronchiectasis and obstructive lung disease), lung parenchyma, pulmonary vasculature, and pleura, and may be complicated, with or without symptoms, attributable at least in part to previous pulmonary tuberculosis

Clinical Presentation of Post-Tuberculosis Associated Disability

- Patients may experience musculoskeletal issues such as arthritis or osteomyelitis, leading to chronic pain and reduced mobility.
- Neurological complications can include meningitis and tuberculomas, resulting in seizures, cognitive impairments, or motor deficits.
- Renal involvement can manifest as tuberculous nephritis, impairing kidney function and potentially leading to chronic kidney disease.
- Gastrointestinal complications, such as intestinal TB, can cause abdominal pain, malabsorption, and weight loss.
- Lymphadenitis
- Chronic cough,
- Dyspnea,
- Wheezing, and hemoptysis.
- Recurrent respiratory infections,
- Patients may exhibit classical symptoms of active tuberculosis, including fever, night sweats, persistent cough, and weight loss

Investigation

Following assessments should be conducted to confirm PTAD. This includes clinical, laboratory, and functional evaluations (such as;

- The 6-Minute Walk Test,
- Sputum Examination
- Blood Gas Analysis
- Lung Function Testing (Spirometry)
- Imaging assessments (including X-rays and CT scans)

Note: Investigations and management of post-TB lung conditions follow the same principles as other chronic respiratory diseases; For detailed guidance. refer to the chapter 9 for respiratory diseases.

Table 7.6: Medical Management of Post-Tuberculosis Associated Disability

Post-TB syndrome	Presenting symptoms	Investigations	Management
Post-TB Asthma	Cough, DIB, Chest tightness, Wheezing	CXR, Spirometry	Budesonide+ Formoterol inhaler (200 mcg/6mcg) depending on severity (Refer chapter for respiratory diseases)
Post-TB COPD	Cough, DIB, Chest heaviness, Wheezing	CXR, Spirometry	Long-Acting Bronchodilators and add-on therapy according to disease stage, Pulmonary rehabilitation (Refer chapter for respiratory diseases)
Post-TB Bronchiectasis	Cough, Fevers, Productive cough, Hemoptysis, DIB, Wheezing	CXR, Chest CT	Mucolytics, bronchodilators, antibiotics according to disease state, Chest Physiotherapy as required (Refer chapter for respiratory diseases)
Post-TB Aspergilloma	Cough, Sputum production, Hemoptysis	CXR, Chest CT, Aspergillus IgG antibody titers	Antifungal therapy Surgical options when indicated (Refer chapter for respiratory diseases)
Recurrent chest infections	Cough, purulent sputum production, fevers	CXR, FBP, CRP/ESR	Treat according to culture results
Pulmonary Hypertension and Right-sided heart failure	Lower limb swelling, difficulty in breathing, and exercise intolerance	CXR, ECG, Echocardiography	Sildenafil 25-100 mg/day Furosemide 40-160 mg/day (Refer chapter for respiratory diseases)
Mental health disorder	Depression, Anxiety	PHQ-9 questionnaire depression score (Refer to **Annex 4**) GAD7 (Refer to **Annex 5**)	If PHQ9 ≥ 10 scores and GAD7 ≥ 10 refer to a psychiatrist for evaluation and further management
Extensive lung fibrosis	Difficulty in breathing, exercise intolerance, chest pains	CXR, CBC -/+ Chest CT, Spirometry	Pulmonary rehabilitation Limited role of medical therapy (Refer chapter for respiratory diseases)

Non-Pharmacological Management and prevention

Differentiated Pulmonary Rehabilitation Service Delivery Packages Respiratory Health Management

- Physical Exercise and Activity
- Nutrition and Diet
- Lifestyle Modifications-Smoking Cessation
- Psychological Support-Mental Health Awareness
- Community and Social Support

7.4 General Treatment of Leprosy

Leprosy is a chronic granulomatous disease caused by *Mycobacterium leprae.* It mainly affects the skin, the peripheral nerves and the mucous membranes. Leprosy is the commonest cause of peripheral neuritis in the world.

Clinical Presentation

Presence of any one among the three cardinal signs of leprosy below:

- Skin patch with loss of sensation
- One or more enlarged peripheral nerves
- Presence of leprosy bacilli–positive smear

Classification of Leprosy Multibacillary (MB) Leprosy

- Patients with six or more leprosy skin lesions
- Positive skin smear

Paucibacillary (PB) Leprosy

- Patients with one to five leprosy skin lesions
- Negative skin smear

Note: If there is any doubt regarding the classification, the patient should be classified and treated as a multi-bacillary case.

Pharmacological Management

Patients should be treated by multidrug combination therapy; dosage may depend with classification and whether patient is adult or children

Table 7.7: Treatment of Leprosy

Classification	Medicine dosage	Duration of treatment
Adult MB:15years and above	Day 1: **A:** rifampicin 600mg + **A:** clofazimine 300mg +**A:** dapsone 100mg Day 2–28: **A:** clofazimine 50mg + **A:** dapsone 100mg daily	12 blister packs to be taken within a period of between 12–18 month
Child MB: below 15years	Day 1**: A:** rifampicin 450mg + **A :** clofazimine 150mg + **A:** dapsone 50mg Day 2–28: **A:** clofazimine 50mg every other day + **A:** dapsone 50mg daily	12 blister packs to be taken within a period of between 12–18 month
Adult PB:15years and above	Day 1**: A:** rifampicin 600mg + **A:** clofazimine 300mg + **A:** dapsone 100mg, Day 2–28: **A:** Clofazimine 50mg + **A :** Dapsone 100mg daily	6 blister packs to be taken within a period of between 6–9 months
Child PB: below 15years	Day 1**: A:** rifampicin 450mg + **A :** clofazimine 150mg + **A:** dapsone 50mg Day 2–28: **A:** clofazimine 50mg every other day + **A:** dapsone 50mg daily	6 blister packs to be taken within a period of between 6–9 months

7.4.1 Treatment of Leprosy in Special Cases

Tuberculosis: Patients suffering from both tuberculosis and leprosy require appropriate anti- Tuberculosis therapy in addition to the MDT. Rifampicin must be given in the dose required for the treatment of tuberculosis. Once the intensive phase of anti TB treatment is completed, the patient should continue with his/her monthly rifampicin for leprosy treatment.

Leprosy reactions: These are acute immune-mediated inflammatory episodes in leprosy patients
There are two types of reactions

- Reverse Reaction or type I reaction
- Erythema Nodosum Leprous (ENL) or type II reaction (For detail refer Manual for the Management of Tuberculosis and Leprosy in Tanzania)

Note: Health care worker should communicate with DTLC and RTLC whenever they suspect leprosy reaction

Treatment of Reaction: Depending on severity, treatment of reverse reaction is by giving anti- inflammatory drugs or corticosteroids usually prednisolone for a prolonged period.

7.4.2 Leprosy post-exposure prophylaxis

Single dose rifampicin for post-exposure leprosy prophylaxis (SDR-PEP) administration is only for eligible contacts with negative leprosy screening outcomes or for referred contacts that are followed-up after leprosy/TB were ruled out.
Single dose rifampicin for post-exposure leprosy prophylaxis must be dosed in accordance with the national leprosy treatment guidelines:

Table 7.8: Dosage of rifampicin given as SDR for leprosy prophylaxis

Age / body weight	Rifampicin single dose
15years and above	600mg
10-14 years	450mg
Children 6-9years (weight ≥20 kg)	300mg
Children 6-9years (weight <20 kg)	150mg
Children 2-5 years with weight ≥10 kg	10-15mg/kg

CHAPTER EIGHT

NERVOUS SYSTEM DISEASE CONDITIONS

8.1 Infections of the Nervous System

Infections of the nervous system can arise secondary to bacteria, fungi, protozoa, or viruses. Clinical features will depend on the site of the nervous system involved.

8.1.1 Bacterial infections

8.1.1.1 Bacterial Meningitis

Bacterial meningitis is a serious infection involving layers (meninges) covering the brain and spinal cord. Causative bacteria differ among different age groups.

Clinical Presentation

Headache, high grade fever, Altered mental status, convulsions, coma, Photophobia, Nausea and vomiting, Signs of meningeal irritation.

Investigations

CBC, Blood C/S, Lumbar puncture for CSF analysis

Pharmacological Management

Where the organism is not known:

A: benzylpenicillin (IV) 5MU 6hourly for 14days.

AND

B: chloramphenicol (IV) 1000mg 6hourly for 14days

OR

D: ceftriaxone+ sulbactam (FDC) (IV) 1.5g 12hourly for 14days

OR

C: ampicillin+ sulbactam (IV) 3g 6hourly for 10–14days

AND

S: cefepime (IV) 2g 8hourly for 10–14days

OR

based on C/S results give

S: meropenem (IV) 2g 8hourly for 10days

Where the organism is known:

Meningococcal meningitis (Refer to notifiable diseases section)

Haemophilus influenza meningitis

B: chloramphenicol (IV) 1g 6hourly for 7–10days.

OR

D: ceftriaxone+ sulbactam (FDC) (IV) 1.5g 12hourly for 14days

Pneumococcal meningitis

A: benzylpenicillin (IV) 5MU 6hourly for 14days

OR

D: ceftriaxone + sulbactam (FDC) (IV) 1.5mg 12hourly for 14days

Note: Where bacterial meningitis is suspected empiric antibiotic Ceftriaxone or Cefotaxime should be administered before admission or transfer

8.1.1.2 Tuberculous Meningitis

Tuberculous meningitis (TBM) is the most common form of central nervous system tuberculosis, associated with high mortality and morbidity from neurological sequelae.

Clinical Presentation

- Headache
- Low grade fever
- Altered mental status, coma.
- Seizures
- Nausea and vomiting
- cranial nerve palsies, stroke like syndrome

Laboratory investigations

- CBC
- Blood C/S
- LP for CSF analysis
  - lymphocytic-predominant pleocytosis usually between 100-500 cells/μL
  - elevated protein levels typically between 100 and 500 mg/dL
  - low glucose-usually less than 45 mg/dL or CSF: Plasma ratio <0.5.
- CSF GeneXpert
- CSF for AFB
- HIV testing

Imaging Investigations

- Contrast head CT scan-can demonstrate multiple ring-enhancing lesions, meningeal and basal cisterns enhancement, dilatation of ventricles
- Contrast brain MRI with diffusion weighted sequences (DWI); CXR

Non-Pharmacological Management

- Screen for postinfectious hydrocephalus as it is a common complication of all meningitis cases and can occur early during treatment—monitor for persistent headache, vomiting, papilledema on fundoscopy and parinauds syndrome.
- Refer all patients presenting with clinical or radiological features of increased ICP from hydrocephalus for neurosurgical evaluation directed at treatment of the associated hydrocephalus by external ventricular drainage (EVD) or VP shunt once CSF is sterile.
- Monitor urine output and serum sodium levels as syndrome of inappropriate antidiuretic hormone secretion (SIADH) is a common complication

Pharmacological Management

Refer to TB and leprosy chapter 7

8.1.1.3 Tetanus

It is an acute, often fatal disease caused by an exotoxin produced by the anaerobic bacterium Clostridium tetani. It is acquired through wounds contaminated with spores of the bacteria and in the case of neonates, through the umbilical stump, resulting in neonatal tetanus.

Clinical Presentation

- Generalized spasms and rigidity of skeletal muscles
- Opisthotonus
- Risus sardonicus
- Locked jaws
- Patients are usually fully conscious and aware.
- Dysphagia
- Diaphoresis
- Local spasms may also occur

Non-Pharmacological Management

- Admit in intensive care unit (ICU)
- Nurse in dark, quiet room to avoid unnecessary external stimuli which can trigger spasms
- Protect the airway (evaluation for early tracheostomy is required)
- Thorough cleaning of the entry site (e.g., wound), leaving it exposed without dressing
- Maintenance of fluid balance and nutrition (via NGT)
- Avoid giving medications via IV/IM route as injections can trigger spasms
- Sedation (see below) and care as for unconscious patient

Pharmacological Management

Treatment is generally aimed at the following:
Pain management as the spasms can be very painful
A: paracetamol (PO/NGT) 1gm 8 hourly for 5 days

For prevention of further absorption of toxin from the wound
A: tetanus immunoglobulin (TIG) (IM) Adults 3000IU stat
AND
A: amoxicillin (PO/NGT) 500mg 8hourly for 5days
AND
A: metronidazole (PO/NGT) 400mg 8hourly for 5days

Control of spasms: Give a sedative cocktail of the following medications preferably via NGT:
C: diazepam (PO/NGT) 10-30mg 4-6hourly for 7-14days
AND
A: chlorpromazine (PO/NGT)100–200mg 8hourly for 7-14days
AND
A: phenobarbitone (PO/NGT) 50–100mg 12hourly for 7-14days

Table 8.1:Guidelines for Dosage Administration**

Time (Hours)	0	3	4	6	9	12	15	18	21	24
diazepam	*			*		*		*		*
chlorpromazine			*			*			*	
phenobarbitone		*					*			

Prevention: tetanus vaccine (IM) 0.5ML; repeat after 4 weeks and after 6-12months, then boost every 10years thereafter.

8.1.1.4 Brain Abscess

Brain abscess is a focal collection of purulent material within the brain parenchyma, which can arise as a complication of a variety of local cranial or remote systemic infections, trauma, or surgery. The manifestations of brain abscess depend on the site, size, and the immune status of the patient.

Clinical Presentation

Headache, Fevers, Seizures, Focal neurological deficit, altered mental status that may progress to coma.

Imaging Investigations

- Focal neurological deficit
- Altered mental status that may progress to coma
- Contrast head CT scan--can demonstrate a ring-enhancing lesion and possible source of infection, e.g., from paranasal sinuses, ear infections
- Contrast brain MRI with diffusion-weighted sequences (DWI)
- MR spectroscopy to distinguish from brain tumors, where diagnosis is unclear
- CXR
- ECHO in suspected valvular heart disease

Laboratory Investigations

- Gram stain, C/S of pus from possible sources
- Purulent aspirate from the abscess for C/S
- Ziehl Neelsen stain, Gene X-pert

Non-Pharmacological Management

- Follow the ABCD protocol
- If unconscious insert NGT for feeding
- Insert urethral catheter

Pharmacological Management:

- Control fever and pain with IV Paracetamol
- Manage seizures with anti-seizure medication
- Prompt initiation of intravenous antibiotics
- Steroids in selected case

Table 8.2: Pharmacological Management of Brain abscess

Condition	Management	Duration
Brain abscess (unspecific bacterial)	**A:** benzylpenicillin (I.V) 5MU 6hourly **OR** **C:** amoxicillin + clavulanic acid (FDC) (IV) 1.2g 12hourly **OR** **D:** ceftriaxone+ sulbactam (FDC) (IV) 1.5g 12hourly **AND** **B:** metronidazole (IV) 500mg 8 hourly	4-6weeks
	alternative regimen based on C/S results **S:** piperacillin+ tazobactam (FDC) (IV) 4.5g 8hourly **OR** **S:** meropenem (IV) 2g every 8hourly	2 Weeks
Brain abscess (Staph. aureus)	**S:** vancomycin (IV) 1g 12hourly (used with cefotaxime or ceftriaxone+ sulbactam)	4-6weeks
Seizures control	**C:** phenytoin (IV) 15mg/kg loading dose infused at 50mg/min followed by 100mg (IV/PO) 8hourly **OR** **A:** carbamazepine (PO/NGT) 200mg 12hourly **OR** **C:** sodium valproate (PO) 250mg 12hourly (escalate dose as required based on response)	Until seizure free for at least 6 months
ICP control in selected cases	**B:** dexamethasone (IV) 0.15mg/kg 6hourly	3-5days

Note: If allergic to penicillin, chloramphenicol 500mg IV every 6hours can be used instead. Instead. In case antiseizure medication are used for prolonged durations, a 5mg daily Folic acid supplement should be added for the entire duration of anticonvulsant treatment, especially in women of childbearing age.

Surgical management
Refer all patients diagnosed with brain abscess for neurosurgical evaluation.

- Stereotactic abscess aspiration (Frame or Frameless)-incorporated with a thin-slice CT scan
- Craniotomy (Burr holes) for drainage of abscess
- Craniotomy and Excision of the Capsule for Stage 4 Abscess.

In cases where the source of infection is paranasal sinuses or ear infection, involve concomitant ENT Surgeon evaluation for primary source control interventions.

8.1.2 Fungal Infections

Cryptococcal Meningitis (CM)
CM is the most common form of fungal meningitis worldwide. It often develops in patients who are immunocompromised e.g., HIV-positive patients with low CD4 cell count, diabetic mellitus and iatrogenic immunosuppression, as in post organ transplant patients.

Clinical Presentation

- Headache, fever, intolerance to light and sound,
- Neck stiffness, vomiting, seizures, deafness, impaired vision
- In advanced stages it may present with confusion,
- Altered mental status that may progress to coma

Investigations

- CSF gram stain
- CSF India Ink stain test
- Serum or CSF Cryptococcal antigen (CrAg) test
- CSF cultures
- Contrast brain MRI may demonstrate Cryptococcus's

Pharmacological Management
The treatment should be done in 3 phases:

Phase 1: Induction phase
S: single high dose of Liposomal amphotericin B 10mg/Kg IV* (Day One Only)
AND
S: 5 Flucytosine 100mg/kg (PO) per day divided into four doses per day for 14 days
AND
A: fluconazole (PO) 1200mg 24 hourly for 14 days
Children and adolescents 12mg/kg per day to a maximum of 800mg daily
OR
S: amphotericin B deoxycholate (IV) 0.7-1mg/kg/day
AND
S: 5 flucytosine (PO)100mg/kg/day for 7days followed by 1 week of
AND
A: fluconazole (PO): Adult 1200mg/day,

Children/adolescents 2mg/kg/day, up to a maximum dose of 800mg daily
In the absence of Amphotericin B:
S: Flucytosine 100mg/kg (PO) per day divided into four doses for 14days
AND
A: Fluconazole 1200mg 24 hourly
Children and adolescents 12mg/kg per day for up to a maximum of 800 mg daily

In the absence of flucytosine, alternative therapy should be:
S: amphotericin B deoxycholate (IV) if available give 3-6mg/kg for 10days
OR
S: liposomal amphotericin B (IV) (3-4mg/Kg per day) for 14 days
AND
A: fluconazole (PO) 1200mg 24 hourly for 14days
OR
C: fluconazole (IV) 1200mg 24 hourly for 14days

Phase 2: Consolidation phase
A: fluconazole (PO) 800mg/day for 8weeks or until CSF is sterile.

Phase 3: Maintenance phase
A: fluconazole (PO) 200mg 24hourly for 1year
Discontinue maintenance treatment if CD4 ≥100 with undetectable (<50 copies), viral load or CD4 ≥ 200 if viral load monitoring not available.

Note
- It is recommended to initiate ART 5 weeks after initiation of Cryptococcal meningitis treatment in ART naïve patient to prevent IRIS and reduce mortality.
- Monitor creatinine, BUN, serum Potassium and magnesium in all patients on Amphotericin B every 24hours.
- *Follow dilution and filtration recommendation provided in the L-AmB package

Non-Pharmacological Management
- Refer to section on bacterial meningitis in unconscious patients.
- Perform serial Lumbar puncture for management of increased ICP in cryptococcal meningitis. Opening pressure should be measured during LP and therapeutic CSF drainage done (20-30ml per session) for pressures >25cm H2O.
- Failure to control ICP after several LPs (recommended 3 attempts) should prompt neurosurgical evaluation for ventriculoperitoneal shunt insertion to divert CSF.

Note: The usage of Mannitol, Hypertonic saline, acetazolamide, or corticosteroids to manage increased ICP in Cryptococcal meningitis is ineffective and NOT recommended.

Clinical Presentation
Altered mental status, Focal neurological deficits, Seizures, Neuropsychiatric manifestations.

Imaging Investigations
- Contrast head CT scan-demonstrates ring-enhancing lesions
- Contrast brain MRI with diffusion weighted sequences (DWI)
- CXR

Laboratory Investigations
- Toxoplasma serology (IgM)

Non-Pharmacological Management
Similar to bacterial meningitis

Pharmacological Management
For acute infection give:
A: sulfadiazine (PO) 1g 6hourly for 6weeks
AND
A: pyrimethamine (PO) 100mg loading dose then 50mg /day for 6weeks
AND
S: folinic acid (PO) 10mg /day for 6weeks.

After six weeks of treatment give maintenance treatment with
D: sulfadiazine (PO) 500mg 6hourly
AND
D: pyrimethamine (PO) 25-50mg /day
AND
S: folinic acid (PO) 10mg /day until CD4 counts is above 200cells/microlitre and/or undetectable viral load for 3-6months

For those allergic to Sulfur replace Sulfadiazine with
S: clindamycin (PO) 450mg 6hourly for 6weeks.

8.1.3. Helminthic infections

Neurocysticercosis (NCC)
NCC is a neurologic infection caused by the larval stage of the tapeworm Taenia solium. In the developing world NCC is the most common cause of new onset acquired epilepsy among the adult population. Humans are the definitive hosts for this parasite, and swine are the intermediate hosts. The mature tapeworm develops in humans after they ingest live cysticercoses in undercooked pork. NCC develops when humans accidentally ingest eggs from fecal contaminated food.

Clinical Presentation
Headache, Seizures, Focal neurological deficit, Features of increased intracranial pressure

Imaging Investigations
- Contrast head CT scan-can demonstrate ring enhancing lesions, calcified lesions
- Contrast brain MRI can demonstrate viable cystic lesions with scolices

Laboratory Investigations
- FBP, serum electrolytes
- Enzyme-linked immunotransfer blot (EITB)
- Liver function tests

Non-Pharmacological Management
- If unconscious, airway and breathing management
- Insert NGT for feeding
- Insert indwelling urethral catheter

Surgical management
- Refer all patients diagnosed with CNS cysticercosis associated with clinical or radiological features of increased intracranial pressure from hydrocephalus for neurosurgical evaluation directed at management of the associated hydrocephalus.
- In patients with untreated hydrocephalus or diffuse cerebral edema, management of elevated intracranial pressure should proceed anthelminthic treatment.

Pharmacological Management

Table 8.3: Pharmacological Management of NCC

Condition	Management	Duration
Anthelminthic treatment for single viable lesion	**A:** albendazole (PO) 15mg/kg/day divided into two daily doses (maximum of 1200mg/day)	2-4weeks
Anthelminthic treatment for multiple viable lesions	**A:** albendazole (PO) 15mg/kg/day divided in two daily doses (maximum of 1200mg/day) **AND** **A:** praziquantel (PO) (50mg/kg/day)	2-4weeks 2weeks
Seizures control	**C:** phenytoin (IV) 15mg/kg loading dose infused at 50mg/min followed by 100mg (IV/PO) 8hourly **OR** **A:** carbamazepine (PO) 200mg 12hourly (can be adjusted based on individual response) **OR** **C:** sodium valproate (PO) 250mg 12hourly (escalate dose as required based on response)	Until seizure free for at least 6 months
Control of increased ICP	**D:** dexamethasone (PO) 0.15mg/kg 6 hourly for 3-5days then taper down. **OR** **B:** dexamethasone (IV) 0.15mg/kg 6 hourly for 3-5days then taper down	2weeks

Note: Fundoscopic examination is **mandatory** for all patients before initiation of anthelminthic therapy.

8.1.4 Viral infections

Viral infections of the nervous system are mainly caused by *Herpes simplex* virus (HSV) and Human immunodeficiency virus (HIV). (Refer to section on viral infections and HIV)

Herpes simplex encephalitis
Most of cases in adults are caused by HSV-1, a small number are caused by HSV-2 usually in immunosuppressed states or in neonates. It should be suspected in all patients not responding to antibiotics/other treatments.

Clinical Presentation

- Early features are fever, headache & altered consciousness which may develop gradually over days or rapidly over hours
- The most common manifestations are personality change, dysphasia, behavioral disturbance, and occasional psychotic features
- Focal or generalized seizures

Investigations

- Lumbar puncture--CSF is under increased pressure and may appear normal or show a mild-moderate lymphocytosis, a mild-moderate elevated protein levels and normal or decreased glucose.
- CSF PCR
- HSV1+HSV2 CSF Rapid test
- MRI—demonstrate predominant involvement of the limbic system structures, medial temporal lobes, and insular cortex

Non-Pharmacological Management

Provide supportive therapy as for unconscious patients

Pharmacological Management

B: acyclovir (IV/PO) 10–15mg/kg 8hourly for 14–21days

8.2 Initial Management of Stroke

8.2.1 Management of Acute Hemorrhagic Stroke

Spontaneous, nontraumatic intracerebral hemorrhage (ICH) remains a significant cause of morbidity and mortality throughout the world. However, population-based studies indicate that most ICHs in most patients are survivable with good medical care thus emphasizing the importance of improved clinical care. in determining ICH outcome.

Clinical Presentation: FAST (Face)

Arm Speech Time)

- Severe headache, vomiting,
- Focal neurological deficits
- Seizure
- Sudden vision changes
- Loss of balance or coordination
- Difficulty understanding, speaking (Slurring, confusion) reading or writing
- Decreased level of consciousness that may progress to coma
- Symptom progression over minutes or hour
- **F**ace: is the face drooping on one side
- **A**rm: Can the person raise both arms
- **S**peech: Is the speech slurred or strange?
- **T**ime: if any of these present call emergency services immediately

Investigations

- Rapid neuroimaging: plain head CT to distinguish ischemic stroke from ICH
- MRI with angiography is useful to evaluate for underlying structural lesions e.g., vascular malformations and tumors in suspicious cases
- CT venography to evaluate Cerebrovenous sinus thrombosis
- Platelet count INR and PTT

Admit all patients with ICH in an ICU or dedicated stroke unit for initial management and monitoring.

Non-Pharmacological Management

- Apply compressive stockings or intermittent pneumatic compression at admission to prevent VTE
- LMWH can be started later after cessation of bleeding in immobile patients.
- Consider systemic anticoagulation or IVC filter only in patients with symptomati**c** deep vein thrombosis or Pulmonary embolism.

Surgical management
Neurosurgical evaluation for

- External Ventricular drainage (EVD) in patients with decreased level of consciousness from resultant hydrocephalus in the setting of intraventricular hemorrhage, +/- aTPA 2 – 4 mg 12hrly (alteplase) intrathecal
- Minimally invasive clot evacuation. Frame or Frameless (Brain Neuronavigation) stereotactic Aspiration (Thin Slices CT scan is mandatory to be incorporated. Endoscopic aspiration of haematoma with or without thrombolytic usage, Alteplase intralesional
- CRANIOTOMY for surgical evacuation of hematoma as soon as possible in patients with cerebellar hemorrhage and supratentorial haematoma (Lobar) who are deteriorating neurologically or who have brainstem compression and/or hydrocephalus from ventricular obstruction
- CRANIECTOMY for decreasing ICP in deteriorating patients as a life-saving measure in selected cases, based on expert neurosurgical clinical judgement

Pharmacological Management
For elevated SBP (150-220mmHg), initiate BP lowering treatment, target at 140mmHg within the hour. Consider more aggressive reduction (by 60mmHg) if SBP>220mmHg.
C: labetalol (IV) at 1mg/min until target SBP is attained.
OR
S: nicardipine HCL (IV) 10mg/hr (100ml/Hr) increasing dose by 2.5mg /hr every 15 minutes up to 15mg/hr
Anticoagulation-and antiplatelet or using Factor Xa inhibitors (Apixaban, edoxaban, rivaroxaban) related ICH: withhold antiplatelets** and anticoagulants and correct INR, if elevated, start on vitamin K and consider FFP transfusion
AND
B: phytomenadione (vitamin K) (IV) 1mg slow infusion over 60 minutes
OR
D: fresh frozen plasma (IV) 15 – 20mg/kg

Chemoprophylaxis with LMWH can be initiated after 48hrs
D: low molecular weight heparin (SC) 40mg per day

To reverse the anticoagulant effects of Low Molecular Weight Heparin within 12 hours give
B: protamine 50mg if < 8hrs since last dose of LMWH or 25mg if >8hrs since last dose of LMWH

Note: Initiate Acetylsalicylic acid in recent cardiac stents or in place of anticoagulation during 4weeks following ICH

If increased ICP based on clinic radiological features, give
C: mannitol (IV bolus) 0.25-1gm/kg 4-6hourly for 24-72hours
OR
C: sodium chloride 3% (hypertonic saline) (IV bolus) at 3-5ml/kg 4-6hourly for 24-72hours

Monitor serum osmolarity and renal function when giving Mannitol or Hypertonic saline, stop if osmolarity goes >320mOsm/L
Control fever with antipyretic medications and/or external cooling methods, investigate for treatable cause

D: paracetamol (IV) 1g 8hourly for 3-5days then when required
Perform regular monitoring and control of blood glucose to prevent both hyperglycemia and hypoglycemia.
Treat clinical or electrographic seizures associated with decreased loss of consciousness
S: levetiracetam (PO/IV) 500mg 12hourly for 2weeks
OR
C: phenytoin (IV) 15mg/kg loading dose over 30min, then maintenance at 100mg 8hourly for 2weeks.

Thrombolytic agents:
S: Injection Alteplase (Intrathecal) 1-2mg stat and may repeat after 24 hours (intraventricular)
OR
S: Injection Alteplase (intralesional) 2-4 mg Stat

8.2.2 Initial Management of Acute Subarachnoid Hemorrhage from Ruptured Cerebral Aneurysm

Subarachnoid hemorrhage (SAH) refers to the presence of blood in the fluid-filled subarachnoid spaces around the brain and spinal cord. The most common presentation is sudden onset of severe novel headache. SAH from ruptured cerebral aneurysms is associated with high mortality and morbidity hence clinician's high index of suspicion and proper initial management is crucial for patient's survival and improved functional outcome.

Clinical Presentation

- Severe headache (worst headache of life)
- Altered mental status that may progress to coma
- Focal neurological deficits
- Seizures

Investigations

- CBC, PT/PTT/INR
- Serial ABGs, electrolytes
- serum and urine osmolality
- CT angiography
- Four vessel catheter angiography/digital subtraction angiography (DSA)
  - Perform 4-vessel catheter angiography to determine source of bleeding
  - The timing of study takes into consideration the patient's condition (unstable or premorbid patients are not candidates), the feasibility of early treatment, the likelihood of endovascular therapy (based on patient's age and predicted aneurysm location as well as availability of required resources and expertise)
- CXR—monitor for pulmonary edema if in hyperdynamic therapy

Note: Principles of initial management of aneurysmal **SAH** are focused on

- Initial hemodynamic stabilization and life support of the patient
- Prevention of rebleeding through timely coiling or surgical clipping
- Prevention, identification, and early management of hydrocephalus
- Prevention and management of delayed ischemic neurologic deficit (DIND) from vasospasm

Admitting orders

- Admit all aneurysmal SAH patients to ICU regardless of their initial GCS score
- Document initial Hunt & Hess, WFNS clinical scores, and Fisher CT scan score
- Bedrest with head of bed elevation at 30°.
- Initiate SAH precautions (low level of external stimulation, restricted visitation, dim light, no loud noises)
- Check neurological status every 1 hour.
- Bed pan, indwelling Foley catheter if patient is lethargic, incontinent with strict Inputs & outputs measurements.
- Keep Nil per Oral (if in preparation for surgery or endovascular intervention)
- Maintain SBP 120–160mmHg in unsecured (unclipped/uncoiled) aneurysm to minimize rebleeding risk, consider

Surgical management

For Neurosurgical evaluation and Intervention via surgical clipping or endovascular intervention (coiling or embolization) to secure the ruptured cerebral aneurysm.

Non-Pharmacological Management

Oxygenation goals (for intubated ventilated patients)

- pO2 > 100mm Hg, O2 saturation 100% in patients at risk for vasospasm, aim for 92% saturation in all others.
- To achieve above goals, increase FiO2 and mean airway pressure (PEEP) in ventilated patients
- In non-intubated patient: Give O2 2L per nasal cannula PRN (based on ABG)
- Strive for normocarbia, avoid prophylactic hyperventilation
- Avoid arterial hyperoxia (paO2 > 300mm Hg)- to avoid risk of vasoconstriction
- Maintain normothermia and encourage other cooling measures to reduce and prevent fever.

Pharmacological Management

C: labetalol (IV) 1mg/min until target SBP is attained.
A: sodium chloride 0.9%
AND
C: potassium chloride 20 mEq KCl/L at 2 ml/kg/hour maintenance fluid

Prophylactic anticonvulsants:
S: levetiracetam (PO/IV) 500mg 12 hourly while aneurysm is unsecured, continue for 1week post clipping/endovascular intervention
OR
C: phenytoin (IV) 15mg/kg loading dose at 50mg/min rate then 100mg 8hourly for 2-4 weeks

Sedation (not over sedation):
D: propofol (IV) (for intubated patients) at 25-75mcg/kg/minute

Give
B: dexamethasone (IV) 4mg 6 hourly for 3-5days to reduce neck pain
AND
S: fentanyl (IV) 25–100mcg (0.5–2 ml) every 1–2hours when required in ICU.

Stool softener: Initiate
C: lactulose (PO) 30mls 8hourly until aneurysm is secured.

Anti-emetics:
D: ondansetron (IV) 4mg over 2–5minutes, may repeat 8hourly for 1–2days.

Prevention of vasospasm: Initiate
S: nimodipine (PO/NGT) 60mg 4hourly, continue for 21days

Stress ulcer prophylaxis:
C: pantoprazole (IV) 40mg 24hourly for 1-2weeks

D: paracetamol (IV) 1g 8hourly for 3-5days then when required

- Hemoglobin and hematocrit: Transfuse whole or PRBC when Hct drops < 40%)
- Monitor serum glucose and maintain normoglycemia.

8.2.3 Initial management of Acute Ischemic Stroke

Acute ischemic stroke (AIS) is a leading cause of adult disability in the developed world. In AIS, thrombus impairs cerebral blood flow, resulting in brain tissue infarction. Collateral blood flow gives rise to an area of hypo perfused tissue (ischemic penumbra) that is at risk of infarction if hypoperfusion persists. Prompt reopening of an occluded blood vessel to re-establish blood flow to the ischemic area (reperfusion) in eligible patients, can rescue the ischemic penumbra from death and spare the patient from serious long-term disabilities.

Clinical Presentation

- Severe headache
- Focal neurological deficits
- decreased level of consciousness that may progress to coma
- seizures
- symptom progression over minutes or hours

Prehospital and lower-level health facilities

- Provide initial airway management and hemodynamic stabilization
- Exclude stroke mimics like hypoglycemia
- International stroke guidelines recommend rapid identification of all fibrinolytic-eligible and mechanical thrombectomy-eligible patients to facilitate initiation of treatment in the fastest achievable onset-to-treatment time
- Consider prompt referral to a centre that can handle stroke patients including rapid neuroimaging and administration of reperfusion therapy.

Referral hospital and specialized centres

- Provide initial stabilization of the patient as per ABCDE protocol
- Perform rapid careful neurological examination.
- Order emergency brain imaging evaluation before initiating any stroke specific treatments.
- Screen for reperfusion eligible patients and initiate appropriate treatment protocol.
- In patients with AIS who awake with stroke symptoms or have unclear time of onset > 4.5 hours from last-known-well (LKW) state, perform brain MRI to identify diffusion-positive, FLAIR-negative lesions to aid selecting those who can benefit from IV alteplase administration.
- In potential candidates for mechanical thrombectomy, consider imaging of the extracranial carotid and vertebral arteries, in addition to the intracranial circulation, to provide useful information on patient eligibility and endovascular procedural planning.

Note: Reperfusion criteria, all must be met

- Clinical diagnosis of an ischaemic stroke causing a measurable deficit
- The patient should be 18years or older
- Onset of stroke or last known well (LKW) state **<4.5hours**
- No increased bleeding risk contraindications
- Blood pressure controlled to <185/105mmHg target.
- Non-contrast brain CT has excluded intracranial hemorrhage and/or

Non-Pharmacological Management

- Oxygenation—support airway, maintain O2 saturation >94%
- Monitor BP, if elevated, initiate BP lowering treatment to target BP<185/110 mmHg
- For patients non eligible for fibrinolysis with extreme BP elevation SBP>220 or DBP> 120 mmHg, should be lowered by 15% over the first 24hrs
- For patients who are non-eligible for fibrinolysis with moderate BP elevation SBP up to 220 or DBP up to 120 mmHg BP should not be lowered (Permissive Hypertension) in the first 24 hours
- Monitor body temperature and initiate treatment when >38°C
- In immobile stroke patients without contraindications, offer compressive stockings, or pneumatic compression devices for DVT prophylaxis.
- Start on enteral diet (PO/NGT) after evaluation of swallowing

Pharmacological Management
A: acetylsalicylic acid (PO) 325mg 24hourly for 4weeks
AND
C: labetalol (IV) 10-20mg infusion 1-2min, repeated until target BP is attained.
AND
D: paracetamol (IV) 1g 8hourly for 3-5days then when required.

Note: For those treated with alteplase, acetylsalicylic acid administration should be delayed for 24 hours

Patients with an acute high-risk TIA or Minor Ischaemic stroke of non-cardioembolic origin (NIHSS 0-4) not at high bleeding risk start Dual Antiplatelet Treatment (DAPT)
A: acetylsalicylic acid ASA (PO) 150mg STAT then 75mg daily
AND
D: clopidogrel 300-600 mg stat then 75mg daily for 21 days
OR
A: acetylsalicylic acid 300mg STAT then 75mg daily
AND
S: ticagrelor 180mg stat then 90mg daily for 21days

Patients not meeting DAPT criteria initiate single antiplatelet
A: acetylsalicylic acid 150mg STAT then 75mg daily for 21 days
OR
D: clopidogrel 300 to 600mg STAT then 75mg daily for 21 days

Patients with atrial fibrillation
C: warfarin (PO) 5mg daily for 21 days before 28 days after cardioversion
OR
S: rivaroxaban (PO) 20mg od for 30days
OR
S: apixaban (PO) 5mg 12hourly for 30 days

Patients with Confirmed Intracranial atherosclerosis initiate DAPT within 24Hrs of stroke onset or as soon as intracranial atherosclerosis is confirmed.
A: acetylsalicylic acid 300mg
AND
D: clopidogrel 600mg STAT continue A: acetylsalicylic acid 150mg AND D: clopidogrel 75mg daily for 90 days followed by A: acetylsalicylic acid 75mg monotherapy lifelong
B: atorvastatin (PO) 40mg – 80mg daily for 180days
OR
S: rosuvastatin (PO) 20mg - 40mg daily for 180 days

For seizure control
C: phenytoin (IV) 15mg/kg loading dose over 30min, then 100mg 8hourly for 28days.
OR
S: levetiracetam (PO/IV) 500mg 12hourly for 14-28days

Initiate statins in eligible patients and continue statins in patients already taking statins at the time of onset of AIS**.**

Reperfusion treatment:
In patients qualified for intravenous thrombolysis, benefit of therapy is time dependent, and treatment should be initiated as quickly as possible with a target door to needle time <60 minutes.
Admit the patient to an ICU or designated stroke unit for monitoring and initiate,

S: alteplase (IV) 0.9mg/kg maximum dose 90mg (given over 60minutes with initial 10% of dose given as bolus over 1 minute)
OR
S: tenecteplase (IV) 0.25mg/kg maximum dose 25mg (given as a single bolus over 5 seconds)
Important precautions:

- Be prepared to treat potential emergent adverse effects, including bleeding complications and angioedema in patients undergoing fibrinolytic therapy.
- Maintain BP at <180/105mmHg for at least 24 hours following Alteplase infusion.
- Obtain a follow-up CT or MRI scan at 24 h after IV alteplase before starting anticoagulants or antiplatelet agents.

For management of intracranial hemorrhage complication within 24 hours following thrombolysis:

- Stop alteplase, obtain an emergent non contrast head CT.
- Obtain hematology and neurosurgery consultations
- Provide supportive care and initiate

C: tranexamic acid (IV) 1g infused over 10 minutes.
AND
D: cryoprecipitate (includes factor VIII): 10 U infused over 10–30 min

In case of angioedema following Alteplase infusion, stop alteplase and provide airway support as required. Give
D: methylprednisolone (IV) 125mg
AND
A: chlorpheniramine (IV) 10mg stat

If there is further increase in angioedema, administer
A: epinephrine (adrenaline) (S/C) (0.1%) 0.3 mL or by nebulizer 0.5 mL stat

Endovascular Treatment

Mechanical thrombectomy
Consider for selected patients who present between **6 and 24 hours** of LKW with an anterior-circulation large-vessel occlusion (ICA or proximal MCA) and meet other specified eligibility criteria based on expert assessment, clinical judgement, and availability of required resources.

Surgical management of AIS

- **Consider decompressive craniectomy** in patients ≤60 years of age who deteriorate neurologically within 48 hours from brain swelling associated with unilateral MCA infarctions despite appropriate medical therapy.
- Consider **external ventricular drainage (EVD)** in the treatment of obstructive hydrocephalus following cerebellar infarction.
- Emergency carotid end arterectomy (CEA) in the acute stage is not well established hence **not recommended** in initial management of AIS.

8.3 Management of Epilepsy

Epilepsy is a common neurological disorder characterised by recurring seizures. About two-thirds of people with active epilepsy have their epilepsy controlled satisfactorily with anti-seizure medication (ASM). Other treatment approaches may include surgery and neuromodulation. Optimal management is required to improve patient's health outcomes and minimise detrimental impacts on social, educational, and occupational activities.

Clinical Presentation
Recurrent seizures

Investigations

- Serum electrolytes, random blood glucose
- Serum antiseizure medication levels
- Electroencephalogram (EEG)
- Brain CT scan
- Brain MRI with epilepsy protocol

Classification of epileptic syndromes
Classify epileptic seizures and epilepsy syndromes in all patients using a multi-axial diagnostic scheme (refer to ILAE classification) as failure to classify the epilepsy syndrome correctly can lead to inappropriate treatment and persistence of seizures.

Pharmacological Management

- Utilize a single ASM (monotherapy) and increase dose until seizures are controlled or side effects cannot be tolerated.
- If the initial treatment is unsuccessful, initiate alternative monotherapy with different medication before resorting to drug combinations.
- Combination therapy (adjunctive or 'add-on' therapy) should only be considered when attempts at monotherapy with ASM s have not resulted in seizure freedom.
- If trials of combination therapy do not bring about worthwhile benefits, revert treatment to the initial monotherapy regimen that has proved most acceptable to the patient and consider referral for expert evaluation.

For management of status epilepticus—refer to emergency and critical care chapter 1

Focal seizures
First Line:
A: carbamazepine (PO) 10-20mg/kg 12hourly for 28days
OR
S: lamotrigine (PO) 1-5mg/kg 12hourly for 28days

Second line:
S: levetiracetam (PO) 10mg/kg 12hourly for 28days
Add-on treatment: gabapentin or sodium valproate as adjunctive treatment if first-line treatments are ineffective or not tolerated.

Generalised tonic–clonic (GTC) seizures
C: sodium valproate (PO) 10-15mg/kg 12hourly for 28days
OR
S: lamotrigine (PO) 1-5mg/kg 12hourly for 28days

Add on treatment: offer levetiracetam as adjunctive treatment if first-line treatments are ineffective or not tolerated.

Absence seizures
First Line:
C: sodium valproate (PO) 10-15mg/kg 12hourly for 28days

Note: DO NOT offer carbamazepine, phenytoin or pregabalin for absence seizures.

Myoclonic seizures
First Line:
C: sodium valproate (PO) 10-15mg/kg 12hourly for 28days

Second line:
S: levetiracetam (PO) 10mg/kg 12hourly for 28days

Lenox Gastaut syndrome (LGS)
First Line:
C: sodium valproate (PO) 10-15mg/kg 12hourly for 28days

Second line:
S: lamotrigine (PO) 1-5mg/kg 12hourly as adjunctive treatment

Note: DO NOT offer carbamazepine or pregabalin.

Idiopathic generalised epilepsy (IGE)
First Line:
C: sodium valproate (PO) 10-15mg/kg 12hourly for 28days

Second line:
S: lamotrigine (PO) 1-5mg/kg 12hourly for 28days

Juvenile Myoclonic epilepsy (JME)
First line:
C: sodium valproate (PO) 10-15mg/kg 12hourly for 28days Second line:

S: lamotrigine (PO) 1-5mg/kg 12hourly for 28days
OR
S: levetiracetam (PO) 10mg/kg 12hourly for 28days

Childhood absence epilepsy
First Line:
C: sodium valproate (PO) 10-15mg/kg 12hourly for 28days

Second line:
S: lamotrigine (PO) 1-5mg/kg 12hourly for 28days
Add-on treatment: consider clonazepam, levetiracetam if first-line treatments are ineffective or not tolerated.

Management of epilepsy in pregnancy
The use of antiseizure medication (ASMs) is associated with increased baseline risk of fetal malformations during pregnancy. Prescribe Folic acid to all women of childbearing age and girls on ASMs preconception. Attempt to decrease Pharmacological Management to monotherapy and utilize the lowest possible effective dose of drugs that have shown minimal risk of maternal and fetal neural tube defects
S: lamotrigine (PO) 1-5mg/kg 12hourly for 28days
OR
S: levetiracetam (PO) 10mg/kg 12hourly for 28days
AND
A: folic acid (PO) 5mg 24hourly for 120-180days
In women who have not had a seizure for at least 2years, attempt complete withdrawal of ASMs.

Surgical Management of Epilepsy:
- Resective Surgery
- Corpus Callosotom
- Vagus Nerve Stimulation
- Lesionectomy
- Hemispherectomy/HemispHemisphorotomy
- Deep Brain Stimulation (DBS)

The choice of Neurosurgical intervention depends on Indication seizure trigger factor and Location.

Non-Pharmacological Management
- Consider ketogenic diet—based on specialist assessment and expert opinion
- Refer all medically refractory seizures for expert neurosurgical evaluation for epilepsy surgeries
- Consider evaluation for Vagus Nerve Stimulation (VNS) as an adjunctive treatment in reducing the frequency of seizures in adults who are refractory to AEDs but who are not suitable for resective surgery

8.4 Parkinson's Disease and other movement disorders

Parkinson's disease (PD) is a common chronic, progressive, neurodegenerative disorder in geriatric population, characterized by the loss of dopaminergic neurons from the substantia nigra that subsequently results in the loss of control of voluntary movement over time

Clinical Presentation
- Motor symptoms: Resting Tremors, bradykinesia, rigidity, akinesia postural instability
- Non motor symptoms: drooling, dementia, depression, orthostatic hypotension

Diagnosis
- Clinical based and brain MRI to rule out atypical Parkinson disease mimics e.g. vascular parkinsonism, neuroferritinopathies, Wilsons disease, Neurodegeneration with brain iron accumulation (NBIA) based on United Kingdom Parkinson's Disease Society Brain Bank (UKPDSBB) criteria
- Atypical parkinsonism consists of dementia with Lewy bodies, corticobasal syndrome, progressive supranuclear palsy and multiple system atrophy

Surgical Management.
- Deep brain Stimulation (DBS)
- Implanting electrodes in specific areas of the brain to regulate brain activity and reduce symptoms
- It's minimally invasive, reversible and adjustable.

Non-Pharmacological Management
Provide physiotherapy, occupational, speech and language therapies

Pharmacological Management

Motor symptoms
First line:
D: levodopa+ carbidopa (FDC) (PO) 100/25mg 8 hourly (escalate dose based on individual response) to be taken 30-45 minutes before meals

Give adjunctive treatment for motor symptoms: MAO-B or COMT inhibitors or Dopamine agonist in persistent motor symptoms despite adequate tolerable doses of Levodopa+ carbidopa FDC treatment.

S: selegiline (PO) 2.5-5mg 24hourly (maximum dose 10mg/day)
OR
S: entacapone (PO) 200mg with each dose of levodopa carbidopa

Non-motor symptoms Drooling:
S: glycopyrrolate (PO) 0.5-1mg 8hourly for 28days

Orthostatic hypotension: Look for offending medication (diuretics, alpha antagonist for prostatism, antihypertensive, Amitriptyline, Levodopa) consider Levodopa dose reduction and give

D: fludrocortisone (PO) 0.1mg 24hourly for 28days

AND

S: midodrine 2.5 to 10mg 8hrly

Depression: Individualize therapy, consider

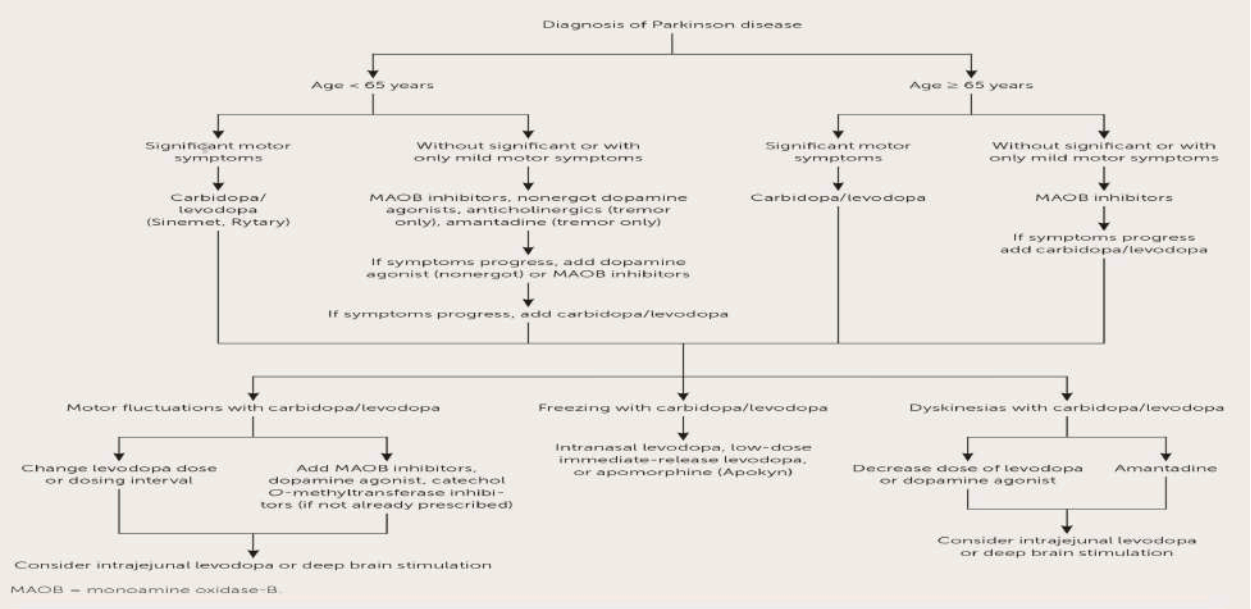
S: fluoxetine (PO) 20mg 24hourly (maximum 60mg/day) for 28days

OR

A: amitriptyline (PO) 50mg 24hourly for 28-84 days (May unmask dementia and orthostatic hypotension caution in the elderly)

Impulse control disorders: Consider modification of dopaminergic drug dosages.

Figure 8.1 Summary of Management of Parkinson's Disease



8.5 Congenital Pediatric Nervous System Diseases

8.5.1 Pediatric Hydrocephalus

Pediatric hydrocephalus (HDC) is a common surgically correctable neurological problem in children with estimated incidence of 1 in every 500 children. HDC can result from various congenital and acquired causes including aqueductal stenosis, Chiari malformations, intraventricular hemorrhage, trauma, tumors, and infection. There are effective surgical interventions that can preserve and improve quality of life in patients with HDC.

Clinical Presentation

Abnormal increase in head size, Seizure, Delayed/regressed developmental milestones, Headache and impaired vision

Investigations

- Cranial Ultrasound
- Non contrast head CT scan
- MRI brain scan

Surgical Management:

- Endoscopic third ventriculostomy with choroid plexus coagulation (ETV+CPC) as first line option in cases with clear obstruction to CSF flow.
- Insertion of ventriculoperitoneal shunt (VP shunt) where ETV+CPC is not available, has failed, or is contraindicated. Other alternative CSF shunts include ventriculoarterial (VA) or ventriculopleural shunts, as well as ventriculo-subgaleal shunting.

Non-Pharmacological Management

- Physiotherapy
- Educational therapy
- Screening for other congenital anomaly

Pharmacological Management

Management of associated seizures:

A: phenobarbitone (PO) 5mg/kg 12hourly for 4weeks

OR

C: sodium valproate (PO) 10-15mg/kg 12hourly for 4weeks

On surgical procedure

C: cefazolin30mg/kg (maximum 2gm) 30 minutes before incision

AND/OR

S: vancomycin (IV) or intrathecal 15 – 20 mg per/Kg 8 or 12 hourly

8.5.2 Management of Pediatric CSF Shunt Infections

Clinical Presentation

CSF leak, purulence, skin erosion, Fever, meningismus, erythema, exposed or protruding hardware

Lab investigations

FBP, CRP**,** CSF analysis, C/S**,** Blood C/S

Non-Pharmacological Management

- Physical therapy
- Change position regularly
- Monitor fever and feeding surgical options
- Insert External ventricular drain (EVD) as interim measure for intracranial pressure monitoring and therapeutic diversion of CSF in the setting where an infected internal shunt device has been removed +/- intrathecal antibiotics e.g., Vancomycin
- ETV and serial irrigation with intrathecal (intravericular) antibiotics.

Pharmacological Management

Initiate empirical antibiotic treatment

C: amoxicillin + clavulanic acid (FDC) (IV) child <3months 30mg/kg 12hourly 3months and older 20-30mg/kg 8hrly (Max 3G daily) for 2weeks

OR

D: ceftriaxone+ sulbactam (FDC) (IV) 100mg/kg 12hourly for 14days

AND

B: metronidazole (IV) 7.5mg/kg/day 8hourly for 14days

Alternative regimen based on C/S results

S: piperacillin+ tazobactam (FDC) (IV) 300mg/kg/day (of piperacillin component) divided in 4doses per day

OR

S: meropenem (IV)10mg/kg 8 hourly, (may increase up to 40mg/kg) for 10-14days Shift to organism's specific regimen after CSF/hardware culture results

For confirmed *Staph spp*. infections add

S: vancomycin (IV) 10mg/kg 6hourly for 2weeks or more.

OR

C: cefazolin30mg/kg (maximum 2gm) 30 minutes before incision

AND

S: vancomycin (intrathecal) 15 – 20 mg per/Kg stat

8.5.3 Congenital Spina Bifida

Spina Bifida (SB) is one of the commonest complex congenital birth defects in developing countries. Children with SB are faced with multiple medical and psychosocial issues that require a comprehensive multidisciplinary care plan.

Clinical Presentation
Swelling on the back, CSF leak, Lower limb weakness, Lower limb deformities, Lower limb paralysis

Investigations
Prenatal diagnosis

- Ultrasound in second trimester of pregnancy
- Amniotic fluid analysis

Postnatal diagnosis

- Cranial Ultrasound—evaluate for associated hydrocephalus
- Neuraxial MRI (Brain and Spine) -is indicated in complex cases to plan surgical management and evaluate for associated defects—Hydrocephalus, chiari malformations, tethered cord
- Neural axis CT scan (Brain and Spine)
- Preoperative screening echocardiogram (ECHO)

Surgical management of Spina Bifida
Refer for expert neurosurgical evaluation for surgical closure of the spinal defect and subsequent evaluation for the need to treat associated hydrocephalus

Surgical procedure

- Closure of the Spina bifida cystica defect/deformity
- +/- ETV + Choroid plexus Cauterization
- +/- CSF Shunting (e.g., Ventriculo Peritoneal Shunt, Ventriculo Subgaleal shunt, Ventriculo Atrial Shunting)

Non-Pharmacological Management
Neuro rehabilitation, Orthotics when necessary.

Pharmacological Management
Initiate antibiotics in children with open infected spinal bifida lesions
B: ceftriaxone (IV) 100mg/kg 12hourly for 2 weeks
OR
B: amoxicillin + clavulanic acid (FDC) (PO) 15mg/kg 8hourly for 2weeks
OR
C: amoxicillin + clavulanic acid (FDC) (IV)15mg/kg 8hourly for 2weeks
AND
A: metronidazole (PO) 7.5mg/kg/day 8hourly for 2weeks
OR
B: metronidazole (IV) 7.5mg/kg/day 8hourly for 2weeks

Supportive and preventive and measures

- Provide routine screenings and testing for specific secondary conditions (HDC, skeletal limb deformities, UTIs) to minimize medical complication rates and help control cost of care.
    - Provide lower limb orthoses (splints, calipers)
    - Provide a wheelchair for ambulation
- Track and counsel women about recurrence risk and prescribe 5mg of folic acid beginning at least one month (preferably 3 months) before another conception and continue through the first 3 months of pregnancy.
- Encourage women of childbearing age to consume food fortified with folic acid and other macronutrients:

Note: Tanzania passed a policy for the mandatory fortification of commercial wheat and maize flour in 2011, Wheat flour is fortified with folic acid, iron, vitamin B12, zinc, thiamin, riboflavin, niacin, and vitamin A, while maize flour is fortified with folic acid, iron, and vitamin B12

8.6 Cranial Nerve Disorder

8.6.1 Trigeminal Neuralgia

Trigeminal neuralgia (TN) is a syndrome characterized by chronic paroxysmal brief episodes of unilateral electric shock-like pains, in one or more divisions of the trigeminal nerve. TN is often mistaken as a dental problem leading to delayed correct diagnosis and appropriate treatment. The diagnosis is based on the characteristic clinical picture.

Clinical Presentation
Unilateral recurrent sudden intense and sharp shock like brief pains in one or more division of trigeminal nerve, jaw, teeth, gums, cheek pain exacerbated by cutaneous stimuli, e.g., chewing, brushing or touching the face

Investigations

- RBG, CBC ESR
- CT scan to exclude structural bond or brain pathologies
- MRI to assess the trigeminal nerve root entry zone (REZ)

Surgical management
Refer all patient with poor response to conservative management for expert Neurosurgical evaluation for microvascular decompression (MVD), a surgical procedure undertaken to identify, isolate and separate a vascular loop abutting the trigeminal nerve at the root entry zone (REZ).

Non-Pharmacological Management
Refer to a neurosurgeon for procedures that involve controlled trigeminal ganglion ablation to alleviate pain

- Radiofrequency ablation
- Gasserian ganglion balloon compression rhizotomy
- Glycerol rhizolysis
- Stereotactic radiosurgery rhizotomy

Pharmacological Management
First line treatment:
A: carbamazepine (PO) 200mg 12hourly for 28-84days (Doses up to 300mg/day-2000mg /day)
OR
Second line treatment
S: lamotrigine (PO) 25-600mg /d for 28-84days weeks

8.6.2 Bell's Palsy

Bell's palsy, also referred to as idiopathic facial nerve palsy is unilateral paralysis of all the muscles of facial expression of suspected viral etiology. Inflammation and edema of the facial nerve likely play a role in pathogenesis. Reactivation of herpes simplex virus (HSV) is also thought to play an etiologic role. Most patients recover within a few weeks or months.

Clinical Presentation

- Unilateral facial paralysis (sudden onset)
- Inability to close the eye (Bells' phenomena)

Investigations

- HIV testing
- RBG
- otoscopic exam

Non-Pharmacological Management

- Provide facial muscle massage and exercises
- Provide eye patch for ocular protection during sleep.
- Refer for ophthalmological evaluation in severe cases

Pharmacological Management

A: prednisolone (PO) 60mg 24hourly for 5 days, then taper down to 50mg 24hourly for next 5days.
AND
B: acyclovir (PO/IV)800mg 4-8hourly for 7-14days.

8.7 Spinal Cord and Peripheral Nerve Disorders

8.7.1 Acute Transverse Myelitis (TM)

Acute onset, usually postinfectious, rapidly progressive neurologic syndrome caused by focal inflammation of the spinal cord. Thoracic spinal cord level is the most commonly involved.

Clinical Presentation

- Rapid progressive bilateral lower limb weakness
- Backache and neuropathic pain
- Numbness and paresthesis
- Bladder and bowel incontinence

Investigations

- FBP, serum electrolytes
- CSF analysis
- Emergency MRI or CT/myelogram to rule out a compressive lesion.
- Brain MRI—may be required to exclude multiple sclerosis

Perform baseline severity score such as American Spinal Injury Association (ASIA) impairment score to assist in clinical management decisions and monitor improvement.

Non-Pharmacological Management

- Monitor respiratory function, support ventilation where required
- Catheterize bladder and offer stool softeners to aid bowel emptying
- Provide manual position changes 2hourly to avoid pressure sores
- Provide rehabilitation--exercises to assist ambulation
- Offer assisted ambulation devices—e.g., high back wheelchairs

Pharmacological Management
Give high-dose steroids
D: methylprednisolone (IV) 500-1000mg/day for 3–5days

Consider cyclophosphamide in refractory cases (under the direction of an oncologist)
S: cyclophosphamide (IV) 800-1000mg/m2 pulse dose.

Long term management
Manage generalized pain with
A: diclofenac (IM) 75mg 12hourly for 3-5days
OR
B: tramadol (PO) 50mg 8hourly for 7-14days.

Manage neuropathic pain with
D: pregabalin (PO) 75mg 12hourly (maximum dose 300mg) for 2-4weeks

Manage spasticity with
S: baclofen (PO) 10mg 8hourly, (maximum dose 120mg/day) for 2weeks
OR
S: tizanidine (PO) 2mg 8hourly, (maximum dose 36mg/day) for 2weeks

8.7.2 Guillan Barre Syndrome

Guillain–Barré syndrome (GBS) is potentially fatal, immune-mediated acute-onset ascending sensorimotor neuropathy usually triggered by infections. Timely recognition, diagnosis, and prompt referral to a centre equipped to provide ventilatory support is essential to improve mortality and minimize long term morbidity.

Clinical Presentation

- Rapid ascending bilateral lower limb weakness
- Little or no sensory deficits
- Evolving respiratory distress
- Cardiac arrhythmias
- Facial or bulbar palsy.

Investigations

- FBP, serum electrolytes
- CSF analysis-albumin cytologic dissociation (↑ protein without pleocytosis)
- Emergency MRI to exclude acute spina cord inflammation or compression

Non-Pharmacological Management

- Provide rehabilitation-exercises to assist ambulation
- Assisted ambulation devices e.g., high back wheelchairs

Pharmacological Management

Admit to ICU and provide ventilatory support to all patients with evolving respiratory distress or severe autonomic cardiovascular dysfunction

S: human immunoglobulin G (IV) 0.4g/kg 24hourly for 5days (started within 14days of disease onset)

For severe cases, consider

S: plasma exchange 200-250ml plasma/kg body weight for 5sessions (started within 28days of disease onset)

Monitor respiratory function-patient is deemed at risk of respiratory failure if the vital capacity is <20ml/kg, the maximum inspiratory pressure is <30cmH2O or the maximum expiratory pressure is <40cmH2O

8.7.3 Peripheral Neuropathy

Peripheral neuropathies encompass disorders of peripheral nerve cells and fibers which manifest secondary to a wide range of pathologies that can affect motor, sensory, and autonomic fibers. Peripheral neuropathies can be classified as mononeuropathies, multifocal neuropathies, and poly- neuropathies. Further sub classifications categorize peripheral neuropathies as axonal, demyelinating, or mixed types, which is essential for treatment and management purposes.

Clinical Presentation

- Numbness and paresthesis,
- Neuropathic pain
- Extremities weakness,
- Loss of coordination
- Orthostatic hypotension
- Cold, pale feet

Investigations

- FBP
- Renal function tests
- RBG and HbA1c (Diabetes is a common cause of neuropathy)
- Testing for vitamin and mineral deficiencies such as copper, thiamine, pyridoxine, folate, B12.
- Infectious workup for HIV, and
- Thyroid function testing
- Anti-body testing for specific autoimmune diseases known to cause peripheral neuropathies such SLE and rheumatoid arthritis
- Nerve conduction studies (NCS) and needle electromyography (EMG) to differentiate axonal from demyelinating neuropathies
- MRI or CT scans in suspected nerve compression
- Urine Test for Bence-Jones proteins
- Genetic testing (for inherited neuropathies)
- Nerve biopsy in selected cases where expertise and resources are available

Table 8.4 Guide to clinical diagnosis of peripheral neuropathies

Type	Clinical features	Common causes
Distal Symmetric Polyneuropathy	• Length-dependent: diffuse involvement • Affects distal segments first • Symptoms occur below the knees prior to affecting fingertips	Most common cause: diabetes, Chronic Idiopathic axonal polyneuropathy, Alcohol, chemotherapy induced.
Mononeuropathy	• Symptoms restricted to distribution of single nerve, myotome, or dermatome • Asymmetric reflexes	Entrapment neuropathies e.g., carpal tunnel, peroneal nerve entrapment. Post traumatic neuropathies, diabetes
Mononeuropathy multiplex	Occurrence of several concurrent mononeuropathies	Autoimmune vasculitic etiologies
Hereditary neuropathies	• Distal calf atrophy, hammertoes, pes cavus • Motor deficits ≥ sensory deficits • Diffuse areflexia	Genetic diseases

Non-Pharmacological Management

- Transcutaneous electrical nerve stimulation (TENS) for pain relief.
- Educate patients on increased risk of injury and infection due to loss of sensation
- Recommend wearing socks with closed-toed shoes to decrease the risk of infection.
- Offer support on cessation to patients with alcohol-induced neuropathy

Pharmacological Management

- Focus on the management of the underlying disease process if identified.
- Ensure glucose control in diabetic neuropathy, alcohol cessation in alcoholic neuropathy and correction of vitamin or mineral deficiencies in nutrition related peripheral neuropathies.
- For drug related neuropathies, stop the offending medicine and give a suitable substitute. e.g., substitute stavudine or didanosine with tenofovir or lamivudine.
- Initial management of symmetric polyneuropathies and postherpetic neuralgia

D: pregabalin (PO) 150mg 12hourly for 4-12weeks
OR
A: amitriptyline (PO) 50-100mg 12hourly for 4-12weeks
AND
C: thiamine (B1), pyridoxine (B6), and cobalamin (B12) (FDC) (PO) 12hourly for 4-12weeks

If the initial treatment is not effective, consider one of the combination therapies.
D: pregabalin (PO) 150mg 12hourly for 4-12weeks
AND
A: amitriptyline (PO) 25-50mg 12hourly for 4-12weeks
AND
C: thiamine (B1), pyridoxine (B6), and cobalamin (B12) (FDC) (PO) 12hourly for 4-12weeks

In chronic demyelinating polyneuropathies, add steroids
A: prednisolone (PO) 20-60mg 24hourly for 6weeks (taper down based on response)

Offer rescue therapy if required, to patients undergoing long term treatment.
B: tramadol (PO) 50mg 8hourly for 7-14 days

Alternatively
D: pregabalin (PO) 150mg 12hourly for 4-12weeks
OR
D: gabapentin (po) 300mg od for 4-12 weeks
AND
S: fluoxetine (PO) 20mg 24hourly for 7days then titrate 12hourly for 4-12weeks
AND
C: thiamine (B1), pyridoxine (B6), and cobalamin (B12) (FDC) (PO) 12hourly for 4-12weeks
AND
S: cytidine 5mg + uridine 3mg (po) 24hourly for 4 -6 weeks

For localized symptoms, consider topical agents as adjunctive treatment.
D: lidocaine 5% patches apply for 60minutes.

For patients on isoniazid related neuropathies, start on
B: pyridoxine (PO) 25–50 mg 8hourly for 3weeks, then 25mg 24hourly until completion of TB dose.

8.8 Demyelinating Disorders

8.8.1 Multiple Sclerosis (MS)

Multiple sclerosis (MS) is an inflammatory demyelinating disease of the central nervous system. It is classified into different types based on disease course, including relapsing remitting MS, Secondary progressive MS, Primary progressive MS and Progressive relapsing MS

Clinical Presentation

- Unilateral, painful vision loss with impaired color perception (Optic neuritis)
- Subacute limb weakness
- Electric shock sensation on neck flexion (Lhermitte's sign)
- Bladder/ bowel dysfunction
- Diplopia, nystagmus, vertigo ataxia dysarthria
- Memory or concentration impairment
- The clinical course of MS can be relapsing remitting (The commonest type). Primary progressive or secondary progressive.

Investigations

- MRI brain, Spine
- CSF analysis
- Visual Evoked potential (VEP)

Note: Treatment aims at treating acute relapses, modify disease course, relieve symptoms and rehabilitate. Medical management along with multidisciplinary team: physiotherapy, occupational therapy, psychology/psychiatry, ophthalmology and other specialties are required to holistically treat these patients

Pharmacological Management
Acute relapse give High dose corticosteroids
D: methylprednisolone (IV) 1000 mg/day 24hourly for 5 days

Plasma exchange is considered for severe relapse, refractory to steroid
Modify disease course

Induction phase
S: rituximab (IV) 1000mg two weeks apart for one months

Maintenance phase
S: rituximab (IV) 1000mg every 6 months

Symptomatic management in MS: constipation (high fiber diet, laxatives) Depression (Antidepressants') erectile dysfunction (PDE5 inhibitors)

8.8.2 Neuromyelitis Optica Spectrum Disorder (NMOSD)

Neuromyelitis optica Spectrum Disorder (NMOSD) is CNS demyelinating disease that primarily affects the optic nerves and spinal cord leading to severe neurological symptoms

Clinical Presentation

- Optic neuritis, acute myelitis
- Area postrema syndrome: episodes of unexplained hiccups or nausea and vomiting
- Acute brainstem syndrome
- Symptomatic narcolepsy or acute diencephalic clinical syndrome with typical diencephalic MRI lesions
- Symptomatic cerebral syndrome with NMO type brain lesions.
- Diagnosis is made when Aquaporin 4 IgG positive (Preferably cell-based test + at least one core clinical characteristic Exclusion of any alternative diagnosis

OR

- In case of unknown Aquaporin 4 IgG status, at least 2 core clinical characteristics with
- A) at least one core characteristic being optic neuritis, acute myelitis with longitudinally extensive transverse myelitis (LETM) or area postrema syndrome
- B) dissemination in space
- C) fulfillment of other MRI characteristic of NMO
- E) exclusion of alternative diagnosis

Investigations

- Serum AQP4-IgG antibody test will be positive. A cell-based assay is recommended.
- MRI brain and spine, CSF
- VEP

Pharmacological Management:
Medical management along with multidisciplinary treatment with physiotherapy, occupational therapy, psychology/psychiatry, and other specialties

In Acute attacks give High dose corticosteroids
D: methylprednisolone 1000mg (IV) daily for five days
Plasma exchange (PLEX)for refractory to high dose corticosteroid

Relapse prevention
Long term immunotherapy is essential to reduce relapse
S: azathioprine 1-2 mg/kg/day (PO)
OR
S: mycophenolate mofetil 1000mg 12hourly
OR
S: rituximab (RTX) 375mg/m2 weekly for 4 weeks or Rituximab 1000mg (IV) every after 6 months

8.8.3 Myelin Oligodendrocyte Glycoprotein (MOG) Antibody Associated Disease (MOGAD)

MOGAD is a rare CNS demyelinating syndrome defined by antibodies against myelin oligodendrocyte glycoprotein. It overlaps clinically with NMOSD and MS but has distinct features

Clinical Presentation

- Acute disseminated encephalomyelitis (ADEM)
- Optic neuritis
- Transverse myelitis
- Autoimmune encephalitis

Investigations:

- Serum anti MOG IgG will be positive
- MRI brain spine
- CSF examination

Pharmacological Management:
Acute attacks, High dose corticosteroids
D: methylprednisolone (IV) 1000mg/day daily for five days require a slow taper of steroids to prevent relapse

Maintenance: Many MOGAD cases are monophasic, relapsing cases are managed with
S: mycophenolate mofetil (O) 1000mg 12hrly
OR
S: rituximab (IV) 375 mg/m2 weekly for 4 weeks
OR
S: rituximab (IV) 1000mg every 6 months
OR
S: azathioprine or Methotrexate may also be used in doses similar to NMO

8.9 Headache Disorders

8.9.1 Tension Type Headache

Overview: Tension type headache (TTH) is the most common primary headache disorder, usually mild-to-moderate and self-limited

Clinical Presentation
Bilateral pressing, tightening non pulsating pain, Photophobia or phonophobia may occur

Investigation:
Clinical, CT/MRI once there are red flags Neurological deficits, papilloedema on fundoscopy

Pharmacological Management:
First line
A: paracetamol (PO) 10-15mg/kg 8hrly for 5-7days
OR
A: ibuprofen (PO) 10mg/kg 8hrly 5-7days
OR
A: naproxen (PO) 5-7mg/kg 8hrly 5-7days

Prevention: For frequent or chronic TTH >15days per month
A: amitriptyline (PO) 10-75mg at bed time three months reviewed subject to response

8.9.2 Migraine

Migraine is a primary headache characterized by moderate to severe, often unilateral, throbbing pain, aggravated by movement associated with nausea, photo/phonophobia, aura-visual or sensory symptoms before headache.

Clinical Presentation
Throbbing headache usually unilateral, photo-phono-phobia, nausea, vomiting

Investigation
Mainly clinical; CT /MRI brain scan

Pharmacological Management
First line
Mild attack
A: paracetamol (PO) 10-15mg/kg 8hrly for 5-7days
OR
A: ibuprofen (PO) 10mg/kg 8hrly for 5-7days

Moderate to severe attacks
S: sumatriptan 0.1-0.3mg/kg stat then repeat after 2hrs if migraine persist
OR
C: ergotamine tartarate (combined with caffeine) (PO) 1-2mg at the start of the symptoms then 2mg hourly if the symptom persists; do not exceed 6mg in a day

Prophylaxis: consider if 2 or more attacks per week or significant disability
First line preventives

A: propranolol (PO) 40-240mg per day for 90days
OR
A: amitriptyline (PO) 10-75mg nocte for three months
OR
S: verapamil (PO) 80mg daily titrate by 80mg 3days (240-480mg)

Non- Pharmacological Management
Lifestyle: trigger avoidance, sleep, hydration and meals.
Behavioral therapy

8.9.3 Trigeminal Autonomic Cephalalgias (TACs)

This group includes Cluster headache, paroxysmal hemicrania, SUNCT/SUNA, and hemicrania continua. They share unilateral severe pain with ipsilateral autonomic symptoms.

8.9.3.1 Cluster headache:

Clinical Presentation
Excruciating unilateral orbital/temporal pain, often with conjunctival injection, lacrimation, nasal congestion and agitation. Attack lasts 15-180minutes, occurs in clusters weeks-months separated by remission.

Pharmacological Management:
Acute:
A: oxygen 12-15L/min ,100% Inhaled via mask
OR
S: sumatriptan (SC) 0.1-0.3mg/kg stat.

Preventive
S: verapamil (PO) 360-480mg/day for 90-180days (High dose)

8.9.3.2 Paroxysmal Hemicrania

Clinical Presentation:
Multiple daily attacks of severe unilateral headache with autonomic signs. Attacks are shorter than cluster

Pharmacological Management:
A: piroxicam 20-40(PO) mg daily leads to complete remission (Diagnostic) for five to seven days

Hemicrania continua: continuous unilateral headache with superimposed exacerbations and autonomic features
A: piroxicam (PO) 20-40mg daily for five to seven days

8.9.3.3 Short Lasting Unilateral Neuralgiform headache with Conjunctival injection and Tearing (SUNCT AND SUNA)

Clinical: Very short (<1min), frequent attacks with lacrimation and flushing

Pharmacological Management:
S: lamotrigine (PO) 25-50mg/day initial three weeks titrate to 100-200mg twice a day for three to six weeks
OR
D: gabapentin (PO) 100-300mg nocte initial 5 days titrate to 450-900 twice a day if symptoms persist

8.9.4 New Daily Persistent Headache (NDPH)

Clinical Presentation:
Daily headache without relief, features of tension or migraine, no neurological deficit, may recall trigger -infection or stress

Investigation
MRI brain**,** CSF

Non-Pharmacological Management:
Trial of sleep hygiene, stress reduction and standard headache therapy

Pharmacological Management
A: amitriptyline (PO) 10-75mg nocte for three to six months
OR
D: gabapentin (PO) 100-300 mg nocte initial five days titrate to 450-900 twice a day if symptoms persist

8.9.5 Cervicogenic Headache

Headache caused by disorder of the cervical spine

Clinical Presentation:
Unilateral occipital or frontotemporal headache provoked by neck movement or sustained posture, radiates to the eye or forehead. Limited range of neck movement Cervical spine tenderness or muscle spasm

Investigations
MRI/CT cervical spine

Non-Pharmacological Management:
Physical therapy focused on cervical mobilization, posture correction and relieve of muscle spasm

Pharmacological Management
A: Ibuprofen (PO) 800mg 8hrly for five to seven days
OR
D: diclofenac (PO) 50mg + paracetamol 325mg + chlorzoxazone250mg (PO) 8hrly for five to seven days
OR
S: triamcinolone+ lidocaine Injection (Cervical epidural or facet blocks)
OR
S: radiofrequency ablation

8.9.6 Secondary Headaches

8.9.6.1 Dementia Syndromes

8.9.6.1.1 Mild Cognitive Impairment

Denotes cognitive decline greater than expected for age but without significant impairment of daily function

Clinical Presentation
Subtle memory lapses, word finding difficult or planning problem but retain independence in basic needs

Investigation

- Neuropsychological testing (MMSE/MOCA)
- Blood tests CBC, B12, TSH
- CSF amyloid Beta 42 (CSFAB42)
- PET Scan (Amyloid Tau FDG)

Pharmacological Management

- Non pharmacological
- Control of vascular risk factors Hypertension, diabetes, smoking.
- Health life style -aerobic exercise, cognitive engagement, sleep
- Pharmacological Management for reversible causes: depression, vitamin B deficiency, hypothyroidism

8.9.6.1.2 Alzheimer's Disease (AD)

Clinical Presentation

- Insidious onset, progressive memory impairment – language, visuospatial skills and executive function
- Poor recall, disorientation, aphasia, or apraxia

Clinical investigation
Neuropsychological test, MRI PET scan, CSF biomarkers (Beta amyloid, Tau)

Pharmacological Management
Table 8.5 Treatment of Alzheimer's Disease

Disease stage	Medicine	Initial Dose	Maintenance Dose
Mild to Moderate	**S:** donepezil	5mg 24 hourly	10mg 24 hourly (after 4-6weeks)
Moderate Severe	**S:** memantine	5mg 24 hourly	20mg 24 hourly (5mg increase every week)
Advanced	**S:** memantine + donepezil (FDC)	7mg/10mg	28mg/10mg (Increment of 7mg at intervals of ≥1week)

8.9.6.1.3 Vascular Dementia

Cognitive impairment attributed to cerebrovascular disease abrupt or insidious focal signs weakness, gait disturbance
Executive dysfunction, slowed thinking

Investigation:
MRI/CT head scan**,** Carotid duplex

Non-Pharmacological Management

- Vascular risk factor control
- Rehabilitation
- Cognitive training

Pharmacological Management
No demential specific drugs
A: acetylsalicylic acid (PO) 75mg every 24 hours for 90 days
AND
S: donepezil (PO) 5mg every 24 hours for 90 days

Treat Hypertension, diabetes, hyperlipidemias

8.9.6.1.4 Frontotemporal dementia (FTD)

Clinical Presentation

- Onset before age 65yrs behavioral variant- personality changes, disinhibition, apathy, compulsive behavior
- Later Progressive aphasia language impairment Semantic or nonfluent

Investigation:

- Neuropsychometry
- MRI brain

Non-Pharmacological Management:
Speech therapy for aphasia, social support

Pharmacological Management
D: citalopram (PO) 10-20 mg 24 hourly

8.9.7 HIV Associated Neurocognitive Disorders (HAND)

Clinical Presentation:
Cognitive slowing, memory and concentration impairment, motor slowing and coordination deficits

Investigation

- Neuropsychological testing
- MRI brain
- HIV viral load, CD4 cell count, CSFHIV RNA
- Vitamin B12, TSH, ACTH stimulation test

Pharmacological Management
Treat with ARV as per HIV/AIDS guideline and as per blood test results.

8.9.8 Lewy Body Dementia (DLB)

Clinical Presentation
Dementia, visual hallucinations sleep disorder, parkinsonism, extrapyramidal features rigidity, bradykinesia

Investigation
MRI**,** DATscan (DaT SPECT)

Pharmacological Management:
Psychotic features if present
S: clozapine (PO) 6.5mg-12.5 24 hourly (increase in 3-5 days

For Parkinsonism
D: levodopa + carbidopa (PO) 125mg 24 hourly for three to 6 months

For REM sleep
D: clonazepam (PO) 0,5mg at bedtime for years

8.9.9 Motor Neuron Disease (Includes ALS)

Characterized by degeneration of motor neurons both central and peripheral

Clinical Presentation

- Progressive painless weakness, asymmetric, muscle atrophy, fasciculations, spasticity and brisk reflexes
- Bulbar involvement-dysarthria, dysphagia. Preserved sensory function

Investigations
NCV**,** EMG**,** MRI Spine/brain**,** Pulmonary function test

Non-Pharmacological

- Non-invasive ventilation (BiPAP)
- Gastrostomy
- Multidisciplinary support (Physical therapy, speech, palliative care

Pharmacological Management

S: edaravone (IV) 60mg 24 hourly for 14 days followed by 14 days drug free. then 60mg 24 hourly for 10 days week-days only

OR

S: edaravone (PO) 105mg (5ml) orally 24-hourly same schedule as the IV route above

8.10 Neuromuscular Junction disorders

8.10.1 Myasthenia Gravis (MG)

Postsynaptic autoimmune disease with antibodies directed towards acetylcholine receptors

Clinical Presentation

- Fluctuating muscle weakness worsening with repetitive use improves with rest
- Ocular symptoms ptosis, diplopia, bulbar sing.
- Normal reflexes and sensation

Investigations

- Icepack test (placing a pack of ice on a closed eyelid for one minute) look for improved ptosis /diplopia
- Serum acetylcholine receptor antibodies MUSK antibodies
- Repetitive nerve stimulation 2 or 3 Hz
- Single fibre electromyography jitter
- Chest imaging CXR/CT/MRI -thymoma

Pharmacological Management:

Lifelong treatment

S: pyridostigmine (PO) 60mg 3-4 times daily, Maintenance 60mg every 3hrs up to 1500 in divided dose

AND

A: prednisolone (PO) 5mg 24Hourly titrated to the need

Generalized or refractory MG

S: azathioprine (PO) 1-2mg/kg/day orally, maintenance dose 2-3mg/kg/day max dose should not exceed 3mg/kg/day

OR

S: cyclosporin (PO) 3-5mg/kg/d 12 hourly

OR

S: mycophenolate Mofetil (PO) 500mg 12hrly escalate to 1000mg 12 hourly for eleven to twenty-four months

8.10.2 Lambert-Eaton Myasthenic Syndrome (LEMS)

LEMS is a presynaptic autoimmune disease with antibodies directed against voltage gated calcium channels that impair acetylcholine release at neuromuscular junction,

Clinical Presentation

- Proximal leg and pelvic weakness that improve with repeated use
- Autonomic symptoms (Dry mouth, impotence, orthostatic hypotension
- Often associated with small cell lung cancer

Investigations

- EMG
- Serum P/Q type calcium channel antibodies
- Chest imaging

Pharmacological Management

S: 3,4-diaminopyridine (PO) 5mg 8hourly, increase by 5mg every 3-4 days max dose 80mg/day no single dose >20mg for 90 to 180 days subject to review

8.11 Myopathies

8.11.1 Inflammatory myopathies

Include polymyopathies, dermatomyositis and inclusion body myositis

Clinical Presentation

Symmetric proximal muscle weakness, gradual onset

Investigations

- Serum CK
- EMG
- Muscle biopsy

Pharmacological Management:

D: methylprednisolone (IV) 1000mg infusion for three days

OR

S: methotrexate (PO) 15mg every 24 hours for two months

8.11.2 Toxic Myopathies

Commonly caused by drugs (e.g., statins, steroids, colchicine) or toxins

Clinical Presentation

Muscle pain insidious onset after starting treatment/offending agent

Investigation:

CK, Creatinine, electrolytes, TSH

Non-Pharmacological Management

- Discontinue the offending agent
- Rehydration
- Treat metabolic abnormalities identified - hypothyroidism

8.11.3 Infectious Myopathies

Viral (e.g., influenza, HIV, Coxsackie) or bacterial infection

Clinical Presentation

Muscle pain, fever, abscess

Investigation:

CK, CBC

Non-Pharmacological Management

Abscess drainage, rehydration

Pharmacological Management

For HIV and other underlying infections treat accordingly as per HIV/AIDS guidelines and as these guidelines.

8.11.4 Inherited Myopathies

Muscular dystrophies (e.g., Duchene, Becker) and congenital myopathies

Clinical Presentation

Progressive weakness early onset, calf pseudohypertrophy

Investigation

CK, EMG**,** Muscle biopsy.

Non-pharmacological

Occupational therapy, braces/orthoses

Pharmacological Management

No cure- mainly supportive

Corticosteroids (Duchenne)

8.12 Common Sleep Disorders

8.12.1 Insomnia

Clinical Presentation.
Sleep onset: Trouble falling asleep; Sleep maintenance Multiple or prolonged awakenings, non-restorative sleep

Non-Pharmacological Management

- Sleep hygiene: fixed awakening and sleeping time,
- Limit day time naps,
- reduce alcohol and smoking near bed time,
- Minimize caffeine
- Light therapy
- Behavioral techniques

Pharmacological Management
D: eszopiclone 1mg before bedtime for five to seven days not more than 28 days
OR
A: amitriptyline 12.5mg – 25mg at night

8.12.2 Obstructive Sleep Apnoea (OSA)

This is discussed under Respiratory Chapter 9. Episode of upper airway collapse during sleep

Clinical Presentation: snoring, gasping daytime sleepiness

Investigation
Polysomnography**,** ECG, ECHO, Lung function test

Non-Pharmacological Management
Weight control, quit smoking, reduce alcohol
CPAP (Apnoea-hypopnoea index >5 in symptomatic or >15 asymptomatic) or Bi-level positive airway pressure (BiPAP)

8.12.3 Restless Legs Syndrome (RLS)

Clinical Presentation
Urge to move the legs, unpleasant sensation can be bilateral at time involve the arms, worse at night or period of immobility relieved by movement

Investigations:
CBC, Ferritin level, Creatinine,

Pharmacological Management
IF Ferritin <50ng/mL
A: ferrous sulphate 200mg daily for 90 days

Moderate to severe RLS
D: gabapentin (PO) 300mg nocte
OR
D: pregabalin (PO) 75mg nocte for six months to one year

Note: Treat coexisting conditions (Renal failure, diabetes, neuropathy)

8.12.4 Narcolepsy

Clinical Presentation
Excessive (irresistible) day time sleep (Cataplexy, sleep paralysis, hypnagogic or hypnopompic hallucinations)

Investigations
Polysomnography - sleep latency, CSF – low hypocretin 1

Pharmacological Management
Sleepiness:
S: methylphenidate (PO) 10-60mg in three divided dose per day for three to six months

8.12.5 Parasomnias

Clinical Presentation
Disruptive sleep related phenomena. Non-REM parasomnia: confusional arousals, sleepwalking, night terrors
REM parasomnias nightmares, sleep behaviors disorder-acting out dreams

Investigations:
CBC, RBG, TSH, EEG

Pharmacological Management
D: clonazepam (PO) 1mg (nocte reduces motor activity but doesn't reestablish sleep atonia)

Note: Treat OSA if present especially when using BDZ that can worsen breathing

8.13 Functional Neurological Disorders (FND)

Conversion disorders – refer to Mental Health section

8.14 Neurogenetic Disorders

8.14.1 Charcot-Marie-Tooth Disease (CMT)

A group of inherited peripheral neuropathies

Clinical Presentation
Adolescent onset distal weakness-foot drop, sensory loss in stocking-glove pattern, pes cavus and hammer toes. Diminished or absent reflexes

Investigation
- Nerve conduction velocity NCV,
- Genetic testing

Non-Pharmacological Management
- Stretching exercises
- Mobility aids
- Evaluation for bladder function

Pharmacological Management
There No cure, only supportive

S: baclofen (PO) 10mg for three to six months
OR
S: tizanidine (PO) 4mg daily for three to six months

8.14.2 Inherited Ataxias

- Include Friederich's ataxia
- Progressive cerebella dysfunction gait, trunk ataxia, dysarthria nystagmus

Investigation:
- MRI brain/spine
- Spinal cord/cerebellar degeneration

Treatment
Supportive

8.15 Dystonia

Dystonia is defined by involuntary maintained contraction of agonist and antagonist muscles yielding abnormal posturing, twisting and repetitive movements, or tremulous and can be initiated or worsened by attempted movement. Primary dystonia (torsion dystonia) is the sole neurological sign and other causes of dystonia such as acquired or neurodegenerative process have been ruled out.
Secondary dystonia is caused by environmental insult and other identified causes such as head injury, drug side effect or neurological diseases such as Wilsons disease, Parkinson disease. Its disabling and painful condition.
Onset infancy or childhood, early or late adult, craniofacial, oromandibular trunk or limb, Acute, static or progressive course.

Investigation:

- CBC, Basic Metabolic Panel, LFT, Lipid panel, ESR, ANA, Cu, Ceruloplasmin, Metabolic testing
- Genetic testing
- Imaging: MRI brain with heme sensitive sequences
- MRI cervical spine

Pharmacological Management
Treat underlying etiology

For Focal or Segmental dystonia:
S: botulinum toxin A injections under EMG guidance.
Dose range 2.5 to 15 units depending on the site as per Botox Injection Protocol

Oromandibular dystonia: Muscles: Masseter, Temporalis, Media/lateral pterygoids and digastric
S: botulinum toxin A injection 15-50 units per side
Lingual (tongue) dystonia

Muscle: Genioglossus
Dose: Botox 5-15units per site
Technique: Submental approach to genioglossus or direct into the tongue body
Precaution: high risk of dysphagia and or dysarthria

Cervical: Sternocleidomastoid, splenius capitis, Trapezius, Levator scapulae and Scalenes
Dose SCM 15050units; Splenius Capitis 25-100units
Technique: injections guided by direction of head deviation (torticollis, retrocollis)
Precaution: Neck injections pose a risk for dysphagia

Spasticity (Upper and or Lower extremity):
Dose: Muscles: Upper Biceps 50-200units; Flexor carpi radialis/ulnaris 25-50 units
Lower limbs: Gastrocn- soleus (100-400units); Adductors (75-300units
Mid-belly approach under EMG guidance
Precautions: Excessive weakness in antagonist muscle may lead to functional loss

8.16 Essential Tremor

Clinical Presentation
involuntary, rhythmic tremor on the hands, head (yes-yes; no-no motion), voice or legs. Worsen with action e.g. Writing.

Investigation:
Clinical diagnosis excluding Parkinson’s disease

Pharmacological Management
A: Propranolol (PO) 20mg – 40mg Q24H titrated to maximum effective dose,

CHAPTER NINE

RESPIRATORY DISEASE CONDITIONS

9.1 Respiratory Tract Infections

A respiratory tract infection is an infectious disease caused by viral, bacterial or other microbial pathogens affecting the upper or lower respiratory system, including the airways and lungs.
For management of COVID 19 and Pulmonary TB please refer to chapters 4 and 7 respectively.

9.1.1 Pneumonia

Pneumonia is an infection of the lung parenchyma characterized by inflammation and consolidation of the alveoli, most commonly caused by bacterial, viral, or fungal pathogens.

Clinical Presentation

- Fever (typically>38^{0}C)
- Dry or productive cough
- Central cyanosis
- Respiratory distress
- Reduced oxygen saturation/Hypoxemia
- Chest pain and tachypnoea

Table 9.1: Tool used for assessing Adult Patient with Pneumonia

CURB 65	**Clinical Feature**		**Points**
C	Confusion		1
U	Urea>7mmol/L		1
R	RR>30		1
B	SBP<90mmHg or DBP,60mmHg		1
65	Age >65		1
CURB-65 Score	**Risk group**	**30-day mortality**	**Management**
0-1	1	1.5%	Low risk, consider home treatment
2	2	9.2%	Probable admission vs close outpatient management
3-5	3	22%	Admission, manage as severe

DBP = diastolic blood pressure; SBP = systolic blood pressure. [a] Defined as a Mental Test Score of ≤8, or new disorientation in person, place or time. Predicted 30-day mortality

Note

- For patients with pneumonia treatment should be instituted when they have FEVER, COUGH AND CXR with findings suggestive of pneumonia.
- Consider alternative diagnosis when a patient is not responding.
- Pulmonary embolism should be investigated carefully for patient with shortness of breath and not responding to treatment of pneumonia

9.1.1.1 Pneumonia in Children

(For more details, refer to Integrated Management of Childhood Illness (IMCI) guidelines)

Table 9.2: Important Clinical Presentation of pneumonia in under-fives

Age	**Signs**	**Classification**
Infants less than 2 months	Severe chest in-drawing or 60 breaths per minute or more	Severe pneumonia (all young infants with pneumonia are classified as severe)
	No severe chest in-drawing Less than 60 breaths per minute	No pneumonia: Cough or cold
Children from 2 months to 1 year	Chest in-drawing	Severe pneumonia
	No chest in-drawing 50 breaths per minute or more	Pneumonia
	No chest in-drawing Less than 50 breaths per minute	No pneumonia: Cough or cold
Children from 1 year to 5 years	Chest in-drawing	Severe pneumonia
	No chest in-drawing 40 breaths per minute or more	Pneumonia

Investigations

- ABG
- FBC (look for increased WBC, neutrophilia) CRP/ESR (increased), Blood culture, Sputum culture and sensitivity, RBG, Serology for HIV test (if Unknown)
- CHEST X-ray-PA/LATERAL
- Bronchoscopy (Consider if immunosuppression, critically ill, fail to respond, suspected TB or PCP or poor response
- CT Scan: if patient is not improving, suspicion of fungal or alternative diagnosis

Non-Pharmacological Management

- Oxygen therapy when required
- Supportive care
  - Remove clothes
  - If wheezing giving rapid-acting bronchodilator: Salbutamol nebulizer
  - Ensure that the child receives daily maintenance fluid appropriate for the child's age but avoid over-hydration refer to IMCI/ STG & Essential Medicines List for Children

Pharmacological Management

Non-severe pneumonia

A: amoxicillin (PO) 25mg/kg 8hourly for 5days

AND

A: paracetamol (PO) 15mg/kg 6-8hourly for 5days (if fever present)

OR

A: paracetamol (supp) 10–15mg/kg 6-8hourly for 5days (if fever present)

OR

A: ibuprofen (PO) 10mg/kg 6-8hourly for 5days (if fever present)

Give the first dose at the clinic and teach the mother how to give the other doses at home. Encourage breasting and feeding.

Severe Pneumonia

A: benzylpenicillin (IV/IM) 50000 units/kg 6hourly for at least 3days

THEN

A: amoxicillin (PO) 40 mg/kg 8hourly for 7days.

Alternatively

A: ampicillin (IV/IM) 50 mg/kg 6hourly for 5days

AND

A: gentamicin (IV/IM) 7.5 mg/kg 24hourly for 5days

THEN

A: amoxicillin (PO) 40 mg/kg 8hourly for 7days.

Note

- For children above 5 years, atypical pneumonia should be considered e.g., mycoplasma
- Consider alternative diagnosis after three visit /not responding, refer patient to a pediatrician

9.1.1.2 Pneumonia in Adults (Community Acquired Pneumonia)

CAP refers to a pneumonia that is acquired outside hospital commonly caused by *Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis*, atypical bacteria (i.e, *Chlamydia pneumoniae, Mycoplasma pneumoniae, Legionella species*) and viral respiratory pathogens (i.e *rhinovirus, Corona virus and influenza*

Clinical Presentation

- Fever
- Cough dry or productive with/without purulent sputum,
- Dyspnea,
- Pleuritic chest pain
- Tachypnea
- Crepitation/Rales heard over the involved lobe or segment
- Reduced oxygen saturation/Hypoxemia
- Increased tactile fremitus, bronchial breath sounds may be present if consolidation has occurred.
- Decreased tactile fremitus and dullness on chest percussion

Investigations

- FBC (look for increased WBC, neutrophilia),
- CRP/ESR (increased)
- ABG (look for pH, bicarbonate, PaO2),
- RBG, Serology for HIV
- Sputum culture and sensitivity (are indicated for inpatients and those with severe disease
- Blood culture (are not recommended for ambulatory patients
- CHEST X-ray-PA/LATERAL (look for one or more focal pulmonary infiltrates, consolidation, tap effusion>5cm),
- Bronchoscopy (Consider if immunosuppression, critically ill, fail to respond, suspected TB or PCP other alternative diagnosis)
- CT-CHEST: if patient is not improving.

Note: Do not use CT chest to diagnose pneumonia

Non-Pharmacological Management

- Stop smoking if previously smoking
- Vaccination when indicated, in specialized centre for patient >65yrs and below 5years and those with chronic lung diseases.

Pharmacological Management

Table 9.3: First Line Treatment of Typical Community Acquired Pneumonia

Condition	Management	Duration
Mild CAP (treated on out-patient basis) (Common organism S pneumonia and these patients have no comorbidities)	**A:** erythromycin (PO) 500mg 8hourly **OR** **B**: ampicillin + cloxacillin (FDC)(PO) 500–1000mg 8hourly	5-7days
Mild to Moderate CAP (failed to respond to Initial treatment)	**A:** doxycycline (PO) 100 mg 12hourly (culture guided) **OR** **B:** azithromycin (PO) 500mg stat and then 250mg 24hourly **OR** **C:** clarithromycin (PO) 500mg 12hourly	5-7days
MILD CAP in patients with comorbidities (i.e., chronic heart, lung, liver, or renal disease; diabetes mellitus; alcoholism; malignancy; asplenia; immunosuppression; prior antibiotics within 90 days	**B:** amoxicillin + clavulanic acid (FDC) (PO) 500mg/125mg 8-12hourly or 875mg/125mg 12hourly **OR** **D:** cefuroxime (PO) 500mg 12hourly **AND** **A:** doxycycline (PO) 100mg 24hourly **OR** **C:** clarithromycin (PO) 500mg 12hourly	5-7 days
Severe pneumonia/Aspiration pneumonia (in-patient)	**D:** ceftriaxone + sulbactam (FDC) (IV) 1.5g 12hourly If suspicion of anaerobes or Aspiration pneumonia Add: **B:** metronidazole (IV) 500mg 8hourly Do culture and imaging if nonresponse consider second line	7- 10days

Second line treatment

If no response to first line further investigation is required. If patient is in respiratory distress, or no response after 3 days of first line treatment, or patient's condition deteriorates, then investigate, start empiric treatment while waiting for culture and sensitivity

S: piperacillin + tazobactam (FDC) (IV) 4.5g 6hourly for 7days

Table 9.4: Treatment of Typical and Atypical Community Acquired Pneumonias Organism Specific

Condition	Management	Duration
Atypical pneumonias (Bordetella pertussis, Mycoplasma pneumonia, Chlamydophila pneumonia)	**A:** erythromycin (PO) 500mg 6hourly **OR** **C:** clarithromycin (PO) 500mg 12hourly	7-10days
Pseudomonas pneumonia (Risk factors structural lung disease, COPD, and bronchiectasis)	**A:** ciprofloxacin (PO) 500mg 12hourly **If culture sputum-positive or HRC suggestive** **S:** piperacillin + tazobactam (FDC) (IV) 4.5g 6 -8hourly **OR** **S:** cefepime (IV) 2g 8hourly **OR** **D:** ceftazidime (IV) 2g 8hourly **OR** **S:** meropenem (IV) 1g 8hourly	7-10days
H. influenza	**A:** amoxicillin (PO) 500mg 8hourly **OR** **D:** cefuroxime (PO) 250-500mg 8hourly (culture & sensitivity should be done in order to choose alternative antibiotics)	7-10days
Pneumocystis Jirovecii Pneumonia (PJP) (Refer to Tanzania HIV Guideline for more details)	**A:** sulfamethoxazole + trimethoprim (PO/IV) 1920mg 8hourly **AND** **A:** folic acid (PO) 5mg 24hourly (if cytopenic) In Sulfur allergy: **S:** clindamycin (PO/IV) 450–600mg 6hourly	21days
Staphylococcus aureus Pneumonia	**B:** ampicillin + cloxacillin (FDC) (IV) 1g 6hourly **OR** **S:** clindamycin (IV/PO) 600mg 6-8 hourly	14days
Klebsiella Pneumonia (due to high mortality observe the duration of antibiotic given not < 10days)	**B:** chloramphenicol (IV) 500mg -1g 6hourly **AND/OR** **A:** gentamicin (IV) 4-5mg/kg 24hourly in 2 divided doses	10-14days
For critical ill patient and those with risk factors for **MRSA** include hemoptysis, recent, influenza, neutropenia, hemodialysis, and congestive heart failure)	**S:** vancomycin (IV) 15mg/kg 8-12hourly	5-7days

Note:

- In severe Pneumocystis Jirovecii pneumonia (PCP), add prednisolone 30–40mg 24hourly for 14days consider tapering down after recovery
- Patients with pneumonia should be afebrile for 48-72hours and have improved clinically before antibiotic therapy is stopped. The duration of therapy may need to be increased if the initial empirical therapy has no activity against the specific pathogen or if the pneumonia is complicated by extra pulmonary infection.

Alternative in Staphylococcal and Klebsiella pneumonia:
D: ceftazidime (IV/IM) 2g 8hourly for 7–14days

9.1.1.3 Hospital Acquired Pneumonia/Nosocomial Pneumonia

This is defined as pneumonia that occurs two days (48hrs) or more after hospitalization but that was not incubating at the time of hospital admission.

Clinical Presentation

- Fever
- Increase in respiratory rate
- Shortness of breath

Pharmacological Management

Empirical treatment until bacteriology available
C: ciprofloxacin (IV) 400mg 12hourly for 7days
OR
D: ceftriaxone + sulbactam (FDC) (IV) 1.5g 12hourly for 7days

Note: In specialized unit management of CAP/HAP can be changed with supportive culture and sensitivity done, this may necessitate use of other broader spectrum antibiotics 48-72hours until the results are obtained

9.2. Other Respiratory Infections

9.2.1 Acute Laryngo-Tracheobronchitis

Laryngo-tracheobronchitis (croup) is acute inflammation of the larynx, trachea and bronchi which occurs in young children (usually between 6 months to 3 years of age). It arises as a result of narrowing of the airway in the region of the larynx. The most common cause is viral infection (particularly parainfluenza viruses) but may also be due to bacterial infection. The obstruction is due to inflammation and oedema.

Clinical Presentation

- The symptoms include paroxysmal "barking" cough, inspiratory stridor, fever, wheezing, hoarseness of voice and tachypnoea
- Such symptoms usually occur at night
- Respiratory failure and pneumonia are potentially fatal complications.

Non-Pharmacological Management

- Prevent asphyxiation
- Treat inflammatory oedema
- Humidification of inhaled air
- Hospitalization may be necessary

Note

- No stridor at rest, give no antibiotics
- Stridor at rest or chest in-drawing or fast breathing **Refer Immediately** to hospital

Mild Croup

- Only stridor when upset, no moderate/severe ARI
- Likely of viral origin
- Home care – steam inhalation
- Antibiotics NOT required

Severe Croup

- Likely bacterial origin
- Stridor in a calm child at rest
- Chest in drawing
- Antibiotics are NOT effective and should not be given

Pharmacological Management

Admit to hospital, give Oxygen therapy to all patients with chest in-drawing (using nasal prongs only, DO NOT use nasopharyngeal or nasal catheter) until the lower chest wall in drawing is no longer present

D: dexamethasone (PO) 0.6mg/kg 24hourly in 1–2 divided doses

AND

A: epinephrine (adrenaline) (inhalation) 400mcg/kg 2hourly if effective; repeat after 30min if necessary.

9.2.2 Laryngeal Diphtheria

Is an infection caused by *Corynebacterium diphtheria*; it is directly transmitted from person to person by droplets. Children between 1–5 years of age are most susceptible although non-immune adults are also at risk. Diphtheria is characterized by grayish-white membrane, composed of dead cells, fibrin, leucocytes and red blood cells as a result of inflammation due to multiplying bacteria.

Non-Pharmacological Management

- Isolate the child
- Gently examine the child's throat – can cause airway obstruction if not carefully done.
- NGT for feeding if unable to swallow: Confirm NGT position with X-ray.
- Avoid oxygen unless there is incipient airway obstruction
- May need tracheostomy if there is incipient airway obstruction: Worsening stridor, oxygen desaturation

Pharmacological Management:

A: phenoxymethylpenicillin (PO) 250mg 6hourly for 14days

OR

A: erythromycin (PO) 125–250mg 6hourly for 14days

OR

B: azithromycin (PO) 500mg 24hourly for 3days

OR

A: benzylpenicillin (IV) 25,000–50,000units/kg to a max. of 1.2MU 12hourly until the patient can take oral medicine

AND

A: diphtheria antitoxin (IM or slow IV) dose depends upon the site and severity of infection:
First give a test dose of 0.1ml of 1 in 10 dilution of antitoxin in 0.9% Sodium Chloride intradermal to detect hypersensitivity. It should be given immediately because delay can lead to increased mortality
The dose should be administered intravenously over 60minutes in order to inactivate toxin rapidly

- 20,000–40,000 units for pharyngeal/laryngeal disease of <48 hours' duration,
- 40,000–60,000 units for nasopharyngeal disease
- 80,000–120,000 units for >3days of illness or diffuse neck swelling "bull-neck"

9.2.3 Whooping Cough

It is a highly infectious childhood disease caused by *Bordetella pertussis*. It is most severe in young infants who have not yet been immunized.

Clinical Presentation
Paroxysmal cough associated with a whoop, Fever, Nasal discharge.

Non-Pharmacological Management

- Place the child head down and prone, or on the side, to prevent any inhaling of vomitus and to aid expectoration of secretions.
- Care for the airway but avoid, as far as possible, any procedure that could trigger coughing, such as application of suction, throat examination
- Do not give cough suppressants, sedatives, mucolytic agents or anti-histamines.
- If the child has fever (>38.5^{0}C) give paracetamol.
- Encourage breastfeeding or oral fluids
- Whooping cough is preventable by immunization with pertussis vaccine contained in DPT- Hep B-Hib vaccine at week 6, 10 and 14.
- Give oxygen to children who have spells of apnoea or cyanosis, or severe paroxysms of coughing.
- Use nasal prongs, not a nasopharyngeal catheter or nasal catheter which can provoke coughing.

Pharmacological Management
A: erythromycin (PO) 12.5 mg/kg 6hourly for 10days.
This does not shorten the illness but reduces the period of infectiousness
If there is fever

In Children older than age 2 months:
A: trimethoprim + sulfamethoxazole (FDC) (PO) 8mg+40mg/kg 12hourly for 7-14days

9.2.4 Pneumocystis jirovecii pneumonia (PJP)

Pneumocystis jirovecii pneumonia (PJP) is a potentially life-threatening fungal lung infection caused by *Pneumocystis jirovecii* (formerly known as *Pneumocystis carinii*). It predominantly affects individuals with compromised immune systems. It is a common Opportunistic infection in HIV.

Clinical Presentation

- Cough dry/productive
- Exertional dyspnoea
- Fever
- Tachypnoea
- Chest pain
- Scattered crackles and wheeze may be present, or rarely signs of focal consolidation
- Pulse oximetry may show low SaO2
- Extra-pulmonary disease may manifest as hepatosplenomegaly, lymphadenopathy or ocular disease

Investigations:

- Elevated LDH
- ABG: Hypoxemia, increased alveolar-arterial oxygen tension gradient
- Serum Beta-D-glucan levels
- Chest X-ray: may appear normal in 10-30% of cases. Predominantly perihilar distributed Fine reticular interstitial changes, small pneumatoceles.
- CT-CHEST: More sensitive, shows perihilar and midzone Ground Glass Pattern, Septal thickening (Crazy paving pattern), pneumatoceles. Rarely consolidations.
- Gallium scanning is highly sensitive but with low and variable specificity.
- Sputum/BAL (PCR or DFA staining): Detect *Pneumocystis jirovecii*

Non pharmacological and Supportive Therapy

- Maintain and monitor hydration
- Antipyretic if there is fever
- Continue therapy for bacterial pneumonia
- Nutrition support
- Oxygen therapy

Pharmacological Therapy

A: sulfamethoxazole + trimethoprim (Cotrimoxazole) (PO) 1920mg 8hourly for 21 days

In severe cases: cotrimoxazole (IV) 15–20mgTMP/75-100mgSMX/kg/day, 6-8hourly, may switch to oral after clinical improvement.

OR

If allergic to sulphur

D: trimethoprim (PO) 12- 15mg/kg/day

AND

S: dapsone (PO) 100mg/day for 21 days

OR

S: clindamycin (PO) 450mg 6hourly or 600 mg 8hourly

AND

A: primaquine 30 mg 24 hourly daily for 21 days.

Adjuvant therapy with steroids may also be beneficial in severe cases. (**PaO_2 <70 mmHg** or A–a gradient >35 mmHg)

A: prednisolone (PO) 40 mg 12 hourly day 1 - 5

THEN

A: prednisolone (PO) 40 mg 24 hourly day 6 -10

THEN

A: prednisolone (PO) 20mg 24 hourly day 11 -21

9.2.5 Pulmonary Aspergillosis

Pulmonary aspergillosis is a spectrum of lung diseases caused by Aspergillus spp., most commonly Aspergillus fumigatus. Manifestations vary depending on host immunity and underlying lung disease.

9.2.5.1 Allergic Bronchopulmonary Aspergillosis (ABPA)

Occurs in patients with underlying chronic airway disease especially asthma or bronchiectasis. Caused by a hypersensitivity reaction to Aspergillus

Clinical Presentation: Recurrent wheeze, cough, mucus plugs

Investigations

- Elevated total IgE (>1000 IU/mL)
- Positive Aspergillus-specific IgE/IgG
- CXR/CT: bronchiectasis, mucus plugging

Pharmacological Management

B: prednisolone (PO) 0.5 mg/kg/day (20–40 mg/day) for 3–6 months (taper slowly over weeks/months)

AND

D: itraconazole (PO) 200mg 12-24hourly for 6-12months

9.2.5.2 Chronic Pulmonary Aspergillosis (CPA)

Patients with underlying lung disease (e.g., Healed TB, COPD, sarcoidosis): e.g., aspergilloma

Clinical Presentation

Cough, hemoptysis, weight loss, fatigue. Symptoms >3 months

Investigations

- Cavity on imaging ± fungal ball
- Positive Aspergillus IgG

Exclude active TB or malignancy

Pharmacological Management

D: itraconazole (PO) 200mg 12-24hourly for 6-12months

Surgical resection or embolization for severe disease

9.2.5.3 Invasive Pulmonary Aspergillosis (IPA): Severely immunocompromised (e.g., neutropenia, transplant)

Clinical Presentation
Fever, pleuritic pain, cough, hemoptysis, rapidly progressive symptoms

Investigations

- Imaging: Halo sign, air crescent sign on CT
- Serum/BAL galactomannan or beta-D-glucan
- Culture or biopsy confirmation

Pharmacological Management
S: liposomal Amphotericin B (IV) 0.7–1 mg/kg/day for 6–12 weeks or until improvement

> **Note:** Itraconazole requires acidic gastric environment for absorption; monitor LFTs. Liposomal Amphotericin B should be reserved for azole failures.

9.3 Aspiration Syndromes

Aspiration syndromes are pulmonary conditions caused by inhalation of gastric contents, oropharyngeal secretions, or foreign material into the lower respiratory tract, resulting in chemical lung injury, infection, or airway obstruction.

Types

1. **Aspiration Pneumonitis**
   Acute chemical lung injury following aspiration of sterile gastric contents.
2. **Aspiration Pneumonia**
   Infective process caused by aspiration of colonized oropharyngeal secretions.
3. **Foreign Body Aspiration**
   Mechanical airway obstruction by inhaled solid or liquid material. It is a medical emergency.

Risk Factor

- Reduced consciousness (alcohol intoxication, anesthesia, seizures)
- Neurological disease such as stroke, dysphagia
- Gastro-oesophageal reflux
- Elderly, debilitated patients

Clinical Features

- Cough, choking
- Dyspnoea, tachypnoea
- Fever (more common in pneumonia)
- Crackles or wheeze
- Hypoxia

Investigations

- Chest X-ray
- Full blood count (if infection suspected)
- Bronchoscopy (suspected foreign body aspiration)

> **Note**: Normal chest X-ray does **not exclude** foreign body aspiration; persistent clinical suspicion (sudden cough, unilateral wheeze, or unexplained respiratory symptoms) warrants early referral for bronchoscopy and specialist evaluation.

Non-Pharmacological Management

- Airway Protection: If the patient is choking, use the Heimlich maneuver. For unconscious patients, turn them on their side and clear the airway.
- Positioning: Place the patient in a Fowler's or Trendelenburg position to prevent further aspiration and aid drainage.
- Suctioning: Immediately suction the oropharynx to remove material.
- Respiratory Support: Administer supplemental oxygen to maintain oxygen saturation. Intubation may be necessary in compromised airway reflexes or severe hypoxia.
- Chest Physiotherapy: May be considered after stabilization to aid secretion clearance in patients with retained secretions or reduced cough effort.

Pharmacological Management

Aspiration Pneumonitis

- Supportive care only
- Antibiotics NOT routinely indicated
- Bronchodilators may be used if bronchospasm or wheezing is present:

B: salbutamol 5mg nebulization, 6hourly (PRN depending on clinical response).
OR
S: ipratropium 0.5mg nebulization, 6hourly (PRN depending on clinical response).
Observe closely for 24–48 hours

a) Mild–Moderate Aspiration Pneumonia
Adults:
B: amoxicillin + clavulanic acid (PO) 625 mg 8-12hourly for 5-7days.
OR
C: amoxicillin + clavulanic acid (IV) 1.2g 8-12hourly for 5-7days.

Pediatrics:
B: amoxicillin + clavulanic acid (PO) 20–45 mg/kg/day in 2–3 divided doses *(amoxicillin component)* for 5-7days.

b) Severe Aspiration Pneumonia
Obtain sputum (and blood where indicated) for culture and sensitivity before starting antibiotics whenever possible, while initiating empiric broad-spectrum antibiotic therapy with anaerobic coverage without delaying treatment.
Adults:
B: ceftriaxone (IV) 2 g 24hourly for 7-10days.
AND
A: metronidazole: 500 mg IV/PO 8hourly for 7-10days.
OR
S: piperacillin + tazobactam (IV) 4.5g 6-8hourly for 7-10days.
OR
S: meropenem (IV) 1g 8hourly for 7-10days.

Pediatrics:
B: ceftriaxone (IV) 50–75 mg/kg/day 24hourly for 7-10days.
AND
A: metronidazole (PO/IV) 7.5 mg/kg/dose 8hourly for 7-10days.
OR
S: piperacillin + tazobactam (IV) 80 mg/kg/dose (piperacillin component) 6-8hourly for 7-10days.
OR
S: meropenem (IV) 20-40mg/kg 8hourly for 7-10days.

In Penicillin Allergy
Adults
S: clindamycin (IV) 600mg 8 hourly OR (PO) 300–450 mg PO 6-8hourly for 7-10days.
Pediatrics
S: clindamycin (IV) 10–20 mg/kg/dose 8hourly for 7-10days.

c) Foreign Body Aspiration

- Urgent bronchoscopy
- Supportive oxygen therapy
- Ventilatory support if required
- Antibiotics only if secondary infection present

Complications

- Acute respiratory distress syndrome (ARDS)
- Lung abscess
- Empyema
- Sepsis and Septic shock

Referral Criteria

- Severe respiratory distress
- Hypoxia not responding to oxygen
- Suspected foreign body aspiration
- Failure to improve after 48–72 hours

Prevention

- Head elevation ≥30°
- Swallowing assessment in high-risk patients
- Avoid oral feeding in reduced consciousness
- Improved oral hygiene

9.4 Obstructive Lung Diseases

It's a chronic airway disease which result in airway flow limitation can be either reversible or irreversible

9.4.1 Asthma

Asthma is chronic inflammatory disorder of the airways, characterized by variable respiratory symptoms such as wheezing, shortness of breath, chest tightness, and cough, along with variable expiratory airflow limitation.

Clinical Presentation

Asthma is likely when there are

- Typical intermittent symptoms that vary over time in frequency and severity
- History of atopy,
- Family history of asthma,
- Environmental/ occupational exposures,
- Response to asthma therapy.

Investigations

Diagnosis of asthma is based on clinical assessment supported by Lung Function Test that demonstrates variable airflow obstruction in adults and children >5 years. Peak Flow Meter should be used when Spirometry is not available.
Other investigations include, CXR, FBP, ESR, S. IGE.

Note:

- Diagnosing asthma in children under 5 can be challenging
- The presence of frequent asthma-like symptoms (e.g., wheezing, cough, difficulty breathing) and improvement with asthma medication are key indicators.

Asthma Management

9.4.1.1 Management of Chronic Asthma

Asthma management should be an ongoing process of assessing, treating and reviewing the patient's response.

Non-Pharmacological Management

The following factors should be addressed:

- Adherence to medications
- Correct inhaler technique should be demonstrated and checked regularly
- Avoidance of triggers and other factors that could worsen asthma including: Exposure to Environmental Tobacco Smoke, Polluted environment (both indoors and outdoors) and Medications such as aspirin or NSAIDs, Avoid non-selective β-blockers,
- Management of other medical conditions likely to affect asthma control such as cardiac disease, allergic rhinitis, obesity, Sleep Apnea and GERD.

Pharmacological Management

Anti-asthma drugs can be classified as controllers (required for maintenance treatment) and relievers (required for quick relief, rescue drugs). Inhalers are the cornerstone of asthma therapy.

Controller medicines

- Inhaled corticosteroids (ICS) e.g. Beclometasone, budesonide, fluticasone
- Long acting β2 agonists (LABA) e.g., formoterol, salmeterol: Inhalation 100mcg, 200mcg
- Combined ICS-LABA: e.g., C: budesonide-formoterol (inhaler), C: Beclometasone-formoterol (inhaler),

C: salmeterol + fluticasone (inhaler) 250/25 mcg/actuation

OR

Long-acting muscarinic antagonist (LAMA)
S: tiotropium: 9/18mcg 1-2 inhalations 24hourly

Reliever medicines

- Short acting β2 agonists (SABA) e.g. A: salbutamol inhaler 100-200 mcg PRN
- Short acting muscarinic antagonist (SAMA) e.g., B: Ipratropium bromide: 20 mcg/metered dose

There are two treatment approaches as follows

a) Low-dose ICS–formoterol taken as needed when symptoms occur, with or without maintenances ICS-Formoterol depending on severity. This strategy cannot be applied with other ICS-LABA combinations. It is specific to ICS-formoterol.

C: budesonide + formoterol (inhaler) 200/6 mcg per dose. **See table 9.5**

OR

C: beclometasone + formoterol (inhaler) 100/6 mcg per dose. **See table 9.6**

Table 9.5 Budesonide +Formoterol Maintenance Dose Regimen

Dose Level	Budesonide Daily Dose	Formoterol Dose per Actuation	Common Inhaler Strengths	Typical Regimen
Low	≤400 mcg/day	6 mcg	100/6, 200/6 mcg	1–2 puffs 12 hourly
Medium	>400–800 mcg/day	6 mcg	200/6 mcg	2 puffs 12 hourly
High	>800 mcg/day	6 mcg	200/6, 400/12 mcg	2 puffs 12 hourly (up to max as needed) *

Additional puffs may be used as needed (max total dose e.g., 8–12 puffs/day).

Table 9.6 Beclometasone + Formoterol Maintenance Dose Regimen

Dose Level	Beclometasone (BDP) Daily Dose	Formoterol Dose per Actuation	Typical Dosing Regimen
Low	≤200 mcg/day	6 mcg	1 puff 12 hourly
Medium	>200–400 mcg/day	6 mcg	2 puffs 12 hourly
High	>400 mcg/day	6 mcg	2 puffs 12 hourly + extra prn*

Additional puffs may be used as needed (max total dose e.g., 8–12 puffs/day).

b) Regular daily maintenance treatment with low-dose ICS, plus as-needed SABA (salbutamol) taken when symptoms occur. This is an alternative only when the 1st approach is not possible.

B: budesonide (inhalation) 100-200µg. 1 – 2 inhalations/ day:

OR

B: beclometasone Dipropionate (inhalation) 100-200µg 12hourly

Table 9.7 Low, Medium and High Dose Inhaled Corticosteroids Adults and Adolescents (≥12 Years)

Inhaled corticosteroid	Total daily dose (mcg)		
	Low	Medium	High
Budesonide	200-400	>400-800	>800
Fluticasone propionate	100-250	>250-500	>500
Mometasone furoate	110-220	>220-440	>440

Table 9.8 Low, Medium and High Dose Inhaled Corticosteroids Children 6–11 Years

Inhaled corticosteroid	Total daily dose (mcg)		
	Low	Medium	High
Budesonide	100-200	>200-400	>400
Budesonide (nebules)	250-500	>500-1000	>1000
Fluticasone propionate	100-200	>200-400	>400
Fluticasone propionate	100-200	>200-500	>500
Mometasone furoate	110	>220-≤440	≥440

Add-on therapies depending on specific indications:

- Leukotriene Receptor Antagonists (LTRA) e.g., **B:** Montelukast (PO) 5 -10mg 24hourly.
- Long-Acting Muscarinic Antagonists (LAMA) e.g., **S:** Tiotropium inhaler 18mcg 24hourly.
- Sublingual Immunotherapy (SLIT)
- Oral Corticosteroids: Reserved for persistent severe asthma. Under specialist decision.

Table 9.9 Long Term Treatment of asthma According to Severity

Step	Asthma Category	Preferred Treatment	Alternative	Add on/Adjunct	Children <5 years
Step 1	Intermittent Asthma - Daytime symptoms <1/week - Nighttime symptoms <2/month - Normal activity	As-needed low-dose ICS-Formoterol	Low-dose ICS (100 – 200Mcg) taken whenever SABA used as needed: **A:** salbutamol inhaler 100–200 micrograms (mcg) SABA alone no longer recommended	None	Consider Intermittent short course ICS at onset of viral illness Spacer use encouraged
Step 2	Mild Persistent Asthma Symptoms >1/week but <1/day - Night symptoms >2/month	As-needed low-dose ICS-Formoterol	Maintenance Low-dose ICS daily. **AND** Low-dose ICS whenever SABA used as reliever.	LTRA **D:** montelukast): 4mg nocte (6 months- 5 yrs) 5mg nocte (6–14 yrs.') 10mg nocte (≥15 yrs)	Daily Low dose ICS **OR** Daily LTRA **AND** As needed SABA
Step 3	Moderate Persistent Asthma - Daily symptoms - Activity affected - Night symptoms >1/week	Daily low-dose Maintenance ICS-Formoterol: 1 inhalation OD/BD **AND** same inhaler taken as needed (Reliever) (One inhalation BD and 1 as needed): Maximum 12 inhalations/day	Maintenance Medium-dose ICS daily **OR** Low-dose ICS + LABA **AND** Low-dose ICS whenever SABA used as reliever.	Add on: LTRA Montelukast as above	Consider Referral to specialist Double Low dose ICS + LTRA **AND** As needed SABA
Step 4	Severe Persistent Asthma Symptoms most days - Frequent night symptoms - Limited activity	Refer this patient to Specialist Medium dose ICS-Formoterol: 2 inhalations 12 hourly **AND** same inhaler taken as needed	Refer this patient to Specialist Medium/High-dose ICS + LABA **AND** Low dose ICS whenever SABA used as reliever.	Add-on: LAMA **S:** Tiotropium 18 mcg 1 puff daily For patient with Allergic rhinitis and asthma add (SLIT) If FEV1>70% predicted	Continue with Maintenance and Refer to specialist Review possible alternative Diagnosis
Step 5	Severe/Refractory Asthma - Persistent symptoms - Frequent night awakenings - Marked activity limitation	Refer to expert opinion (respiratory physician/pulmonologist for phenotypic investigation+/- add on treatment High dose ICS-Formoterol **AND** Low dose ICS whenever SABA used as reliever.	Refer to expert opinion (respiratory physician/pulmonologist for phenotypic investigation+/- add on treatment High Dose ICS-LABA **AND** Low dose ICS whenever SABA used as reliever.	Low dose OCS (consider side effects) Macrolide trial in select adults	

Note: Treatment can be adjusted up or down the steps based on individual patient needs, following objective assessment during regular follow-up.

9.4.1.2 Management of Acute Asthma

Exacerbations are marked by worsening symptoms and reduced lung function. Management involves:

- Assessment of severity
- Drug delivery and re-evaluation
- Discharge plan

Table 9.10 Assessment and Treatment of Asthma attack in Children ≥2years & Adults

Attack	Clinical Presentation	Management (Children & Adults)
MILD- MODER ATE ATTACK	• Able to talk in sentences or phrases • Not agitated Pulse rate 100-120bpm • Sat 02(on air)-90- 95% • PEF>50% predicted	a) Salbutamol inhalation (can be given by pMDI or spacer or Nebulization) Give: 4-10 puffs by pMDI/ spacer/ every 20minutes for 1st hour Adult: **B:** salbutamol nebulizer 5mg 6hrly (2-3cycles and reassess); Pediatric: **B:** salbutamol nebulizer 2.5mg 6hrly (2-3cycles and reassess). If symptoms completely subside observe for 1–4hours, give Salbutamol for 24–48hours (2-4 puffs every 4–6hours) for 3 days. If attack is only partially resolved give 2–4 puffs of Salbutamol every 3–4 hours if attack is mild; 6 puffs every 1–2 hours if the attack is moderate, until symptoms subside. When attack completely resolved proceed as above.
		b) Prednisolone **A:** prednisolone (PO): Adult 40mg am 7/7; Pediatrics 1-2mg/kg max 40mg Do tapering if exceed seven days.
		c) Controlled oxygen (if available): target saturation 93-95% (children: 94-98%)
		Note: If symptoms worsen or do not improve, treat as SEVERE ATTACK
SEVERE ATTACK	• Talks in words i.e., cannot complete a sentence in 1 breath or too breathless to talk/ feed • Sits hunched forwards • Agitated • Respiratory rate >30/min. • Accessory muscles being used • Pulse rate > 120 bpm • O2 saturation (on air): < 90% • PEF ≤ 50% predicted or best	a) Admit the patient, place in semi-sitting position b) oxygen continuously 5L/min (maintain O2 saturation for adult 93-95% (Children 94-98%) c) Inhalation **B:** salbutamol nebulizer4-10puffs every 20-30min in children <5years, up to 20 puffs in children >5years and adults **AND** **S:** ipratropium bromide (inhalation)0.25-0.5mg 6-8hourly **AND** **A:** hydrocortisone (IV) 5mg/kg in children, 100mg in adults 6hourly **THEN** switch to oral **A:** prednisolone (PO)1-2mg/kg 24hourly to complete 7days of treatment If attack is completely resolved continue with salbutamol inhalation 2–4puffs every 4hours for 24-48hours and oral prednisolone 1-2mg/kg 24hourly to complete 3–5days of treatment. If not improving or condition worsens, treat as **LIFE-THREATENING ATTACK. REFER FOR SPECIALIZED CARE.**

Discharge Plan

- Should include as-needed reliever (ICS-formoterol or SABA), a short course of OCS, Prednisolone 0.5mg/kg. Max 50mg OD or dexamethasone 6-12mg OD, 5-7 days
- Regular controller therapy.
- Review inhaler technique, adherence, and adjust maintenance therapy after 2–4weeks if needed.
- Schedule follow-up within 2–7 days to reassess control, risk factors, causes, and update asthma action plan.

9.4.2 Chronic Obstructive Pulmonary Disease (COPD)

Chronic Obstructive Pulmonary Disease (COPD) is a diverse lung condition marked by persistent airflow limitation and respiratory symptoms of shortness of breath, cough, and exacerbations; resulting from structural abnormalities in the airways (Bronchitis) or in the alveoli (Emphysema). It is usually caused by significant exposure to noxious particles or gases.

Risk Factors for COPD

1. Indoor and outdoor air pollution
    - Exposure from burning wood
    - Exposure to biofuel
    - Heating in poorly vented dwellings

2. Occupational exposure
    - Coal miners
    - Tunnel Workers
    - Hard-rock miners
    - Concrete manufacture
    - Livestock farming (i.e., to pesticides)

3. Cigarette smoking
4. Use of domestic solid fuel
5. Childhood Asthma
6. Alpha-1 antitrypsin deficiency

Clinical Presentation

- Shortness of breath
- Cough, sometimes caused by the production of mucus
- Wheezing
- Slow and prolonged expiration
- Chest wall hyperinflation,
- Limited diaphragmatic motion on auscultation,
- Distant breath sounds, and heart sounds
- Coarse early inspiratory crackles.
- Use of accessory muscles
- Pursed-lip breathing
- Signs of cor pulmonale. (Raised JVP, peripheral oedema, hepatomegaly etc.)
- Cyanosis
- Asterixis

Investigations

- FBP (Raised hematocrit: men>52% and women >47)
- ESR /CRP/Procalcitonin
- Lung function Test (Spirometry): For Diagnosis, Assessment of severity and follow-up
- Serum alpha-1 antitrypsin levels as indicated
- Chest radiography: Exclusion of other respiratory conditions with similar presentation as well as complications.
- Sputum culture and sensitivity
- Sputum cytology (if the cough is persistent)
- Chest CT scan: Detailed disease assessment and surgical planning when indicated.
- Bronchoscopy (to exclude foreign body aspiration, tuberculosis, tumours, and other chronic diseases in patients with worsening symptoms, BAL for C/S)

Non-Pharmacological Management

- Smoking cessation
- Remove from hazardous environment
- Prompt treatment of infective exacerbations
- Controlled oxygen therapy
- Physiotherapy
- Pulmonary Rehabilitation (consist of education, lifestyle modification, regular physical activities, physiotherapy and avoid indoor and outdoor pollutants)
- Nutrition support
- Ventilatory support in specialized center
- Lung volume reduction surgery

Pharmacological Management

Pharmacological therapy has 3 major goals: Reduce symptoms, reduce frequency and severity of exacerbations and improve health status and exercise tolerance. It is guided by disease severity (GOLD stage), symptom burden, and exacerbation history.

1. Bronchodilators

a) Short-acting bronchodilators (for symptom relief)

Short-acting β2-agonists (SABA):

A: salbutamol inhalation. 100–200mcg 4–6 hourly. (inhaler)

OR

B: salbutamol nebulizer 2.5mg 4–6hourly.

Short-acting anticholinergics (SAMA):

S: ipratropium inhalation 20–80mcg, 6–8hourly 20–40mcg 6hourly (inhaler)

OR

S: ipratropium nebulization 0.5mg 6–8hourly

b) Long-acting bronchodilators (maintenance therapy)

Long-acting β2-agonists (LABA) inhalers:

C: formoterol 6 mcg 12hourly.

OR

C: salmeterol 25 mcg 2 inhalations 12hourly

Long-acting muscarinic antagonists (LAMA):
S: tiotropium inhaler 18Mcg1 inhalation 24hourly

LABA+LAMA combinations provide enhanced bronchodilation and are preferred in moderate to severe disease.

2. Inhaled Corticosteroids (ICS)

- Used in combination with LABA or LABA/LAMA in patients with:
- Frequent exacerbations
- High eosinophil counts (>300 cells/μL)

ICS+LABA:
C: budesonide +formoterol combination: 200/6mcg. 1 inhalation 12hourly

Note: ICS monotherapy is not recommended.

3. Triple Therapy
S: (ICS + LABA + LAMA) inhalation
For patients with persistent symptoms or exacerbations despite dual therapy.

4. Macrolides
B: azithromycin 500mg (PO) 24 hourly for 3 days
Prolonged macrolide use may be indicated in selected patients with frequent exacerbations despite optimal inhaler therapy (antibacterial effects; Immune-modulatory and anti-inflammatory effects). Refer to specialist for evaluation.

5. Mucolytics
N-acetylcysteine, Carbocysteine): Reduces overproduction and hypersecretion, increases elimination.
C: n-acetylcysteine (PO) Tablets/Effervescent tablets- 600mg 24hourly.
OR
C: n-acetylcysteine Inhaled solution: 10%/20% solution. 2- 4 ml nebulization 6 -8hourly.
(Pre-medication with Salbutamol nebulizer is advised to reduce risk of bronchospasm)

6. Vaccinations (Supportive)
Influenza, pneumococcal, and COVID-19 vaccines are essential to reduce risk of infection-triggered exacerbations.

Table 9.11 Initial Pharmacological Management as per COPD staging

GOLD FEV1Stage	Exacerbation Per Year	Mild symptoms	Moderate/Severe Symptoms
I: ≥80% II: 50-79% III: 30-49% IV: 30%	**0 -1** **(Not leading to hospitalization)**	**GROUP A** Bronchodilator (SABA- PRN)	**GROUP B** LAMA OR LABA
GROUP E **≥2 exacerbations or >1 leading to hospitalization: Regardless of symptom severity** LABA+LAMA (+ICS if eosinophil >300)			

Note:

- Inhalers are the mainstay of therapy.
- Single inhaler therapy is more desirable to improve adherence.
- Inhaler technique should be checked regularly.
- Advise patient to rinse mouth after use of ICS inhaler
- Oral Corticosteroids should be avoided due to numerous side effects

9.4.3 COPD Exacerbations

COPD exacerbation is a worsening or “flares up” of COPD symptoms, particularly dyspnoea, cough and/or sputum production, that is acute in onset and leads to a change in medication." commonly caused by infection in the lungs but in some cases the cause is unknown.

Triggers:
Infectious causes: ~70–80% (viral or bacterial respiratory infections)
Non-infectious causes: air pollution, poor adherence to therapy, pulmonary embolism, or comorbidities (e.g., heart failure, gastro oesophageal reflux disease (GERD)

Clinical Presentation
Worsening cough**,** Change in sputum color, consistency, volume**,** Increase in dyspnea, Wheezing.

Investigations
- Chest Xray
- Sputum C/s
- FBP
- CRP, ESR, Pro-Calcitonin
- ABG
- ECG

Table 9.12 COPD Exacerbation Management

Agent	Dose
SAMA **S:** ipratropium bromide (aerosol)	MDI 4-8 puffs 1-2 hourly, Nebulizer 0.5mg 1-2hourly
SABA **A:** salbutamol (inhalation)	MDI 4-8 puffs 1-2 hourly Nebulizer 2.5-5mg 1-2 hourly
Corticosteroids	
A: prednisone (PO)	1mg/kg 24hourly for 5days
OR	
A: hydrocortisone (IV)	1-2mg/kg 6hourly
D: methylprednisolone (IV)	125mg 6hourly for 72hours (Then switch oral)
B: dexamethasone (IV)	4 -8 mg 12hourly
Antibiotic (If infection Presents) (Penicillin/Macrolide/Fluoroquinolone)	
A: amoxicillin (PO)	500mg 8hourly for 7days
OR	
A: ciprofloxacin (PO)	500mg 12hourly for 7days
OR	
A: doxycycline (PO)	100mg 12hourly for 7days
OR	
C: clarithromycin (PO)	500mg 12hourly for 7days
Mucolytic agents: For patients with significant mucus production. **C:** n-acetylcysteine solution 10/20%	2 -4 ml nebulization 6-8hourly
Ventilatory support, Oxygenation if indicated: Avoid hyperoxia	

9.5 Suppurative Lung Diseases

A group of respiratory disorders characterized by chronic infection and pus formation in the airways and/or lung parenchyma, leading to persistent inflammation, tissue destruction, and structural abnormalities.

Common Types: Bronchiectasis, Lung abscess, Empyema, Necrotizing Pneumonia

9.5.1 Bronchiectasis

A chronic lung condition characterized by permanent, abnormal dilation of the bronchi due to chronic infection, inflammation, and/or impaired mucociliary clearance.
It is a common complication/sequalae of Pulmonary Tuberculosis (Post TB Lung Disease).

Etiology (Causes):

Category	Examples
Post-infectious:	Severe pneumonia, tuberculosis, measles
Congenital:	Cystic fibrosis (CF), primary ciliary dyskinesia
Immune disorders:	Common variable immunodeficiency (CVID), HIV
Obstruction:	Tumors, foreign bodies
Idiopathic:	No identifiable cause in ~30–50% of cases

Clinical Presentation

- Chronic productive cough (often with purulent sputum)
- Recurrent respiratory infections
- Hemoptysis
- Dyspnea
- Wheezing
- Fatigue
- Digital clubbing (in advanced cases)
- Exacerbations are characterized by worsening of symptoms and change in Sputum volume and quality

Investigations:

- High-resolution CT (HRCT) scan of chest: Gold standard
- Sputum culture and microscopy
- Pulmonary function tests (PFTs): Often show obstructive pattern
- Immunoglobulin levels, sweat chloride test, ciliary function tests: Based on suspected cause

Pharmacological Management

Management focuses on controlling infection, clearing airways, reducing inflammation, and managing comorbid conditions.

a) Treat underlying cause

b) Airway clearance

- Chest physiotherapy, postural drainage
- Oscillatory devices
- Mucolytics (e.g., hypertonic saline, nebulized acetylcysteine)

c) Antibiotics: See **Table 9.13 and 9.14**

d) Bronchodilators: In cases with airway hyperreactivity or obstruction: (**Table 9.15)**

e) Vaccinations: Influenza, COVID-19 and pneumococcal vaccines

f) Surgical: Lobectomy in localized, treatment-refractory disease

Table 9.13 Antibiotics for exacerbations

Drug	Dose	Comments
B: amoxicillin + clavulanic acid (PO)	625–1000 mg 8-12hourly for 5-10 days	Broad-spectrum; adjust dose in renal impairment
A: ciprofloxacin (PO)	500–750 mg 12hourly for 5-10 days	Good against Pseudomonas; avoid in epilepsy, QT risk
B: azithromycin (short-term)	500mg 24hourly for 3–5 days	For exacerbation or atypical pathogens
D: cefuroxime (PO)	500mg 24hourly for 5-10 days	Second-gen cephalosporin; less effective against Pseudomonas
B: ceftriaxone (IV)	1–2g IV 24hourly for 5-10 days	Used for severe infections or hospitalized patients
S: colistin (inhaled)	1–2MIU via nebulizer 12hourly	Alternative to tobramycin; monitor for bronchospasm

Table 9.14 Macrolides (Long-term Anti-inflammatory/Antibiotic)

Drug	Comments
B: azithromycin (PO)	Refer to specialist for evaluation and possible initiation of long-term macrolides if ≥3 exacerbations/year

Table 9.15 Bronchodilators (If Obstructive Component)

Drug	Dose	Notes
A: salbutamol (SABA)	100–200 mcg via inhaler 6hourly or prn	Rescue therapy; should also be used before physiotherapy
C: formoterol (LABA)	12 mcg 12hourly via inhaler	Use with ICS in COPD/asthma overlap
S: ipratropium (SAMA)	20 mcg via inhaler 6hourly	Often combined with SABA
S: tiotropium (LAMA)	18 mcg inhaled 24hourly	Long-term maintenance if airflow limitation persists

Table 9.16 Mucolytics / Airway Clearance Aids

Drug	Dose	Comments
C: sodium chloride (hypertonic saline) **(3%–7%)**	3–5 mL nebulized 12hourly	Promotes mucus hydration; may cause bronchospasm
Nebulized Acetylcysteine	2–4 mL of 10/20% solution 8hourly	Mucolytic effect; may irritate airways

Note: Refer to specialist if:

- Unclear cause of bronchiectasis
- Suspected cystic fibrosis or primary ciliary dyskinesia
- Recurrent infections despite treatment
- Hemoptysis (especially if moderate to severe)
- Rapid progression or declining lung function
- Frequent exacerbations (≥3 per year)
- Consideration of long-term antibiotic therapy

9.5.2 Lung Abscess

A lung abscess is a localized collection of pus in the lung parenchyma caused by suppurative necrosis of lung tissue, resulting in cavity formation, usually with an air-fluid level.

Etiology (Causes):

a) Primary Lung Abscess (Most common): Aspiration of oropharyngeal contents

Risk factors:

- Altered consciousness (e.g., alcohol, seizures, anesthesia), poor dentition, stroke
- Anaerobic bacteria are most common (e.g., *Peptostreptococcus*, *Bacteroides*, *Fusobacterium*)

b) Secondary Lung Abscess

- Post-obstructive (tumor, foreign body)
- Septic emboli (e.g., endocarditis)
- Immunosuppression
- Bronchiectasis, necrotizing pneumonia (e.g., Staph. aureus, Klebsiella)
- Direct extension from infection (e.g., empyema)

Clinical Presentation

- Fever, chills, night sweats
- Cough with foul-smelling, purulent sputum
- Hemoptysis (may occur)
- Pleuritic chest pain
- Weight loss, fatigue
- Clubbing (in chronic cases)

Investigations:

Test	Findings
Chest X-ray	Thick-walled cavity with air-fluid level
CT Chest	Better definition of cavity, rule out underlying mass or empyema
Sputum culture	Identify causative organisms (anaerobes, aerobes)
Blood cultures	Especially if febrile or septic
Bronchoscopy	If atypical features, no response to treatment, or suspicion of obstruction

Non-Pharmacological Management

a) Supportive Care

- Chest physiotherapy, hydration, nutrition
- Monitor inflammatory markers (e.g., CRP, WBC)

b) Drainage (If needed)

Percutaneous catheter drainage if:

- Large abscess
- Poor response to antibiotics
- Risk of rupture

c) Surgery

- Reserved for complications (e.g., massive hemoptysis, rupture, non-resolving abscess)
- Lobectomy may be needed in severe or recurrent cases

Pharmacological Management

Antibiotics (Mainstay of Treatment)

B: ampicillin + cloxacillin (FDC)(IV) 500–1000mg 8hourly for 7days then (PO) 8hourly for 3– 6 weeks (children 50mg/kg/dose)

AND

B: metronidazole (IV) 500mg 8hourly for 7days then (PO) 400mg 8hourly for 4–6weeks (children 7.5mg/kg)

Note:
The duration of antibiotics therapy depends on the clinical and radiographic response of the patient, but completely healing, with radiographic normalization can be seen after two months. Refer patient to specialized unit if large cavity size (i.e., >6cm in diameter), persistent fever.

OR

S: clindamycin (IV) 600mg 8hourly for 7days and then (PO) 300mg 8hourly for 4-6weeks

OR

S: piperacillin + tazobactam (FDC) (IV) 4.5g 6hourly for 4-6weeks

OR

S: meropenem (IV) 1g 8hourly for 4-6 weeks

9.6 Interstitial Lung Diseases (ILDs)

Interstitial Lung Diseases (ILDs), also known as diffuse parenchymal lung diseases, are a heterogeneous group of disorders characterized by inflammation and/or fibrosis of the lung interstitium, alveolar epithelium and small airways.

Examples of Common Interstitial Lung Diseases (ILDs)

Category	Examples
Occupational and Environmental ILDs	• Silicosis • Coal workers' pneumoconiosis • Chronic hypersensitivity pneumonitis (e.g., due to mould or agricultural exposure)
Post-Infectious ILDs	• Post-tuberculosis fibrotic lung disease • Post-COVID-19 fibrotic lung disease • HIV-associated interstitial lung disease
Inflammatory/Autoimmune ILDs	• Sarcoidosis • Connective tissue disease-associated ILD (e.g., rheumatoid arthritis, systemic lupus erythematosus, systemic sclerosis)
Idiopathic ILDs	• Idiopathic pulmonary fibrosis (IPF) • Non-specific interstitial pneumonia (NSIP)

Clinical Presentation:
Progressive dyspnea, Dry cough,

Investigations

- Full blood count (FBC).
- Autoimmune screen (ANA, RF, anti-CCP if connective-tissue disease suspected.
- ESR/CRP.
- Arterial blood gases (ABG) – assess hypoxemia.
- Pulmonary function tests, Spirometry, DLCO, Six-Minute Walk Test
  and distribution of disease.
- Chest X -Ray: Reticular or nodular interstitial patterns.
- High-resolution CT (HRCT): key investigation; identifies fibrosis, ground-glass opacities, honeycombing

Non-pharmacological Management

- Smoking cessation
- Oxygen therapy if hypoxemic
- Pulmonary rehabilitation
- Vaccinations (influenza, pneumococcal)
- **Lung transplantation:** Considered in advanced/refractory cases for eligible patients.

Pharmacological Management
Anti-fibrotic agents
Indicated for Idiopathic pulmonary fibrosis (IPF) and selected cases of progressive fibrosing ILD.
S: pirfenidone (PO) 200mg 8hourly, double the dose on week 2. Maintenance 800mg 8hourly.

Note:

- Immunosuppressants for Connective Tissue - ILDs: Refer to **Rheumatology chapter**
- Corticosteroids/ immunosuppressants in inflammatory ILDs: Refer Sarcoidosis

9.6.1 Sarcoidosis

Sarcoidosis is a multisystem granulomatous disease of unknown cause characterized by the formation of non-caseating granulomas in affected organs, most commonly the lungs and lymphatic system.

Investigations

- Chest X-ray**:** Stages 0–IV (Bilateral hilar lymphadenopathy, infiltrates, fibrosis)
- High**-**Resolution CT **(HRCT):** Detailed lung parenchyma assessment
- Pulmonary Function Tests: Restrictive pattern, reduced DLCO
- Serum ACE**:** Elevated in ~60% (nonspecific)
- Calcium: Hypercalcemia or hypercalciuria
- Tissue biopsy**:** non-caseating granulomas.

Pharmacological Management
First-line**:** Oral corticosteroids
A: prednisolone (PO): 0.5–1 mg/kg/day
Typical dose: 20–40 mg daily: 4–6 weeks, then reassess for clinical/radiological response. Gradual taper over 6–12 months depending on response and severity.

Steroid-sparing agents:
S: methotrexate (PO) 10–25 mg weekly
OR
S: azathioprine (PO) 1–2 mg/kg/day
OR
S: hydroxychloroquine (PO) 200-400mg 24hourly (esp. for skin or hypercalcemia)

9.6.2 Coal Workers' Pneumoconiosis (CWP)

A chronic occupational lung disease caused by inhalation of coal mine dust, leading to lung fibrosis. It is preventable but progressive if exposure continues.

Clinical Presentation

- Often asymptomatic in early stages
- Chronic cough, exertional dyspnea
- Sputum production, wheeze (esp. with coexisting COPD)
- Late-stage: hypoxemia, cor-pulmonale, respiratory failure
- High risk for TB and COPD
- Caplan's syndrome: CWP + rheumatoid arthritis

Investigations

- Chest X-ray: Small nodules (simple); large masses (PMF)
- HRCT: More sensitive—shows centrilobular nodules, fibrosis
- PFTs:
    - Normal or restrictive pattern
    - ↓ DLCO in advanced disease
- Occupational history: Critical for diagnosis

Non-Pharmacological Management

- No curative treatment
- Prevention: Eliminate exposure (dust control, PPE)
- Smoking cessation
- Vaccinations: Influenza, pneumococcus
- Pulmonary rehabilitation

Pharmacological Management

Symptom management

- Bronchodilators (if airflow limitation): See COPD section
- Oxygen therapy (if hypoxemic)

9.6.3 Silicosis

Silicosis is a pneumoconiosis caused by inhalation of crystalline silica dust, leading to chronic lung inflammation and progressive pulmonary fibrosis.

Clinical Presentation

- Chronic cough, exertional dyspnea
- Often asymptomatic early on
- Can progress to respiratory failure
- Crackles, cyanosis, and clubbing in advanced cases
- ↑ Risk of tuberculosis, lung cancer, and autoimmune diseases (e.g., scleroderma)

Complications

- Progressive Massive Fibrosis (PMF)
- Chronic respiratory failure
- Pulmonary hypertension
- Tuberculosis and atypical mycobacterial infections

Investigations

- Chest X-ray:
  -Small, rounded opacities (nodules) in upper lobes
  -"Eggshell calcification" of hilar lymph nodes
- HRCT chest
- Pulmonary function tests (PFTs): Restrictive or mixed pattern; ↓ DLCO
- TB screening recommended due to high risk

Non-Pharmacological Management
No cure – prevention is key

Prevention: Workplace control: wet drilling, ventilation, appropriate PPE

Health surveillance
periodic chest imaging, lung function testing

- Remove from exposure
- Supportive care:
  - Smoking cessation
  - Pulmonary Rehabilitation
- TB prophylaxis or treatment if indicated
- Lung transplant in advanced disease

Pharmacological Management

- Oxygen therapy
- Bronchodilators if obstruction present

9.7 Lung Cancer

Malignant neoplasm originating from lung parenchyma or bronchial epithelium. is the leading cause of cancer-related death worldwide. Main categories include Non-Small Cell Lung Cancer (NSCLC) and Small Cell Lung Cancer (SCLC).

Risk Factors

- Active and passive (second and third hand) cigarette smoking
- Occupational exposure (asbestos, silica, radon)
- Biomass smoke exposure (prolonged indoor cooking using firewood or charcoal in poorly ventilated environments)
- Air pollution
- Family history of cancer
- Chronic lung disease (COPD, pulmonary fibrosis)
- HIV infection and immunosuppression

Note:

- Smoking in all forms (cigarettes, cigars, pipes, shisha) accounts for **90% of lung cancer cases** and is a major preventable risk factor; smoking cessation should be strongly advised for all patients.
- People living with HIV have an increased risk of lung cancer. Persistent respiratory symptoms in HIV-positive patients should prompt early imaging and specialist evaluation.

Clinical Presentation

- Persistent or worsening cough
- Hemoptysis
- Dyspnea
- Chest pain
- Weight loss, anorexia
- Hoarseness or wheeze
- Recurrent chest infections
- Clubbing
- Lymphadenopathy
- Pleural effusion
- Features of metastasis (neurological deficits, bone pain)

Note: Symptoms and signs of lung cancer may mimic pulmonary TB, Patients with persistent or atypical features should be referred early for chest CT imaging and specialist evaluation to avoid delayed diagnosis.

Investigations

Initial Investigations

- Chest X-ray
- Full blood count
- Liver function tests
- Tumor markers: CEA

Confirmatory Tests

- CT scan of chest
- Bronchoscopy with biopsy
- CT-guided needle biopsy
- Sputum cytology

Management

Category	Management Measures
General Measures	• Provide smoking cessation counselling • Administer oxygen therapy in hypoxic patients • Ensure adequate nutritional support • Provide analgesia and symptomatic management • Offer psychosocial support
Specific Treatment	• Refer to Malignancies **chapter 22**
Palliative Management	• Provide pain management, including opioids where indicated • Manage dyspnoea appropriately • Perform drainage of pleural effusion when indicated • Initiate end-of-life care planning

Referral Criteria

- Suspicious chest X-ray or hemoptysis
- Persistent cough >3 weeks in high-risk patient
- Unexplained weight loss with respiratory symptoms
- Confirmed malignancy for oncology evaluation

Prevention

- Smoking cessation
- Occupational safety measures

9.8 Pulmonary Vascular Diseases (PVDS) and Cor Pulmonale

Pulmonary Vascular Diseases (PVDs) encompasses a group of disorders that affect the blood vessels within the lungs. These disorders disrupt normal pulmonary blood flow, potentially leading to impaired gas exchange and right ventricular overload or failure (Cor Pulmonale).

The major types are Pulmonary embolism, Pulmonary Hypertension, Pulmonary veno-occlusive disease, Pulmonary Arterio-Venous Malformation etc.

9.8.1 Pulmonary Embolism

Refer cardiovascular disease conditions **chapter 20**

9.8.2 Pulmonary Hypertension

Pulmonary Hypertension is defined as a mean pulmonary artery pressure (mPAP) ≥ 20 mmHg at rest, as measured by right heart catheterization.
Classification (WHO Groups):

- Group 1 – Pulmonary Arterial Hypertension (PAH): Idiopathic, heritable, drug-induced, connective tissue disease, HIV, portal hypertension, congenital heart disease.
- Group 2 – PH due to Left Heart Disease
- Group 3 – PH due to lung diseases and/or Hypoxia: COPD, ILD, sleep apnea, high altitude.
- Group 4 – Chronic Thromboembolic PH (CTEPH)
- Group 5 – PH with Unclear Multifactorial Mechanisms: Hematologic, systemic, or metabolic disorders.

Clinical Presentation

- Exertional dyspnea
- Fatigue
- Chest pain
- Syncope or presyncope
- Peripheral edema
- Loud P2
- Right ventricular heave
- Jugular venous distension (JVD)
- Hepatomegaly, ascites
- Peripheral edema
- Tricuspid regurgitation murmur

Investigations
Initial Testing

- ECG: right heart strain
- Chest X-ray: enlarged pulmonary arteries
- Echocardiography: RV function and estimate pulmonary pressures

Definitive Diagnosis

- Right heart catheterization (gold standard): confirms elevated mPAP ≥ 20 mmHg

Additional Evaluation

- V/Q scan or CTPA: to rule out CTEPH
- PFTs, ABG: for lung diseases
- Autoimmune panel, HIV testing, LFTs: to identify causes

Non-Pharmacological Management

- Oxygen therapy as indicated
- Exercise and supportive care

Pharmacological Management

- Diuretics (for fluid overload)
- Anticoagulation (especially in CTEPH)

Group-specific Treatments:
Group 1 (PAH):
Initial therapy:
Phosphodiesterase-5 inhibitors (PDEi)

S: sildenafil (PO) 20 mg 8hourly
(Use the IV formulation if available for critically ill patients)

If inadequate response or intermediate risk, add Endothelin Receptor Antagonist (ERA)
S: bosentan (PO) 62.5 mg 12hourly
Early oral combination therapy (PDEi + ERA) in stage 2 or advanced disease

Calcium channel blockers (if Vaso reactive):
B: amlodipine (PO) 2.5mg - 10mg 24hourly
OR
A: nifedipine Slow Release (PO) 30mg - 120 mg 12hourly
OR
D: diltiazem 120 - 240 mg 24hourly

Group 2: Treat underlying heart failure or valvular disease
Group 3: Optimize treatment of lung disease and provide oxygen as required.
Group 4 (CTEPH):

- Lifelong anticoagulation
- Medical therapy including anticoagulation (could be lifelong), Pulmonary endarterectomy (surgical)

Group 5: Treat underlying disorder

9.8.3 Cor Pulmonale

Cor Pulmonale is right ventricular (RV) enlargement and/or failure due to pulmonary hypertension (PH) caused by diseases of the lung, chest wall, or pulmonary vasculature.
Excludes RV failure due to left heart disease or congenital heart disease.

Clinical Presentation

- Progressive exertional dyspnea
- Fatigue, chest discomfort
- Swelling of legs
- Abdominal distension
- Raised JVP
- Hepatomegaly
- Ascites
- Peripheral edema
- Loud P2
- RV heave
- Tricuspid regurgitation murmur

Investigations

Test	Findings
ECG	Right axis deviation, RV hypertrophy
Chest X-ray	Enlarged pulmonary arteries, right heart border
Echocardiogram	RV enlargement, raised pulmonary pressures, TR
ABG	Hypoxemia ± hypercapnia
PFTs	Obstructive or restrictive pattern depending on underlying disease
BNP/NT-pro BNP	May be elevated if RV dysfunction present
Right heart catheterization	Confirms PH and RV pressure status

Non-Pharmacological Management

- Optimize COPD, ILD, or other pulmonary disease treatment
- Smoking cessation
- Long-term oxygen therapy (LTOT) if PaO_2 < 55 mmHg (or < 60 mmHg with polycythemia/cor pulmonale)

Pharmacological Management

Give Diuretics:

- Furosemide, spironolactone for volume overload
- Use cautiously to avoid reducing preload too much

Pulmonary Vasodilators:

- Consider specific PH therapy (e.g., sildenafil, Bosentan) only if Group 1 PH or CTEPH

Others:

- Non-invasive ventilation (CPAP or BiPAP) in sleep-disordered breathing
- Anticoagulation if CTEPH or high risk of VTE

9.9 Pleural Effusion

Pleural effusion, is collection of fluid abnormally present in the pleural space, usually resulting from excess fluid production and/or decreased lymphatic absorption, is rarely a primary disease process but is usually secondary to other diseases.

Clinical Presentation

- Progressive dyspnea
- Cough
- Pleuritic chest pain
- Extrapulmonary symptoms that mimic features of congestive heart failure (CHF) etc.
- Night sweats, fever, hemoptysis, and weight loss should suggest tuberculosis (TB)
- Hemoptysis also raises the possibility of malignancy, other endotracheal or endobronchial pathology, or pulmonary infarction
- Pleural friction rub
- When pleural fluid >300ml
  >Dullness to percussion
  >Decreased tactile fremitus
  >Asymmetrical chest expansion
  >Displacement of the trachea and mediastinum toward the side of the effusion- observed with effusions larger than 1000 mL
  >Diminished or inaudible breath sounds

Investigations

- CXR
- Full blood picture
- Erythrocyte Sedimentation Rate (ESR)
- Point of care bed side USS
- Pleural fluid analysis:
  >Gross appearance:
  >Biochemistry: Glucose, PH, LDH, Protein: Use Light's Criteria to differentiate between transudative and exudative pleural effusions
  >Microbiology: Gram Stain, Gene Xpert, pleural fluid culture
- Other Tests as per indication of suspected diagnosis
  Pleural Fluid
  >ADA (High sensitivity and specificity in TB pleuritis)
  >Cytology (Malignancy/autoimmune)
  >Amylase (Pancreatitis)
  >Triglycerides and cholesterol
  >Bilirubin
- Tumor markers as indicated (e.g., CA-15, CEA, CA-125etc).
- Rheumatoid Factor (if indicated)
- Autoimmune profile or single marker (ANA, ACE etc.)
- Renal function (creatinine and BUN)
- Liver function and liver enzymes (Albumin, bilirubin total, direct, PT, PTT, INR ALT, AST, GGT, ALP)
- ECHO
- ECG
- CT-Scan Chest with contrast
- Thoracoscopy
- Image-guided (i.e., CT- or US-guided) pleural biopsy

Management

- Serial Thoracentesis- for non-complicated pleural effusion.
- Chest Tube Drainage-Hemothorax, Empyema, Complicated para-pneumonic effusion, Post-trauma, Malignant
- Fibrinolytic Therapy-use of Streptokinase and Alteplase, indicated for patients with empyema and complicated loculated pleural effusions.
- Thoracoscopy and video-assisted thoracoscopic surgery (VATS: For patient with fibrinopurulent pleural infections and loculated effusion.
- Pleurodesis (pleural sclerosis) – Various agents can be used to sclerose the pleural space:
  >Povidone-iodine 20mls of 10% mixed with 80–100 mL of 0.9% NaCl,
  >Talk Slurry or Poudrage: via thoracoscope
  >Doxycycline, bleomycin sulfate,
- Thoracotomy, Decortication, and Open Drainage- Main salvage procedure after unsuccessful thoracoscopy.

Indication for thoracostomy/decortication

- Patients with organized empyemas who cannot tolerate thoracotomy or have trapped lungs can undergo rib resection with open drainage
- Chronic empyema with bronchopleural fistulas or chronic empyema that are not amenable to surgery
- Critical ill and toxic patients with associated mediastinitis or bronchopleural fistulas who require mediastinal drainage or fistula closure.

For Malignant Effusions

Chest tube drainage, radiation, chemotherapy, surgical pleurectomy, pleuroperitoneal shunt, pleurodesis or decortication and indwelling pleural catheter.

Note

- Emergent thoracentesis and/or chest tube placement is necessary in patients with pleural effusion causing imminent or ongoing respiratory compromise or hemodynamic instability.
- Refer to specialist/specialist review: Unexplained or recurrent effusion, malignant pleural effusion, Empyema thoracic, Loculated effusion.

9.10 Obstructive Sleep Apnea Syndrome (OSA)

Obstructive sleep apnea (OSA) is a sleep-related breathing disorder characterized by recurrent episodes of complete (apnea) or partial (hypopnea) upper airway collapse during sleep, leading to reduced or absent airflow despite ongoing respiratory effort, often associated with oxygen desaturation and/or arousals from sleep.

Clinical Presentation

- Daytime sleepiness
- Restless sleep
- Loud snoring
- Morning headaches;
- Insomnia;
- Decreased sex drive;
- Unexplained weight gain;
- Increased urination and/or nocturia.
- Heartburn or gastro esophageal reflux disease
- Trouble concentrating; mood changes such as irritability, anxiety and depression; Forgetfulness; Increased heart rate and/or blood pressure;
- Obesity
- Large neck circumference (>43cm in male, >40.5cm in female)
- Crowded oropharynx (e.g., enlarged tonsils), nasal septum deviation
- Cranio-facial abnormalities: Retrognathia / Micrognathia, Midface hypoplasia
- Elevated BP

Investigations

- Use STOP-BANG questionnaire and EPWORTH Sleepiness Scale for screening.
- Polysomnography (PSG): Gold standard. Measures apnea–hypopnea index (AHI).

Non-Pharmacological Management

a) General & Lifestyle Measures

- Weight loss: Most effective non-device therapy
- Avoid alcohol and sedatives: Reduce airway collapsibility
- Avoid supine position (positional OSA)
- Smoking cessation

b) Positive Airway Pressure (PAP) Therapy: The mainstay of OSA treatment, moderate to severe cases: CPAP/ APAP/ BiPAP depending on tolerance and comorbidity.
c) Oral Appliances: Mandibular advancement devices (MADs)
d) Behavioral & Adjunctive Therapies: e.g., Cognitive behavioral therapy
e) Surgical Option: Considered when anatomic obstruction is identified and PAP is not tolerated: Refer to **ENT chapter 15**

- UPPP (Uvulopalatopharyngoplasty): Removes/repositions tissue at soft palate
- Tonsillectomy/adenoidectomy: Especially in children

Pharmacological Management

Limited role in OSA.

9.11 Respiratory Failure and ARDS

Respiratory failure is a life-threatening condition in which the respiratory system fails to maintain adequate gas exchange, resulting in hypoxemia, hypercapnia, or both.

Types of Respiratory Failure:

Type	Description	Key Feature
Type I (Hypoxemic)	Failure of oxygenation	PaO_2 < 60 mmHg (on room air)
Type II (Hypercapnic)	Failure of ventilation	$PaCO_2$ > 45 mmHg

Causes:

Type of Respiratory Failure	Common Causes
Type I (Hypoxemic)	• Pneumonia • Acute Respiratory Distress Syndrome (ARDS) • Pulmonary embolism • Pulmonary oedema (cardiogenic or non-cardiogenic) • Interstitial lung disease
Type II (Hypercapnic)	• Acute exacerbation of chronic obstructive pulmonary disease (COPD) • Neuromuscular disorders (e.g., myasthenia gravis, Guillain–Barré syndrome) • Central nervous system depression (e.g., drugs, stroke) • Obesity hypoventilation syndrome • Chest wall disorders (e.g., kyphoscoliosis)

Clinical Presentation

- Dyspnea, tachypnea
- Cyanosis (Type I)
- Headache, confusion, asterixis (Type II – due to hypercapnia)
- Accessory muscle use, nasal flaring
- Signs of underlying cause (e.g., wheeze, crepitations, fever)

Investigations

- Arterial blood gas (ABG)
  - ↓PaO_2 in Type I
  - ↑$PaCO_2$ ± ↓PaO_2 in Type II
- Chest X-ray / CT chest: Identify underlying pathology
- Pulmonary function tests, if chronic cause suspected
- ECG, Echocardiogram: If cardiogenic causes suspected
- Labs: CBC, electrolytes, renal/liver function, infection markers

Non-Pharmacological Management

Component	Management
General Measures	• Identify and treat the underlying cause • Monitor oxygenation and ventilation (SpO_2, arterial blood gases [ABG]) • Provide supportive care including fluids, antipyretics, and deep vein thrombosis (DVT) prophylaxis
Oxygen Therapy	Type I Respiratory Failure (Hypoxemic): • Administer supplemental oxygen to maintain SpO_2 ≥ 92% Type II Respiratory Failure (Hypercapnic): • Use oxygen cautiously to avoid worsening hypercapnia • Target oxygen saturation according to clinical condition and ABG findings
Ventilatory Support	• Non-invasive ventilation (NIV) indicated in selected patients, e.g., chronic obstructive pulmonary disease (COPD) and obesity hypoventilation syndrome (OHS) • Invasive mechanical ventilation for worsening hypoxia, hypercapnia, respiratory fatigue, or failure of NIV • High-flow nasal cannula (HFNC) may be used in selected cases of Type I respiratory failure

Pharmacological Management

Specific Treatments

a) COPD exacerbation: bronchodilators, steroids, NIV

b) Pneumonia: antibiotics

c) ARDS: lung-protective ventilation, prone positioning

d) Neuromuscular causes: IVIG/plasmapheresis + ventilatory support

9.11.1 Acute respiratory distress syndrome (ARDS)

A severe inflammatory lung condition characterized by acute onset of hypoxemic respiratory failure with bilateral pulmonary infiltrates, not fully explained by cardiac failure or fluid overload.

Based on the Berlin Criteria:

- Timing: Within 1 week of a known clinical insult or new/worsening respiratory symptoms
- Chest imaging: Bilateral opacities not fully explained by effusions, collapse, or nodules
- Origin of edema: Not primarily cardiac
- Oxygenation (on PEEP ≥5 cm H_2O):

Severity	PaO_2/FiO_2 Ratio
Mild ARDS	200–300 mmHg
Moderate ARDS	100–200 mmHg
Severe ARDS	<100 mmHg

Common Causes:

- **Direct lung injury**: Pneumonia (bacterial, viral including COVID-19), aspiration, inhalation injury, drowning
- **Indirect lung injury**: Sepsis, pancreatitis, trauma, massive transfusion, drug overdose

Clinical Presentation

- Acute dyspnea, tachypnea
- Hypoxia refractory to oxygen therapy
- Diffuse crackles on auscultation

Investigations:

- ABG: Respiratory alkalosis on ABG (early), later progressing to hypoxemia and hypercapnia
- Chest X-ray/CT: Bilateral infiltrates (ground-glass opacities or consolidation)
- Echocardiography: To rule out cardiogenic pulmonary edema
- Labs: To identify underlying cause and for monitoring (e.g., cultures, procalcitonin, inflammatory markers)

Non pharmacological

- Refer to higher facility for intensive care.
- Admit to ICU
- Treat underlying cause (e.g., sepsis, pneumonia)
- Lung-protective mechanical ventilation:
  >Low tidal volume (6 mL/kg predicted body weight)
  >Plateau pressure <30 cm H_2O
  >Adequate PEEP to prevent alveolar collapse
- Prone positioning: Especially in moderate–severe ARDS
- Neuromuscular blockade: In select cases of severe ARDS
- Extracorporeal Membrane Oxygenation **(ECMO)**: For refractory hypoxemia despite optimal ventilation

Pharmacological Management

Conservative fluid management once hemodynamically stable

Adjunctive Therapies (selected cases):

- Inhaled nitric oxide (short-term benefit)
- Corticosteroids in selected cases: e.g. COVID-19 ARDS: **B:** Dexamethasone (IV) 6mg 24hourly.
- Protease inhibitors e.g.
  S: ulinastatin (IV) 200,000 to 600,000 IU/day, in 2-3 divided doses. Use restricted to ICU, under specialist supervision.

CHAPTER TEN

GASTROINTESTINAL DISEASE CONDITIONS

10.1 Infections of Gastrointestinal Tract

10.1.1 Amoebiasis

Amoebiasis is an infection caused by the protozoa organism *Entamoeba histolytica*, which can cause colitis and other extra-intestinal manifestations. The infection is primarily acquired through ingestion of contaminated food and water and occasionally can be acquired through oral-anal sexual practices.

Clinical Presentation

- Bloody diarrhea
- Crampy abdominal pain
- Fever
- Weight loss
- Peritonitis in severe forms
- Evidence of motile trophozoites or cysts on saline wet mount from a stool specimen

Pharmacological Management

Because metronidazole and tinidazole do not kill all cysts in the bowel, a two-step approach is necessary for complete eradication:

Tissue Agents (Active Infection): Used to kill invading parasites and treat symptoms.

A: metronidazole (PO) 400–800mg 8hourly for 7-10days

OR

B: tinidazole (PO) 2g 24 hourly for 3-5days due to shorter duration

AND

C: diloxanide furoate (PO) 500 mg 8hourly for 10days

Luminal Agents (Cyst Eradication): Essential to kill cysts and prevent relapse, even if symptoms are gone.

10.1.2 Amoebic Liver Abscess

It is the most frequent extra-intestinal manifestation of *Entamoeba histolytica* infection which results from the invasion of the portal venous system from the colon leading to inflammation and subsequently abscess formation particularly involving the right lobe of the liver.

Clinical Presentation

- High grade fever, 39°C
- Right upper quadrant pain,
- Tender and enlarged liver
- Positive imaging evidence of liver abscess
- Serological evidence of *E. histolytica* antibodies or antigens

Pharmacological Management

B: metronidazole (IV) 800mg 8hourly for 10days.

OR

B: tinidazole (PO) Adults: 2g 24 hourly for 3days

Note

- Metronidazole and Tinidazole should not be given in the first trimester of pregnancy due to potential teratogenic effects.
- Should not be taken with alcohol due to disulfiram-like effects

Surgery:

Consider therapeutic aspiration of amebic liver abscess in the following situations: (1) high risk of abscess rupture, as defined by cavity size greater than 5 cm; (2) left lobe liver abscess, which is associated with higher mortality and frequency of peritoneal leak or rupture into the pericardium; (3) failure to observe a clinical medical response to therapy within 5-7 days; and (4) cannot differentiate from a pyogenic liver abscess.

10.1.3 Giardiasis

It is the infestation of the upper small intestine caused by the flagellate protozoan *Giardia lamblia* (or *G. intestinalis*), cytopathic effects of which leads to malabsorption and diarrhea. It is more common in immune compromised individuals and is acquired through ingestion of contaminated water

Clinical Presentation

- Crampy abdominal pain
- Chronic diarrhoea
- Steatorrhea
- Weight loss

Investigations

- Evidence of *Giardia intestinalis* trophozoites or cysts on serial 3 samples of stool examination
- Serological evidence of *G. Intestinalis* trophozoites antigen or antibody
- Evidence of G. Intestinalis in duodenal aspirates or biopsy specimen.

Pharmacological Management

A: metronidazole (PO) 400–800mg 8hourly for 5days

OR

B: tinidazole (PO) 2g 24 hourly for 3days

For refractory cases:

D: nitazoxanide (PO) 500mg 12 hourly for 3 days

10.1.4 Ascariasis

It is a small intestinal infestation caused by *Ascaris lumbricoides* which leads to malnutrition, iron deficiency anaemia, impaired growth and cognition in susceptible hosts. It is most common infestation in children, and it is acquired through ingestion of contaminated food and water.

Clinical Presentation

- Chronic Diarrhea
- Steatorrhea
- Malnutrition
- Chronic Cough (Loffler's syndrome)
- Intestinal obstruction
- Obstructive jaundice

Investigations

Stool examination: evidence of ova or worms on wet mount

Pharmacological Management

A: mebendazole (PO) 500mg stat or 100mg 12hourly for 3days.

OR

A: albendazole (PO) 400mg stat

10.1.5 Ancylostomiasis

It is a hookworm disease caused by infestation of the small intestine with *Ancylostoma duodenale* or *Necator americanus* leading to anaemia and malnutrition.

Clinical Presentation

- Abdominal pains
- Chronic diarrhea
- Melena stool
- Weight loss
- Chronic cough (Loffler's syndrome) PLUS
- Evidence of ova or worms on wet mount stool examination
- Anaemia

Pharmacological Management

A: mebendazole (PO) 500mg stat or 100mg 12hourly for 3days.

OR

A: albendazole (PO) 400mg stat

Note

If persistent, give second course after 4 weeks. Iron replacement and nutritional supplementation (protein and vitamins) should be part of the management strategy. Albendazole is contraindicated in the first trimester of pregnancy

10.1.6 Strongyloidiasis

Small intestinal infestation caused by *Strongyloides stercoralis* usually asymptomatic in immune competent adult but can lead to life-threatening infestation and disseminated strongyloidiasis in an immune-compromised host associated with high mortality rates

Clinical Presentation

- Pruritic papulo–vesicular rash at the site of penetration or urticarial rash involving the perennial region extending to the buttocks, thighs and abdomen
- Chronic cough
- Colicky abdominal pains
- Chronic diarrhea and passage of mucus
- Weight loss
- Hyper-infection syndrome

Investigations

Evidence of rhabditiform larva in wet mount stool examination with Serological evidence (ELISA) for anti-strongyloides antibody

Pharmacological Management

A: albendazole (PO) 400mg 12hourly for 3days (Repeat after 4 weeks if still positive stool findings)

OR

A: ivermectin (PO) 200 µg /kg 24hourly for 2days

Note: Give treatment for 10 days in case of disseminated/super infestation

10.1.7 Taeniasis

Is a tapeworm disease acquired from eating raw or not-well cooked food? Can be due to *Taenia saginata* (beef tapeworm), *Taenia solium* (pork tapeworm), *Diphyllobothrium latum* (fish tapeworm) and *Hymenolepsis nana* (faecal oral contamination from human and dogs) leading to chronic malnutrition (Taeniasis) or multi-organ dissemination and dysfunction (Cysticercosis)

Clinical Presentation

- Taeniasis
- Colicky abdominal pain
- Body Weakness
- Loss of or increased appetite
- Constipation or diarrhea
- Pruritus ani
- Hyperexcitability

Investigations

Evidence of characteristic ova, proglottids or scolex in the wet mount stool examination

Cysticercosis - The cysticerci are most often located in subcutaneous and intermuscular tissues, followed by the eye and then the brain. The CNS is involved in 60-90% of patients i.e., Neurocystercosis which may manifest as:

Convulsions and/or seizures:

- Intracranial hypertension: headache, nausea, vomiting, vertigo, and papilledema.
- Personality and mental status changes (Neuropsychiatric changes)
- Behavioral changes and learning disabilities more marked in children and immunocompromised adults. PLUS
- Head CT scan OR Brain MRI

Note: Refer the patient to high centers for further investigation and expertise.

Pharmacological Management

Taeniasis

A: praziquantel (PO) 5–10mg/kg stat

Cysticercosis (NCC)

A: praziquantel (PO) 50mg/kg 24hourly for 21days

OR

A: albendazole (PO) 15mg/kg 24hourly for 30days.

AND

B: dexamethasone (IV) 4mg 12hourly can be given up to 7days.

AND

A: carbamazepine (PO) initially 200 mg 12-24hourly, increased slowly to 0.8–1.2 g 24hourly in divided doses (for seizures refer to CNS chapter)

Note: Hydrocephalus should be treated with surgical shutting. Ocular manifestation cysticercosis, should be referred to eye specialist

10.1.8 Echinococcosis

It is a canine tape worm *Echinococcus granulosus* which is transmitted by dogs, sheep and horses. Human infestation is through contamination of food or water causing visceral cysts (Hydatid Cyst Disease) particularly in the liver and lungs and is usually asymptomatic in susceptible host.

Clinical Presentation

- Upper abdominal discomfort and pain, poor appetite,
- Upper abdominal mass swelling with enlarged liver.
- Cough with features of acute hypersensitivity reaction. (for ruptured cysts)
- Portal hypertension, biliary obstruction or Budd-Chiari syndrome (for complicated cases)

Investigations

- Echinococcus serology
- LFT, RFT, FBC
- Abdominal Ultrasound
- Abdominal CT scan or MRI

Pharmacological Management

A: albendazole (PO) 400mg 12hourly for 3months

OR

A: mebendazole (PO) 500mg 12hourly for 3months

Referral: For symptomatic/ complicated cases refer to higher centers with management and expertise.

- PAIR (puncture, aspiration, injection, and re-aspiration) is a percutaneous treatment alternative to surgery
- Surgical treatment: either radical pericystectomy or conservative deroofing

10.1.9 Schistosomiasis

Parasitic disease caused by blood flukes (trematodes) of the genus Schistosoma. Common species found in Tanzania are *S. haematobium* responsible for urogenital schistosomiasis and *S. mansoni* responsible for intestinal schistosomiasis as a result of immune mediated reaction which leads to progressive inflammation and fibrosis of the urinary bladder or portal venous system respectively.

Clinical Presentation

Schistosoma mansoni

- Swimmer's itch or katayama fevers in acute infection phase.
- Colicky abdominal pains
- Diarrhoea and dysentery
- Anemia
- Hepatomegaly
- Portal hypertension with bleeding esophageal varices
- Decompensated liver disease

Schistosoma hematobium

- Dysuria and terminal hematuria
- Hematospermia
- Obstructive uropathy (hydronephrosis, hydroureters)
- Glomerulonephritis and amyloidosis
- Bladder carcinoma
- Chronic kidney failure

Investigations

Laboratory evidence characteristic eggs in urine, (S. Hematobium) or in stool (S. mansoni, S. japonicum) examined by kato katz thick smear procedure or PCR assays of both urine and stool samples.

Pharmacological Management

A: praziquantel (PO) 40mg/kg stat or in 2 divided doses (repeat every 6 months for continues exposure)

10.1.10 Typhoid and Paratyphoid

It is an acute systemic disease resulting from infection by *Salmonella typhi* and *S. paratyphi*, serovar group A and B respectively. Infection is acquired through ingestion of contaminated food and water.

Clinical Presentation

- Fever, severe headache, abdominal and muscle pains (myalgia)
- Delirium, obtundation, intestinal hemorrhage, bowel perforation,
- Sequela neuropsychiatric complications

Investigations

- Laboratory evidence of positive cultures from bone marrow aspirates; blood or stool done within 1 week of acute infection OR
- Salmonella stool antigen test
- Indirect fluorescent Vi antibody, ELISA for immunoglobulin M (IgM) and IgG antibodies to *S. Typhi* polysaccharide.

Pharmacological Management

Uncomplicated typhoid fever

A: ciprofloxacin (PO) 500mg 12 hourly for 10-14days

OR

B: azithromycin (PO) Adult 500mg 24hourly for 7days

OR

A: cefixime 400mg (PO) 24hourly for 7-14days

For complicated typhoid fever

C: ciprofloxacin (IV) 200-400 mg 12hourly daily 7days

OR

B: ceftriaxone (IV) 1-2gm 24hourly 4-7days

Note: Definitive treatment of typhoid (enteric fever) is based on susceptibility. For patients with severe or complicated disease (e.g., systemic toxicity, depressed consciousness, prolonged fever, organ system dysfunction or other features that prompt hospitalization), initial therapy with a parenteral agent is appropriate.

10.1.11 Shigellosis

Shigella organisms are a group of gram-negative, facultative intracellular bacteria pathogens. They are grouped into 4 species: *Shigella dysenteriae*, *Shigella flexneri*, *Shigella boydii*, and *Shigella sonnei*, also known as groups A, B, C, and D respectively. Shigellosis is spread by means of fecal- oral, by ingestion by ingestion of contaminated food or water and leads to bacillary dysentery.

Clinical Presentation

- Acute abdominal cramping, high-grade fever, emesis and large-volume watery diarrhea
- Tenesmus, urgency, fecal incontinence, mucoid bloody diarrhea
- Severe headache, lethargy, meningismus, delirium, and convulsions
- Hemolytic uremic syndrome (HUS), microangiopathic hemolytic anemia, thrombocytopenia, and renal failure
- Profound dehydration and hypoglycemia

Investigations

- Laboratory evidence of microscopic isolation of the bacteria from stool or rectal swabs specimens
- Stool culture for suspected cases in early course of infection
- An enzyme immunoassay (ELISA) for shiga toxin detection in stool for *S. dysenteriae* type I

Pharmacological Management

A: ciprofloxacin (PO) 500mg 12hourly for 5days

OR

A: erythromycin (PO) 500mg 6hourly for 5days.

10.1.12 Cholera

For diagnostic criteria, investigations, prevention and treatment refer to chapter under **notifiable diseases chapter 4.**

10.2 Disorders of Gastrointestinal Tract

10.2.1 Peptic Ulcer Disease

Refers to acid related peptic ulceration involving the lower esophagus; stomach and duodenum as a result of active inflammation induced by acid –pepsin leading to disruption of the mucosal integrity causing local defect or excavation

10.2.1.1 Gastroesophageal Reflux Disease (GERD)

It is a disorder resulting from gastric acid-pepsin activity and other gastric contents reflux into the esophagus due to incompetent barriers at the gastroesophageal junction leading to active inflammation of the distal third of the esophagus (prolonged contact with acid can evolve to stricture)

Clinical Presentation

- Heartburn and regurgitation are cardinal symptoms.
- Odynophagia, dysphagia, weight loss and bleeding
- Chronic cough, laryngitis, pharyngitis
- Chronic bronchitis, asthma, COPD, pneumonia, chronic sinusitis and dental decay

Investigations

- Endoscopic evidence mucosal ulceration
- Histological evidence of chronic active inflammation
- Positive finding with a gold standard 24-hours esophageal pH testing.

Pharmacological Management

Non-erosive, symptomatic

A: omeprazole (PO) 20mg 24hourly for 8weeks

OR

S: esomeprazole (PO) 20mg-40mg 24hourly for 8weeks.

Erosive esophagitis

C: pantoprazole (PO) 40mg 24hourly for 8-16weeks

For refractory cases acid suppression therapy may require continuation up to 6 months. Lifestyle modification and avoidance of triggers is important including avoidance of smoking, alcohol and NSAID use.

Referral: Refer to next level center with adequate expertise and facility for refractory cases or cases with alarming symptoms (red flags) such as bleeding, anemia, early satiety, progressive dysphagia or odynophagia, unexplained weight loss, recurrent vomiting or family history of gastrointestinal (GI) cancers, age ≥ 40 years.

10.2.1.2 Gastroduodenal Ulcers (PUD)

This is a disorder resulting from breakdown of mucosal defense mechanisms against hydrochloric acid and proteolytic enzymes, most commonly secondary to H. Pylori infection or NSAID use.

Clinical Presentation

- Burning epigastric abdominal pains, usually relived by antacids.
- Anorexia, early satiety, bloating,
- Hematemesis or melena stools
- Weight loss

Investigations

- Endoscopic evidence of gastric or duodenal mucosal ulceration
- Risk stratification using Glasgow-Blatchford score

Pharmacological Management

A: omeprazole (PO) 20mg 24hourly for 8weeks

OR

C: pantoprazole (PO) 40mg 24hourly for 8weeks

OR

S: esomeprazole (PO) 20mg 24hourly for 8weeks

AND

A: antiacid liquid mixture (PO) 10-15ml 12hourly to 8hourly for 7-14days

For bleeding PUD: refer to higher centers

C: pantoprazole (IV) 80mg stat then 40mg 12hourly for 2-3days, then (PO) as above if bleeding stops

OR

S: esomeprazole (IV) 40mg 12hourly for 2-3days, then (PO) as above if bleeding stops

OR

C: pantoprazole (IV) 80mg bolus followed by continuous infusion of 8mg/hour for 72 hours

10.2.1.3 Helicobacter Pylori Related Peptic Ulcer Disease

Helicobacter pylori is a ubiquitous organism that is present in about 50% of the global population. Chronic infection with H pylori causes atrophic and even metaplastic changes in the stomach, and it has a known association with peptic ulcer disease. The most common route of H pylori infection is either oral-to-oral or fecal-to-oral contact.

Clinical Presentation

- Heartburn and regurgitation are cardinal symptoms.
- Odynophagia, dysphagia, weight loss and bleeding
- Chronic cough, laryngitis, pharyngitis
- Chronic bronchitis, asthma, COPD, pneumonia, chronic sinusitis and dental decay

Investigations

- Positive stool antigen test (Stop PPI 2 weeks before testing)
- Positive urease breath test
- Positive urease test on endoscopic biopsy sample
- Identification of the pathogen by histopathology examination

Pharmacological Management

Triple therapy is indicated for complete eradication of the organism

First-Line Therapy

Regimen	Medicine, Dose & Frequency	Duration
Triple Therapy	**A:** omeprazole (PO) 20 mg 12-hourly **OR** **C:** pantoprazole (PO) 40 mg 12-hourly **OR** **S:** esomeprazole (PO) 40 mg 12-hourly **AND** **A:** amoxicillin (PO) 1000 mg 12-hourly **AND** **A:** metronidazole (PO) 400 mg 12-hourly **OR** **B:** tinidazole (PO) 500 mg 12-hourly	14 days
Concomitant Therapy	**A:** PPI (as above) 12-hourly **AND** **A:** amoxicillin (PO) 1000 mg 12-hourly **AND** **A:** metronidazole (PO) 400 mg 12-hourly **OR** **B:** tinidazole (PO) 500 mg 12-hourly **AND** **C:** clarithromycin (PO) 500 mg 12-hourly	14 days

Second-Line Therapy

Regimen	Medicine, Dose & Frequency	Duration
Bismuth-based Quadruple Therapy	**A:** PPI (as above) 12-hourly **AND** **D:** bismuth subsalicylate (PO) 525 mg 6-hourly **AND** **A:** metronidazole (PO) 400 mg 12-hourly **OR** **B:** tinidazole (PO) 500 mg 12-hourly **AND** **A:** doxycycline (PO) 100 mg 12-hourly	14 days
Alternative Quadruple Therapy	**A:** PPI (as above) 12-hourly **AND** **D:** bismuth subsalicylate (PO) 525 mg 6-hourly **AND** **D:** nitazoxanide (PO) 500 mg 8-hourly **AND** **A:** doxycycline (PO) 100 mg 12-hourly	14 days

Treatment failure

H. pylori treatment failure is defined as the positive stool antigen test or urease breath test 5 weeks after the last dose of eradication therapy. Antimicrobial susceptibility testing (AST) should be performed after (two) treatment failures. This is associated with higher eradication rates compared with individuals without AST. After treatment failure, the treatment should be individualized following the culture and sensitivity of the gastric biopsy or PCR.

10.2.2 Ulcer Related Conditions

10.2.2.1 Non-ulcer Dyspepsia (Functional Dyspepsia, Indigestion)

It is a chronic recurrent dyspeptic disorder characterized by upper abdominal symptoms, discomfort, pain, fullness, early satiety, bloating, burning epigastric pain syndrome and post prandial distress syndrome without any organic, systemic or metabolic disease to explain its presence.

Clinical Presentation

- Dyspeptic symptoms present for last 3 months and onset at least months prior to diagnosis
- Bothersome abdominal discomfort post prandial fullness.
- Early satiety
- Epigastric pains
- Epigastric burning

Investigations

Lack of evidence of structural disease by upper endoscopic examination.

Non-Pharmacological Management

Non-Pharmacological Management of functional dyspepsia (FD) focuses on dietary adjustments, lifestyle modifications, and stress reduction to alleviate symptoms like epigastric pain, burning, and early satiety. Key strategies include eating smaller, frequent meals, reducing fat and caffeine intake, avoiding trigger foods (spicy, acidic), and utilizing stress-reduction techniques like cognitive behavioral therapy (CBT), yoga, or meditation.

a) Dietary Modifications:
   - Meal Frequency: Eat smaller, more frequent meals rather than three large ones to reduce the burden on the stomach.
   - Trigger Foods: Avoid foods that trigger symptoms, such as high-fat foods, alcohol, caffeine (coffee, tea), carbonated beverages, spicy foods, citrus fruits, and certain vegetables like broccoli or onions.
   - Diet Composition: Adopt a diet rich in, or similar to, the Mediterranean diet, focusing on fresh foods while reducing processed items.
   - Texture Modification: If necessary, ensure a portion of daily meals consists of soft or liquid foods.
   - Fiber Reduction: Reduce fiber-enriched foods, particularly those containing inulin.

b) Lifestyle Changes:
   - Stress Management: Implement relaxation techniques, such as yoga, meditation, or, specifically, cognitive behavioral therapy (CBT), which has shown significant promise in managing symptoms.
   - Eating Habits: Chew food thoroughly and eat slowly.
   - Habit Adjustments: Smoking cessation and avoidance of NSAIDs (nonsteroidal anti-inflammatory drugs) are recommended.

c) Other Therapies:
   - Herbal Remedies: Some herbal teas (ginger, chamomile, peppermint) or preparations like STW-5 (Iberis amara) may provide relief,
   - Acupuncture/Electrical Stimulation: These may be used for symptom management,

d) Psychotherapy:
   - Psychological therapies, particularly CBT, are considered effective in treating FD by addressing the gut-brain interaction,

These approaches, often used alongside reassurance from a healthcare provider, can help manage symptoms effectively,

Pharmacological Management

H. pylori eradication (see under *H. pylori*)

A: omeprazole (PO) 20mg 24hourly for 4-8weeks

OR

C: pantoprazole (PO) 40mg 24hourly for 4-8weeks

OR

S: esomeprazole (PO) 40mg 24hourly for 4-8weeks

AND

B: metoclopramide (PO) 10mg 8hourly when required (bloating and nausea symptoms, delayed gastric emptying)

OR

D: domperidone (PO) 10mg 8hourly when required to alleviate bloating and nausea symptoms, delayed gastric emptying.

AND

A: amitriptyline (PO) 25mg at bedtime when required for refractory cases

Note: Presence of alarm features (see list above under GERD) warrant OGD.

10.2.2.2 Gastritis

This is an inflammatory mucosal response to injury from variety of agents and mechanisms including infections, drugs, alcohol, acute stress, radiation, allergy, acid and bile, ischemia or direct trauma. The inflammation may involve the entire stomach (pangastritis) or a region of the stomach (antral gastritis) while the severity of inflammation may be erosive or non-erosive.

Clinical Presentation

- Nausea, vomiting, loss of appetite, belching, and bloating
- Acute abdominal pain or abdominal discomfort
- Fever, chills, and hiccups also may be present

Investigations

- Endoscopic evidence of gastric mucosal inflammation
- Histologic evidence of chronic active inflammation of biopsy specimen.

Non-Pharmacological Management

- Reduce the use of drugs known to cause gastritis (e.g., NSAIDs, alcohol)
- Stop smoking

Pharmacological Management

Triple therapy for H. pylori eradication if confirmed present.

Administer fluids and electrolytes as required, particularly if the patient is vomiting.

C: pantoprazole (IV) 40mg 6hourly 2-3days

OR

S: esomeprazole (IV) 40mg 12hourly 2-3days

AND

B: metoclopramide (IM) 10mg 12hourly when required (for cases presenting with intractable vomiting) in order to relieve symptoms.

Switch to oral PPI once patient can tolerate oral intake. Referral

Refer to next level service with adequate expertise and facilities for complicated case with alarm features (anemia, vomiting blood and weight loss, see complete list under GERD above).

10.2.3 Gastrointestinal (GI) Bleeding

Intraluminal blood loss anywhere from the oropharynx to the anus. Classification: upper = above the ligament of Treitz; lower = below the ligament of Treitz “Severe” GIB: defined as having associated shock, orthostatic hypotension, fall in hematocrit by 6% (or decrease in Hb by 2 g/dL), or requiring transfusion ≥2U PRBCs. Requires hospitalization.

10.2.3.1 Upper GI Bleeding (UGIB)

PUD caused by *Helicobacter pylori* infection or NSAID use is the most common cause of nonvariceal UGI bleeding. Characteristic findings are hematemesis, melena, or (infrequently) bright-red blood per rectum or a high serum BUN/creatinine ratio. Slow and/or chronic bleeding is suggested by iron deficiency and is typical of erosive disease, tumor, esophageal ulcer, portal hypertensive gastropathy, Cameron lesion (erosions found within large hiatal hernias), and angiodysplasia.

Table 10.1 Differential Diagnosis of Upper GI Bleeding

Presentation	Diagnosis
Dyspepsia, H. pylori infection, NSAID use, anticoagulation, severe medical illness	Peptic ulcer disease
Stigmata of chronic liver disease, evidence of portal hypertension or risk factors for cirrhosis (alcohol use, viral hepatitis)	Variceal bleeding
History of heavy alcohol use and retching before hematemesis, hematemesis following weightlifting, or young woman with bulimia	Mallory-Weiss tear
Heartburn, regurgitation, and dysphagia; usually small-volume or occult bleeding	Esophagitis
Progressive dysphagia, weight loss, early satiety, or abdominal pain; usually small-volume or occult bleeding	Esophageal or gastric cancer
NSAID use, heavy alcohol intake, severe medical illness; usually small-volume or occult bleeding	Gastroduodenal erosions

Initial management

Assess severity: vital signs including orthostatic changes, JVP. Tachycardia (can be masked by βB use) suggests 10% volume loss, orthostatic hypotension 20% loss, shock >30% loss. After the patient is stabilized, upper endoscopy is required to document the source of bleeding. If upper endoscopy shows an ulcer, test for *H. pylori* infection.

Resuscitation: placement of 2 large-bore (18-gauge or larger) intravenous lines, volume replacement: NS or LR to achieve normal vital signs, urine output, and mental status.

Pharmacological Management

For variceal bleeding refer to (10.4.2.3 Bleeding Esophageal Varices) For bleeding peptic ulcer disease

C: pantoprazole (IV) 40mg 12hourly for 2-3days

OR

S: esomeprazole (IV) 40mg 12hourly for 2-3days

Note

- Treat high-risk ulcers endoscopically (haemoclips, thermal therapy, or injection therapy) and continuous IV PPI infusion for 72 hours. Blood transfusion to target haemoglobin level of 7 g/dl Repeat endoscopic therapy for continued bleeding
- Surgery or interventional radiology if endoscopic therapy unsuccessful

Laboratory Investigations

- FBP, LFT, RFT.
- Abdominal ultrasound
- Viral hepatitis screening
- H. pylori stool antigen

Lower gastrointestinal (GI) Bleeding

Acute, painless LGI bleeding in older adult patients is usually due to colonic diverticula or angiodysplasia. Ten percent of rapid rectal bleeding has an UGI source.

Consider outpatient follow-up or early discharge when:

- patient age <60 years
- no hemodynamic instability
- no evidence of gross rectal bleeding
- identification of an obvious anorectal source of bleeding

Table 10.2 Differential Diagnosis of Lower GI Bleeding

Presentation	Diagnosis
Painless, self-limited, massive hematochezia	Diverticular bleeding (most common overall cause)
Chronic blood loss or acute painless hematochezia in an older adult patient	Angiodysplasia
Stool positive for occult blood in an asymptomatic patient	Colonic polyp or cancer
Risk factors for atherosclerosis and evidence of vascular disease in an older adult patient; typically, with LLQ abdominal pain	Ischemic colitis
Aortic stenosis	Angiodysplasia (Heyde Syndrome)
History of bloody diarrhea, tenesmus, abdominal pain, fever	IBD
Rapid UGI bleeding	Dieulafoy lesion (large, tortuous, submucosal arteriole)
Large hiatal hernia	Cameron lesion (mucosal erosions)
Recent liver or biliary procedure	Haemobilia
Necrotizing pancreatitis	Hemosuccus pancreaticus (bleeding from pancreas)
Aortic aneurysm repair	Aortoenteric fistula
Painless hematochezia in a young patient and normal upper endoscopy and colonoscopy	Meckel diverticulum
Mucocutaneous telangiectasias	Hereditary hemorrhagic telangiectasia

Note

- According to expert opinion, the blood transfusion threshold for patients with colonic bleeding is a haemoglobin value <9 g/dL (note this is different for the evidence-based threshold for UGI bleeding).
- If the patient is hemodynamically unstable, resuscitate the patient before diagnostic studies are performed. Most episodes of LGI bleeding resolve spontaneously.
- Colonoscopy is recommended early, usually within the first 48 hours of admission, and endoscopic therapy is used to control continued bleeding.
- If colonoscopy does not identify a discrete lesion or endoscopic therapy does not control the bleeding, interventional angiography or surgery may be indicated.
- Patients with angiodysplasia in the setting of AS (Heyde Syndrome) may benefit from valve replacement surgery.

10.2.3.1 Bleeding of Obscure Origin

Obscure GI bleeding is recurrent blood loss without an identified source of bleeding despite upper endoscopy and colonoscopy. Patients aged ≤50 years are more likely to have tumors (leiomyomas, carcinoid, adenocarcinoma, or lymphoma), Dieulafoylesion, or Crohn's disease. Older patients are more likely to have vascular lesions, such as angiodysplasia. Angiodysplasia is the most common cause of obscure GI bleeding overall (40% of all cases). Patients may present with either melena or hematochezia or positive fecal occult blood test (FOBT). The first step is to repeat upper endoscopy and/or colonoscopy, which is diagnostic in approximately 40% of cases.

For patients with obscure active GI bleeding

- Nuclear studies (technetium 99m-labeled erythrocyte or sulfur colloid nuclear scan) first, followed by angiography
- if unrevealing, consider push enteroscopy or balloon-assisted enteroscopy (deep enteroscopy)
- Surgery and intraoperative enteroscopy is a last diagnostic option

For patients with occult GI bleeding

- Capsule endoscopy (first choice GIE 2015; 81:889) or deep enteroscopy
- If unrevealing, repeat endoscopic examinations (upper endoscopy, colonoscopy, capsule endoscopy), or deep enteroscopy

10.3 Diseases of the Intestine

10.3.1 Inflammatory Bowel Diseases

Inflammatory bowel disease (IBD) is an idiopathic disease involving an immune reaction of the body to its own intestinal tract. The 2 major types of IBD are ulcerative colitis (UC) and Crohn's disease (CD). Pathologically, ulcerative colitis is limited to the colon while Crohn's disease can involve any segment of the gastrointestinal (GI) tract from the mouth to the anus.

10.3.1.1 Ulcerative Colitis (UC)

Inflammatory condition that involves the rectum and extends proximally to affect a variable extent of the colon up to the caecum

Clinical Presentation

- Diarrhoea
- Rectal bleeding
- Tenesmus, passage of mucus
- Crampy abdominal pain
- Fevers and Chills.

Investigations

- Endoscopic evidence of diffuse and continuous colonic mucosal inflammation with friability and loss of mucosal vascularity
- Histologic evidence of abnormal crypt architecture and superficial inflammation typical of UC.
- Fecal calprotectin
- CT enterography/MRI enterography: Plays role in diagnosis, assessment and management

Pharmacological Management

D: sulfasalazine (PO) 1000mg 6hourly a day for acute disease, reducing to 1000mg 24 hourly for maintenance

OR

S: mesalazine (PO) 1.5g–4g/day in divided doses reduced to 0.75–2g g/day in divided doses for maintenance

AND

A: prednisolone (PO) 30–60mg 24hourly for severe, acute and extensive disease; tapering gradually after induction of remission within 8 weeks.

For severe disease flares give IV corticosteroids,
D: methylprednisolone (IV) 16-20mg 8hourly 5- 7days

If irresponsive (i.e., fewer stools, less bleeding) to IV corticosteroids for 5-7days, or acute complications give the following;
S: cyclosporine (IV) 2-4mg/kg 12hourly for 7days

THEN

S: azathioprine (PO) 1.5-2.5 mg/kg 24hourly for maintenance.

OR

S: infliximab (IV) 5 mg/kg at 0, 2, and 6weeks, then every 8weeks

OR

S: adalimumab (Indicated for patients unresponsive to immunosuppressants (eg, corticosteroids, azathioprine, 6-mercaptopurine [6-MP])

Induction: 160 mg SC either as 4 injections of 40 mg on day 1 or as 2 injections of 40 mg daily on 2 consecutive days, then 80 mg SC 2 weeks later (day 15)
Maintenance: (beginning Week 4 [Day 29]): 40 mg SC q2wk
Continue maintenance dose only if evidence of clinical remission is apparent by 8 weeks of therapy

Note

Complication of UC may present with massive hemorrhage, toxic mega colon, AND perforation with features of peritonitis necessitates hospitalization. Colonoscopy with random biopsy 8 years after diagnosis to evaluate for dysplasia, every 1-3 years thereafter based on risk factors. Use steroids only when the disease is confirmed and for induction of remission only.

10.3.1.2 Crohn's Disease

Crohn's disease is an idiopathic, chronic, transmural inflammatory process of the bowel that often leads to fibrosis and obstructive symptoms and can affect any part of the gastrointestinal tract from the mouth to the anus.

Clinical Presentation

- Abdominal pain, diarrhea, weight loss, anorexia and fever
- Gross rectal bleeding or acute hemorrhage is uncommon
- Anemia due to illeal disease involvement
- Small bowel obstruction, due to structuring
- Perianal disease associated with fistulization
- Gastroduodenal ulceration

Investigations

- Endoscopic evidence of rectal sparing skip lesions, cobble stoning with linear ulceration appearance with,
- Histological evidence of transmural disease, aphthous ulcers, and non-caseating granulomas
- CTMRI enterography: Plays role in diagnosis, assessment and management

Pharmacological Management

S: methotrexate (PO) 7.5–15mg weekly

OR

S: azathioprine (PO) 50mg 24hourly for maintenance of remission.

AND

A: prednisolone (PO) 1–2mg/kg for induction of remission only (Taper in 8 weeks)

AND

A: metronidazole (PO) 400mg 8hourly for 7–10days

OR

A: ciprofloxacin (PO) 500mg 12hourly for 7–10days – can be added in presence of perianal disease or evident septic complications.

For severe disease flare or acute complications

Patients who have had inadequate response to conventional therapy, also for reducing the number of draining enterocutaneous and rectovaginal fistulas and maintaining fistula closure in adult patients with fistulizing Crohn disease.

S: infliximab (IV) 5 mg/kg at 0, 2, and 6 weeks, THEN every 8weeks thereafter

AND

S: azathioprine (PO) 1.5-2.5 mg/kg 24hourly

OR

S: adalimumab (May be used in patients who have lost response to or are intolerant of infliximab)

Induction: 160 mg SC either as 4 injections of 40 mg on day 1 or as 2 injections of 40 mg daily on 2 consecutive days, then 80 mg SC 2 weeks later (day 15)

Maintenance (beginning Week 4 [Day 29]): 40 mg SC q2wk

Use in CD beyond 1 year has not been evaluated in controlled clinical studies

Note: Resuscitative and supportive management should be instituted as for UC section note above.

10.3.2 Pseudomembranous Colitis

This condition is caused by Clostridium difficile, a gram positive, anaerobic bacterium causing antibiotic associated diarrhoea as a result of altered bacterial flora and release of enterotoxins.

Clinical Presentation

- Bloody Diarrhea
- Abdominal cramps and tenderness
- Nausea, fever, dehydration

Investigations

- Lower endoscopic pathognomonic findings of pseudomembranous yellowish plaques overlying the ulcerated and friable rectal sigmoid colon mucosa
- Laboratory evidence of *C. difficile* toxin A-B isolation from cultured stool samples (Toxin B) OR ELISA assay (Toxin A)

Pharmacological Treatment

Stop the causative antibiotics

A: metronidazole (PO) 400mg 8hourly for 10-14days

OR

S: vancomycin (PO) Adults, 125mg–500mg 6hourly for 10-14days

Note

Resuscitative and supportive management should be instituted as for UC above. Refer to next level of care with adequate expertise and facilities for all suspected cases for initial evaluation and management and cases presenting with acute complications such as Toxic mega colon

10.3.3 Radiation Proctitis

Radiation proctopathy is defined as epithelial damage to the rectum due to radiation that is associated with minimal or no inflammation. Acute radiation proctitis occurs during or within six weeks of radiation therapy. Chronic radiation proctitis has a more delayed onset. The first symptoms often occur 9 to 14 months following radiation exposure but can occur any time post-irradiation up to 30 years after exposure.

Clinical Presentation

- Symptoms of acute radiation proctitis include diarrhea, mucus discharge, urgency, tenesmus, and, uncommonly, bleeding.
- Patients with chronic radiation proctitis have similar symptoms as patients with acute radiation proctitis, but bleeding is usually more severe. In addition, patients may have symptoms of obstructed defecation due to strictures with constipation, rectal pain, urgency, and, rarely, fecal incontinence due to overflow.
- Concomitant injury to the genitourinary tract or small bowel may lead to fistulas, small bowel obstruction, small intestinal bacterial overgrowth, urethral stenosis, and cystitis
- Acute radiation proctitis should be suspected in patients with diarrhea, mucus discharge, urgency, tenesmus, or bleeding during or within six weeks of radiation therapy. Chronic radiation proctitis should be suspected in patients who develop these symptoms nine months or more after pelvic radiation exposure.

Investigations

- Stool studies for *C. difficile* toxin, routine stool cultures (*Salmonella, Shigella, Campylobacter,* and *Yersinia), Escherichia coli* O157:H7. Microscopy for ova and parasites (three samples)
- Testing for STI, including *C. trachomatis, N. gonorrhoeae,* HSV, and *Treponema pallidum*,
- Endoscopy (colonoscopy and biopsy)
- Magnetic resonance imaging

Pharmacological Management

Note: Resuscitative and supportive management should be instituted as for UC above. Refer to next level of care with adequate expertise and facilities for all suspected cases for initial evaluation and management and cases presenting with acute complications such as Toxic mega colon

D: sulfasalazine (PO) 3g 24hourly for 4weeks

AND

S: sucralfate enemas (rectal preparation) 2g 12hourly for 4weeks

Note: Refer to higher level facility with expertise and experience in the management complications such as bleeding. Endoscopic therapy — Argon plasma coagulation (APC) for bleeding. Surgery — Surgery should be reserved for patients who have intractable symptoms such as a stricture, pain, bleeding, perforation, or a fistula

10.3.4 Irritable bowel syndrome

Irritable bowel syndrome (IBS) is a functional GI disorder characterized by abdominal pain and altered bowel habits in the absence of specific and unique organic pathology.

Four bowel patterns may be seen with IBS;

a) IBS-D (diarrhea predominant)
b) IBS-C (constipation predominant)
c) IBS-M (mixed diarrhea and constipation)
d) IBS-U (unclassified; the symptoms cannot be categorized into one of the above three subtypes)

Clinical Presentation

- Recurrent abdominal pains or discomfort at least 3 days per month in the last 3 months associated with two or more of the following
- Improvement with defecation
- Onset associated with a change in frequency of stools
- Onset associated with a change in form of stool
- Bloating or feeling of abdominal fullness

Non-Pharmacological Management

- Counseling on compelling psycho –social factors, lifestyle modification, avoidance of trigger factors, and reassurance are corner stone of long-term management strategy. Plus, supportive therapies such as:
- High fiber diet and eating a healthy diet.

Pharmacological Management

A: hyoscine butyl bromide (PO) 10mg 6hourly when required

OR

D: mebeverine (PO) 135mg 8hourly when required

AND

A: amitriptyline (PO) 25mg nocte for one week then 50mg nocte week 2-4.

AND

C: lactulose (PO) 20mls 12hourly (when required for constipation)

OR

A: bisacodyl (PO) 5-15mg when required for constipation

For diarrheal predominant IBS

B: loperamide (PO) 4mg stat, for diarrhoea followed by 2mg 8hourly or after each unformed stool until diarrhoea is controlled.

10.3.5 Diverticulosis

Acquired herniations of colonic mucosa and submucosa in areas where vasa recta penetrate, thought to occur in setting of abnormal motility and increased intraluminal pressure.

Clinical Presentation

Asymptomatic but 5–15% develop diverticular hemorrhage (see "GIB" above) and <5% diverticulitis

10.3.6 Diverticulitis

Retention of undigested food and bacteria in diverticulum leads to fecalith formation with obstruction which compromise diverticulum's blood supply, infection, perforation

Uncomplicated: micro perforation leading to localized infection

Complicated: macro perforation leading to abscess, peritonitis, fistula, obstruction

Clinical Presentation

- LLQ abdominal pain, fever, nausea, vomiting, constipation or diarrhea
- Physical findings range from LLQ tenderness and/or palpable mass to peritoneal signs and septic shock
- Differential diagnosis includes IBD, infectious colitis, PID, tubal pregnancy, cystitis, colorectal cancer

Investigations

- Plain abdominal radiographs to rule out free air, ileus or obstruction
- Abdominal CT scan with contrast, to assess complicated disease (abscess, fistula, perforation with fecal peritonitis by Hinchy classification)
- Colonoscopy contraindicated acutely as increases the risk of perforation; do 6–8 weeks after to rule out neoplasm

Pharmacological Management

Mild: outpatient indicated if patient has little comorbidity and can tolerate oral intake

B: amoxicillin + clavulanic acid FDC (PO) 625mg 12hourly daily for 7–10days

AND

A: metronidazole (PO) 400mg 8hourly for 7–10days

AND

Liquid diet until clinical improvement Alternatively

A: ciprofloxacin (PO) 500mg 12hourly daily for 7–10days

OR

A: metronidazole 400mg (PO) 8hourly for 7–10days

AND

Liquid diet until clinical improvement for severe cases

B: ceftriaxone (IV) 1-2g 24hourly for 7-10days

OR

S: piperacillin + tazobactam (IV) 4.5gm 6-8hourly 7-10days (for severe/complicated cases)

OR

S: meropenem (IV) 1gm 8hourly 7-10days

AND

B: metronidazole (IV) 500mg 8hourly for 7-10days

Note

- Abscesses >4 cm should be drained percutaneously or surgically.
- Surgery: if progressions despite medical treatment, undrainable abscess, free perforation.
- After source control, 4days antibiotics may be enough.
- Resection for recurrent bouts of diverticulitis on a case-by-case basis.

10.3.7 Polyps and Adenomas

Accumulation of mutations in colonic epithelial cell DNA affecting oncogenes and tumor suppressor genes which leads to tumor initiation (formation of adenoma) tumor progression (adenoma to carcinoma).
Neoplastic polyps: adenomas (tubular, villous, tubulovillous dysplasia), sessile serrated adenomas/polyps (concern for interval CRC), carcinomas.
Non-neoplastic polyps: hyperplastic, juvenile, Peutz-Jeghers, inflammatory.

Investigations
Colonoscopy is gold standard

Note
- Colonoscopy in all patients starting at age 50 years, then typically every 10years unless pathology found.
- If positive family history, start age 40, or 10 years before age of diagnosis in youngest family member, repeat every 5 years.

10.3.8 Hemorrhoids

Hemorrhoid disease is due to enlargement or thrombosis of the veins in the external or internal hemorrhoidal plexus.

Clinical Presentation
- Painless anal rectal piles
- Painless bleeding –post defecation
- Pain
- Pruritus
- Prolaps

Investigations
Endoscopy (Anoscopy, or proctosigmoidoscopy) for evidence of characteristic anal recta piles.

Treatment
- Depends on severity of the disease
- Grade I hemorrhoids are treated with conservative medical therapy and avoidance of nonsteroidal anti-inflammatory drugs (NSAIDs) and spicy or fatty foods
- Grade II or III hemorrhoids are initially treated with nonsurgical procedures (sclerotherapy, band ligation
- Very symptomatic grade III and grade IV hemorrhoids are best treated with surgical hemorrhoidectomy

Pharmacological Management
A: benzyl benzoate 1.25%, bismuth oxide 0.875%, bismuth subgallate 2.25%, hydrocortisone acetate 0.25%, Peru balsam 1.875%, zinc oxide 10.75% (PR) suppository one or twice a day
OR
S: euphobia prostrata extract 100mg+ Calcium dobesilate 500mg (PO) 24hourly (chewable do not swallow)
AND/OR
S: prednisolone hexanoate 1.3mg +Cinchocaine hydrochloride 1mg Suppository 24hourly 5-7days

10.3.9 Anal Fissures

These are painful linear ulcers in the anal canal. Young and middle-aged adults most affected. Primary fissure occurs in the posterior midline. It can also be secondary to Crohn's disease, anal cancer, or infection such as syphilis, TB in which case they occur more lateral. Passage of hard stools is a common predisposition to primary fissures.

Clinical Presentation
Severe sharp pain during and after defecation with/out bright red bleeding.

Investigations
Evidence of linear anal rectal ulceration on proctoscopy examination

Non-Pharmacological Management
Ensure high fluid intake

Pharmacological Management
Topical anesthetics and frequent seat baths can reduce sphincter spasm (should be offered before surgery)

B: lidocaine (5% ointment or 2% jelly) apply 12 hourly
Use non stimulant osmotic laxatives to target 1-2 motions per day, if diarrhea stop or reduce dose
C: lactulose (PO) 10-30mls 12 hourly

Surgery: Surgical sphincterotomy is definitive treatment.

10.3.10 Fistula in Ano

Is a chronic abnormal communication lined by degree of granulation tissues which runs outward from mucosal lumen.

Risk factors

- Previous perianal abscess formation
- Chhorn's disease
- Diabetes mellitus
- Tuberculosis
- Trauma
- Radiotherapy
- Immunosuppression-HIV, malignancy

Classifications of fistula in ano

a) bIntersphincteric
b) Suprasphincteric
c) Transphincteric
d) Extra sphincteric

Clinical Presentation

- Purulent or bloody discharges
- Pruritis ani
- History of anorectal abscess

Investigations

- Fistulography
- Endoanal USS
- Pelvic MRI-gold standard
- Surgical Treatment options
- Fistulotomy, Fistulectomy, Seton, Fibrin glue, anal fistula plug, Advancement flap

10.3.11 Appendicitis

This is characterised by inflammation of the appendix, and usually requires urgent surgical intervention.

Clinical Presentation

- Sudden peri-umbilical pain often migrating to the right iliac fossa.
- Nausea and vomiting
- Loss of appetite
- Fever
- Constipation or occasionally diarrhea.
- Bloated abdomen.
- Rebound tenderness
- guarding and rigidity.
- Right iliac fossa tenderness.
- Right iliac fossa rebound pain.
- Severe persistent abdominal pain.

Investigations

- FBP
- Urinalysis
- Pregnancy test in females
- LFT
- Lipase/amylase excludes pancreatitis
- Abdominal USS
- CT scan

Complications

- Perforation/peritonitis
- Appendicular abscess
- Appendicular mass

Pharmacological Management

B: ceftriaxone (IV) 1g 12hourly for 5-7days

AND

B: metronidazole (IV) 500mg 8hourly for 5-7days

AND

A: diclofenac (IM) 75mg 8hourly for 3days

10.4 Pancreatitis

Pancreatitis is an inflammatory process in which pancreatic enzymes auto digest the pancreatic gland leading to functional and morphologic loss of the gland.

10.4.1 Acute Pancreatitis

It is due to sudden inflammation of the pancreas due to pancreatic enzymes auto digestion. Common risk factors which trigger the acute episode are presence of gallstones and alcohol intake.

Clinical Presentation

- Severe, unremitting epigastric pain, radiating to the back
- Nausea and vomiting
- Signs of shock may be present
- Ileus is also common
- Local complications: inflammatory mass, obstructive jaundice, gastric outlet obstruction
- Systemic complication: sepsis, acute respiratory distress syndrome, acute renal failure
-

Investigations

- Raised Serum levels for lipase and amylase greater than 3 times the upper limit of normal ULN (Lipase is more specific and sensitive than amylase). And,
- Radiological (ultrasound, CT, MRI) evidence of inflamed and/or necrotizing pancreatitis.

Management

Principles of management include supportive therapies.

- Intravascular volume expansion (colloids/crystalloid)
- Opiates analgesia usually required (follow WHO analgesic ladder)
- Enteral feeding, (only in absence of illeus) start within 72 hours
- Correction of electrolytes and metabolic deficit accordingly

Pharmacological Management

B: ceftriaxone (IV) 1g 12hourly for 7days

OR

C: ciprofloxacin (IV) 200-400mg 12hourly for 7days

AND

B: metronidazole (IV) 500mg 8hourly for 7days

OR

S: meropenem (IV) 1g 8hourly for 7days

Note

- Fever can be because of pancreatitis itself; antibiotics should be avoided before 7 days. **Pancreatic necrosis:** Nonviable pancreatic tissue. CT-guided FNA if infection suspected. **Sterile necrosis:** if asymptomatic, can be managed expectantly, no role for prophylactic antibiotics. **Infected necrosis**: high mortality. Treat with carbapenem or metronidazole plus fluoroquinolone
- If stable, defer drainage to >4 weeks. If symptomatic or unstable, percutaneous drainage and minimally invasive surgical debridement or endoscopic necrosectomy superior to open necrosectomy. ERCP + Sphincterotomy may be needed.

10.4.2 Chronic Pancreatitis

Chronic pancreatitis is long-term (chronic) inflammation of the pancreas that leads to permanent loss of function and morphology of the gland.

Clinical Presentation

- Chronic upper abdominal pain associated with nausea, vomiting and loss of appetite.
- Malabsorption diarrhoea (exocrine pancreatic insufficiency (steatorrhea))
- Recurrent attacks of pancreatitis weight loss
- Diabetes

Investigations

Radiological (Abdominal Ultrasonography/CT scan) evidence pancreatic calcification and atrophy.

Pharmacological Management
Supportive therapies with analgesics in the following order;

A: paracetamol (PO) 1g 8hourly daily when required
OR
B: tramadol (PO) 50mg 12hourly when required for chronic pain relief.
OR
C: morphine (PO) 5-10mls 6hourly when required
If pain unresponsive to above medications Add

A: amitriptyline (PO) 25mg nocte when required for pain control
OR
D: pregabalin (PO) 75mg 24 hourly when required for pain relief

Manage complications
Pancreatic enzymes deficiency and steatorrhea
S: pancreatin (PO) 1–3tablet 24hourly to supplement digestive enzyme and improve food absorption.

Diabetes mellitus
Refer to metabolic and endocrine disease conditions chapter

Note: In patients with persistent or refractory pain look for a dilated pancreatic duct and intraductal calcifications. These patients may benefit from endoscopic stenting, lithotripsy, or surgical drainage (pancreatojejunostomy).

10.5 Disorders of The Liver and Biliary Tract

10.5.1 Hepatitis

This is the term referring to inflammation of the liver, which may result from various causes, both infectious (i.e. viral, bacterial, fungal, and parasitic organisms) and non-infectious e.g. alcohol, drugs, autoimmune and metabolic diseases; this section focuses on viral hepatitis and its sequels.

10.5.1.1 Viral Hepatitis

It is a systemic infection predominantly affecting the liver caused hepatotropic viral agents namely Hepatitis A virus (HAV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), HBV – associated delta agent or Hepatitis D virus (HDV), and Hepatitis E virus (HEV); in most cases leads to a self-limiting disease but can take a fulminant course and lead to hepatic failure or progress to chronic liver disease (HBV, HBV-HDV and HCV)

Note: For comprehensive management of viral hepatitis refer to the National Guidelines for Prevention and Management of Viral Hepatitis 2020.

10.5.1.1.1 Hepatitis A Virus (HAV)

HAV is the RNA virus from piconaviridae family under genus hepatovirus. It primarily infects the liver. The disease occurs sporadically or in epidemics and has an incubation period of 14- 28 days. The group most affected is aged between 5-14 years and adults are often infected by spread from children.

Clinical Presentation
Mild flu-like symptoms of anorexia, nausea and vomiting, fatigue, malaise, low-grade fever (usually < 39.5°C), myalgia, and mild headache, dark urine appears first (bilirubinuria). Pale stool soon follows; Jaundice occurs in most adults. Abdominal pain itching (pruritus), Arthralgias and skin rash, (less frequent than the above symptoms).

Investigations
Specific diagnosis involves serological detection of Hepatitis A specific immunoglobulins IgM or IgG antibodies in blood for acute and resolved infection respectively. Viral RNA detection through PCR is definitive and confirmatory specialized laboratory test. Other tests include FBP, LFT, RFT and tests for other viral hepatitis viruses (HBV±HDV, HCV, and HEV).

Management

- Supportive management such as hydration, adequate feeding and avoidance of concomitant use of hepatotoxic medications including herbals is all that is required in mild infections. The disease resolves spontaneously in several weeks or months.
- Hospitalization is necessary in settings of acute liver failure. Therapy is aimed at maintaining fluid replacement, balanced nutritional feeding, relief of pains and fever including specific management for liver failure.

10.5.1.1.2 Hepatitis B Virus (HBV)

New-onset hepatitis B infection that may or may not be icteric or symptomatic. Diagnosis is based on detection of hepatitis B surface antigen (HBsAg) and IgM antibodies to hepatitis B core antigen (anti-HBc). Recovery is accompanied by clearance of HBsAg with seroconversion to anti-HBs (antibodies to hepatitis B surface antigen), usually within 3 months.

Clinical Presentation

- Fever, anorexia, malaise, jaundice and abdominal pain
- Enlarged and tender liver
- Altered consciousness, coma (hepatic encephalopathy), and bleeding stigmata (in fulminant cases).

Investigations

Serological evidence of specific viral antigen/ core antibody tests (HBc IgM or HBc IgG); and biochemical alteration of liver transaminases (ALT, AST).

Management of Acute Viral Hepatitis B

- No specific antiviral treatment is required.
- Offer supportive management and counselling.
- Offer a follow up plan at 4- or 6-weeks' intervals for a clinical and laboratory re assessment for evidence of symptoms recovery and biochemical remission.
- Re-test at 6 months to assess seroconversion status or progression to chronicity

Chronic Hepatitis B infection.

Defined as persistence of hepatitis B surface antigen (HBsAg) for six months or more after acute infection with HBV.

Clinical Presentation

- Usually, asymptomatic
- Right upper quadrant abdominal pains.
- Fatigue, malaise, anorexia, low grade fever; jaundice is frequent in severe disease.
- Ascites, variceal bleeding, encephalopathy, coagulopathy, and hypersplenism.
- Urticaria, arthritis, vasculitis, polyneuropathy, glomerulonephritis, thyroiditis

Investigations

- HBsAg, HBsAb, HBeAg, HBeAb, HBV DNA PCR
- LFT, RFT, FBP, HIV,
- Alfa Feto Protein (AFP)
- Colour Doppler ultrasonography or duplex Doppler ultrasonography or real time ultrasonography.
- Dynamic imaging: Tiphasic CT scan/contrast MRI (diagnostic for HCC/in most cases no need for liver biopsy)
- Fibroscan (if available)

Management of Chronic Hepatitis B Infection Pre-Treatment Considerations – Who to Treat:

The following are the eligibility criteria for initiation of HBV treatment to a RoC (recipient of care)

- Evidence of significant fibrosis or based on an APRI score of >0.5 or transient elastography value of >7 kPa* or evidence of cirrhosis (based on clinical criteria (or an APRI score of >1 or transient elastography value of >12.5 kPa). (Captures 20-25% of HBV positive)
- HBV DNA >2000 IU/mL and an ALT level above the upper limit of normal (ULN). (Captures 20-35% of HBV positive)
- Persistently elevated ALT above ULN on two consecutive occasions (if a ROC has an elevated ALT above ULN, a second monitoring test during a 6- to 12-month period) (captures 20% of all HBV positive)
- Presence of co-infections (such as HIV, hepatitis D or hepatitis C) (captures 5-8% of HBV positive)
- Family history of liver cirrhosis
- Immune suppression (such as long-term steroids, solid organ or stem cell transplant)
- Comorbidities (such as diabetes or metabolic dysfunction—associated steatotic liver disease) ;) or extrahepatic manifestations (such as glomerulonephritis or vasculitis), regardless of the APRI score or HBV DNA or ALT levels.

Pre-Treatment Considerations – Who not to treat:

- Persistently normal ALT and,
- HBV DNA <2000 IU/mL and,
- Absence of coinfections, comorbidities, immune suppression, extrahepatic manifestations, family history of liver cancer or cirrhosis

Pharmacological Management

(For eligible adults with no contraindications to tenofovir)

B: tenofovir disoproxil fumarate (TDF) (PO) 300mg 24hourly; for at least 48weeks;

OR

B: tenofovir alafenamide (TAF) (PO) 25mg 24 hourly (in case of TDF toxicity e.g., nephrotoxicity, bone mineral disease)

Note

- Re-asses at 24 weeks for evidence of biochemical and viral replication remission. (Normalization of ALT, viral suppression to undetected level and seroconversion to anti- HBe).
- Offer a consolidated TDF therapy for extended 48 weeks for patients with evidence of HBeAb sero-conversion and biochemical remission at the end of the first 48 weeks. For patients still with detectable viral load and or not yet seroconverted to HBeAb, continue with Tenofovir 300mg daily dose and reassess every 6 to 12 months for HBV DNA, HBeAg/Ab status
- Absolute Contraindications to Tenofovir in patients aged < 12 Years

OR

S: entecavir in the following groups: Children and adolescents between age 2 to 18 years weighing between 10kg and 32kg

Adults with renal insufficiency (CrCl<49ml/min

Entecavir dose Considerations

- Children age 2 to 18 years weighing between 10kg and 32kg - 0.5mg (PO) 24hourly
- Adults naive to nucleoside therapy (PO) 0.5mg 24hourly
- Adults with Lamivudine resistance/previous exposure; and decompensated cirrhosis - 1mg (PO)
- Adults with renal insufficiency (CrCl<49ml/min); dose should be adjusted according to calculated GFR

B: tenofovir (PO) 300mg 24hourly for patients who have treatment failure with other Nucleotides analogues with low resistance barrier (i.e., Lamivudine) OR Interferon based therapy.

Note: Lamivudine should not be prioritized due to their low resistance barrier. Interferon based therapy is not recommended in our setting due to undesirable side effects, route of administration and high cost.

When to Stop Treatment

- A lifelong treatment is required for all patients with cirrhosis (based on APRI or clinical evidence) due to risk of reactivation, which can cause Acute-on-chronic liver failure.
- Discontinuation of nucleotides can be considered in persons without evidence of cirrhosis
- There is evidence of HBeAg loss with concurrent seroconversion to HBeAb in patients who were initially HBeAg positive, with a completion of at least one addition year of treatment.
- In association with persistently normal ALT levels and persistently undetected HBV DNA levels.
- Where DNA testing is not available, discontinuation of nucleotides may be considered in persons with evidence of HBsAg loss and after completion of at least one addition year of treatment.

When not to stop treatment

A lifelong treatment is required for all patients with Cirrhosis based on

- APRI score of >1
- Transient elastography value of >12.5 kPa
- Imaging or clinical evidence of liver cirrhosis.

Monitoring and evaluation of therapeutic response and toxicity.

To be done every six months

Abdominal Ultrasound (AUS) and Alpha Feto Protein (AFP) should be done every 6 months for HCC surveillance.

To be done annually

- Adherence at each visit, if on treatment
- Non-invasive tests (APRI or transient elastography)
- ALT and HBV DNA level
- Monitoring of renal function (creatinine), as indicated

Note: Screening all close contacts is important. All at risk individuals e.g. Healthcare workers, men who have sex with men, patients on hemodialysis, prisoners, children born to mothers with HBV and patients requiring multiple transfusions, patients with non-B viral hepatitis should be tested for HBV and vaccinated if found negative for HBsAg and no evidence of natural immunity to HBV.

HBV in Pregnancy

All Infants and Neonates should have mandatory vaccination according to the recommended National EPI schedule. Neonates born to mothers infected with HBV and HBeAg positive, should receive at birth dose of hepatitis B immunoglobulin (HBIG) and HBV Vaccine, and then follow up with EPI program schedule at 6weeks. During pregnancy, prevention of HBV transmission from mother to child should follow similar protocols as per adults with HBV infection. HBsAg positive pregnant mothers with VL >200,000 IU/ml should receive TDF at 3rd trimester until 6months post- natal period.

Pharmacological Management

- First dose for the infant: Hepatitis B vaccine born to HBsAg-negative mothers
- Medically stable infants weighing ≥2,000 grams: 0.5 ML (IM) within 24h of birth
- Preterm infants weighing <2,000 g: 0.5 mL (IM) 1 month after birth or at hospital discharge

First dose for the infant: Hepatitis B vaccine born to HBsAg-positive mothers
B: hepatitis B vaccine (HBV) (IM) 0.5 mL within 12hours of birth

AND

B: hepatitis B immune globulin (HBIG) (IM) 0.5 mL within 12hours of birth

Note: Mother's HBsAg status unknown: 0.5 mL IM within 12 hour of birth AND HBIG 0.5ml(IM); if newborn weight <2 kg, determine mother's HBsAg status as soon as possible and, if she is HBsAg-positive, also administer HBIG for infants weighing 2 kg or more (no later than age 1 week)

For the HBV positive pregnant mother

B: tenofovir (PO) 300mg 24hourly (from third trimester to 6 months post-delivery for the mother)

Prevention services for all infants

All infants should receive hepatitis B vaccine within 24 hours of delivery irrespective of Hepatitis B status of their mothers followed by 3 doses of HBV vaccine as per IVDP guidelines

Prevention services for Hepatitis B exposed infant

All infants born to mothers with HBV infection should receive.

- A birth dose of HBV monovalent vaccine within 24 hours post delivery
- If available, a single dose of 100IU HBIG intramuscularly should be given together with HBV vaccine birth dose. This should be given to all exposed infants born to mothers with high Hepatitis B DNA viral load (More than 200,000 IU/ML) preferably within 12 hours.
- Subsequent 3 doses of HBV vaccine during immunization schedule at 6, 10 and 14 weeks of age

Verify if:

- Mother with high HBV DNA viral load (>200,000IU/ml) is on Tenofovir prophylaxis.
- Mother with HIV/HBV coinfection is on Tenofovir based regimen

Note:

- Infants born to Hepatitis B positive mothers should be tested for Hepatitis B surface antigen and Hepatitis B surface antibodies at the age of 9 months for confirmation of Hepatitis B infection status.
- Appropriate services for the prevention of transmission of HIV and Syphilis should be offered together with Hepatitis B & C prevention services

HBV pregnant mother with HBV viral load >200,000 iu/ml or HBeAg + should receive TDF/TAF from second trimester until the infant completes immunization schedule for HBV.

Post exposure prophylaxis (PEP)
HBIG and HBV vaccine should be given to individuals who are HBsAg negative exposed to HBsAg positive focus within 24hours followed by active standard schedule to complete 3 doses.

B: hepatitis B immune globulin (HBIG) (IM) 0.06 mL/kg once
AND
B: hepatitis B vaccine (HBV) (IM) 1 mL (20 mcg) at 0, 1, and 6months

Retesting of HBsAg for a potential HBV infection should be done at 9 weeks after PEP completion which is the last dose of vaccine.

Note: Hepatitis B PEP does not reduce the risk of infection with other blood borne viruses such as hepatitis C or HIV, therefore, HIV PEP should also be offered as directed in the National Integrated HIV, Hepatitis and STI Management Guidelines. Also, HBV positive health care providers who perform prone to exposure procedures should be on Tenofovir treatment to reduce the risk of transmission to exposed patients.

Table 10.3 Post exposure prophylaxis for non-occupational and occupational exposure to hepatitis B

Exposed Individual Vaccination Status	Source is HBsAg-Positive or Not Available Indicated treatment for EXPOSED individual	Source is HBsAg Negative
Unvaccinated/non-immune	• Administer HBIG 0.06 mL/kg IM. • Initiate HBV vaccine series.	Initiate HBV vaccine series.
Previously vaccinated with completed HBV series	• Administer single dose of vaccine. • Check titer if available. If low, complete 3-dose vaccine series.	No treatment.
Undergoing vaccination at time of exposure	• Administer HBIG 0.06 mL/kg IM. • Complete 3-dose vaccine series.	Complete vaccine series.

Abbreviations: HBIG, hepatitis B immune globulin; HBsAg, hepatitis B surface antigen; HBV, hepatitis B virus; IM, intramuscular.

Note: HBIG and HBV Vaccine should be given at different intramuscular sites PEP should be given in <24hours, may not be effective after 72hours of exposure.

10.5.1.1.3 Hepatitis C virus (HCV)

Hepatitis C virus (HCV) is a small enveloped RNA virus and a member of the family Flaviviridae. HCV comprises six genotypes and hundreds of subtypes with variable geographical distribution and bears significance in determining the rate of liver disease progression, development of HCC and specific therapeutic responses.

Clinical Presentation

- Initial symptoms of HCV are often extrahepatic, most commonly involving the joints, muscle, and skin.
- Arthralgias,
- Paresthesias,
- Myalgias,
- Pruritus,
- Sicca syndrome.
- Sensory neuropath

Symptoms characteristic of complications from advanced or decompensated liver disease are related to synthetic dysfunction and portal hypertension, such as the following:

- Mental status changes (hepatic encephalopathy), Ankle edema and abdominal distention (ascites), Hematemesis or melena (variceal bleeding)

Signs in patients with decompensated liver disease include the following:

- **Hand signs:** Palmar erythema, Dupuytren contracture, asterixis, leukonychia, clubbing
- **Head signs:** Icteric sclera, temporal muscle wasting, enlarged parotid gland, cyanosis
- **Fetor hepaticus,** Gynecomastia, small testes
- **Abdominal signs:** Paraumbilical hernia, ascites, caput medusae, hepatosplenomegaly, abdominal bruit, Ankle edema, Scant body hair, Skin signs: Spider nevi, petechiae, excoriations due to pruritus

Other common extrahepatic manifestations include the following:

- Cryoglobulinemia, Membranoproliferative glomerulonephritis, Idiopathic thrombocytopenic purpura, Lichen planus, Keratoconjunctivitis sicca, Raynaud syndrome, Sjögren syndrome
- Porphyria cutanea tarda, Necrotizing cutaneous vasculitis

Investigations

General baseline studies in patients with suspected HCV include the following:

- FBP, LFT, RFT TSH, T3
- Screening tests for coinfection with HIV or HBV
- Screening for alcohol abuse, drug abuse, or depression
- Pregnancy testing

Tests for detecting HCV infection include the following:

- Hepatitis C antibody testing:(screening test for previous exposure)
- Quantitative assays for HCV RNA PCR (to confirm active infection)
- Other serologic testing (essential mixed cryoglobulinemia is a common finding)

Management

Use pangenotypic drugs which are efficacious, safe and cost-effective.

Who to treat

- Confirmed cases of Hepatitis C irrespective of clinical stage of the liver disease
- Patients with HCC who are eligible for liver transplant if feasible.
- Liver transplant patients if MELD score is < 18 (pre transplant) or >18 (post-transplant)
- Children >3 years of age

Who not to treat

- HCC patients who are not eligible for liver transplant.
- Patient with limited life expectancy due to ESLD (by MELD score or Child-Pugh), or non- hepatic related comorbidities.

Pharmacological Management

Use of fixed combination of anti HCV based therapy is recommend based on age, weight (table) and history of past treatment exposure.

C: sofosbuvir 400mg + daclatasvir 60mg 24hrly for 12 weeks for treatment naïve and up to 24 weeks for treatment experienced and those with liver cirrhosis.

OR

C: sofosbuvir 400mg + velpatasvir 100mg 24hrly for 12 weeks up to 24 weeks may be used (Depending on availability)

All RoC completing anti HCV dose duration should have their viral load (HCV RNA PCR) done at three (3) months after treatment completion to establish sustained virologic response (SVR).

When To Stop

- Adverse drug reaction
- ALT flares or massively increased ALT(>10xUNL)
- Drug to drug interaction (https://hcv.hep-druginteractions.org/checker)

Note: Currently, there is no vaccine for prevention of HCV infection and therefore all preventive measures are geared towards primary prevention in general population through health education and awareness creation, Blood and injection safety and Harm Reduction.

Table 10.4 Anti HCV based Therapy

Recommended pan genotypic (Hepatitis C1, C2, C3, C4, C5, C6) Direct acting antiviral agents (DAA) regimens	
SOF/VEL	SOF/DCV2
>30 kg 400/100 mg 24 hourly (FDC tablet)	>26 kg 400/60 mg 24 hourly (film-coated tablets)
17–29 kg 200/50 mg 24 hourly (FDC tablet or granules)	14–25 kg 200 mg/30 mg (as single tablets, SOF preferred as smaller, 100 mg tablet)
<17 kg 150/37.5 mg 24 hourly (Coated granules)	

Note:

- HCV/HIV Co infected patients should receive concurrent treatment regardless of CD 4 count and fibrosis stage.
- Due to potential drug-drug interactions and presence of hepato-renal toxicity, selection of antiviral regimen should be considered, and duration of treatment extended from 24 weeks up to 48 weeks
- For individual with CD4 count less than 200cells/ml, it is recommended to defer HCV therapy until the individual stable (CD4 count greater than 200cells/ml) on ART with HIV RNA suppressed levels of less than 1000 copies/ml.
- For those who co-infected with HCV/HIV/HBV TAF based regimen is recommended.
- Due to complexity and variability of HCV management, care and treatment should be done at the tertiary level facility

When to stop medications

- If there's adverse drug reaction
- When there is ALT flares or massively increased ALT (>10 X UNL)
- If there's evidence of drug-to-drug interactions- consider switching to medication with a less interacting potential

Clinical monitoring and follow up

- Assess treatment adherence, tolerance and toxicity at 4 weeks after treatment initiation.
- Treatment toxicity
- Stop all DAAs if ALT >10 X ULN and other causes have been ruled out

10.5.1.1.4 Hepatitis D Virus

Hepatitis D virus (HDV) is a defective RNA virus belonging to genus of delta virus that requires the helper function of Hepatitis B (HBV) for virion assembly, release and transmission, and therefore the infection does not occur in the absence of hepatitis B virus. The routes of HDV transmission are similar for HBV the most important being sexually, percutaneous or parenteral exposure to blood or blood products.

Investigations

Serology assays for HDV immunoglobulin titres for IgM and IgG are diagnostic for acute and post exposure/chronic infections respectively. Real time PCR for HDV RNA is confirmatory.

Management

There is no specific treatment for acute or chronic HDV infection.

Note:

The more risk population includes health care workers, transfusion recipients and haemophiliacs, PWID, and immigrants of endemic areas. Nucleotide sequences of HDV obtained worldwide indicates the existence of eight genotypes, with genotype 1 being detected worldwide. HDV Antiviral nucleotide analogues for HBV have no or limited effect on HDV replication and Pegylated interferon alpha is the only drug effective against HDV now and more than one year of therapy may be necessary as most of patients relapses after discontinuation of therapy.

10.5.1.1.5 Hepatitis E Virus

Hepatitis E virus (HEV) belongs is an RNA virus belonging from a family Hepadna viridae under Genus Hepevirus and acute liver infection. The virus has at least 4 different types: genotypes 1, 2, 3 and 4. Genotypes 1 and 2 have been found only in humans. Genotype 3 and 4 viruses circulate in several animals (including pigs, wild boars, and deer) without causing any disease, and occasionally infect humans.

Clinical Presentation

Prodromal-phase symptoms include the following:

- Myalgia, Arthralgia, Fever with mild temperature elevations
- Anorexia, Nausea/vomiting, Weight loss. Dehydration, right upper quadrant pain

Icteric-phase symptoms may last days to several weeks and include the following:

- Jaundice, Dark urine, Light-colored stool, Pruritus

Other features include the following

- Malaise (most common), Arthritis, Pancreatitis
- Aplastic anemia, Thrombocytopenia
- Neurologic symptoms of polyradiculopathy, Guillain–Barré syndrome, Bell palsy, peripheral neuropathy, ataxia, and mental confusion
- Membranoproliferative glomerulonephritis and membranous glomerulonephritis

Investigations

Serology assays for HEV immunoglobulin titres for IgM and IgG are diagnostic for acute and post exposure/chronic infections respectively. Real time PCR for HEV RNA in serum and particularly in stool is confirmatory.

Management

There is no specific treatment for cure or reversing the course of acute hepatitis E. The disease is usually self-limiting; hospitalization is generally not required except for patients with fulminant hepatitis or for symptomatic pregnant women where severity of infection is usually high and associated with high rates of fetal loss and mortality especially in third trimester.

Note

- The virus is shed in the stools of infected persons and enters the human body through the intestine. It is transmitted mainly through contaminated drinking water. Usually, the infection is self-limiting and resolves within 2–6 weeks. Rarely the infection can lead to fulminant hepatitis with acute liver failure.
- The virus causes sporadic cases and major epidemics of viral hepatitis and occurs in resource poor population with unhygienic conditions and through ingestion of contaminated water and food.

10.5.2 Autoimmune Hepatitis (AIH)

AIH: Is a chronic inflammatory liver disease caused by the immune system attacking liver cells characterized by elevated liver enzymes (AST, ALT), increased immunoglobulin G (IgG), presence of autoantibodies, and characteristic liver histology.
Diagnosis requires exclusion of other liver diseases (e.g., viral hepatitis, drug-induced liver injury, Wilson's disease, hemochromatosis)

Diagnostic Pillars

a) Clinical and laboratory findings

- Elevated serum aminotransferases (AST, ALT) and IgG levels
- Presence of autoantibodies: ANA, anti-SMA, and anti-LKM1 are commonly tested. Anti-SLA antibodies are more prognostic
- Exclusion of other causes of liver disease

b) Liver biopsy

- Crucial for diagnosis and staging the disease.
- Typical findings include interface hepatitis (inflammation at the portal-parenchymal interface), often with plasma cell infiltration.
- Recommended before starting immunosuppression unless risks outweigh benefits

Treatment goal - Induce and maintain biochemical remission (normalization of liver enzymes and IgG) and prevent progression to cirrhosis and liver failure.

Indications for treatment

- Active AIH regardless of symptoms.
- Elevated transaminases (>3xULN), elevated IgG >1.5xULN),
- Moderate to severe interface hepatitis on biopsy.
- Asymptomatic patients with significant inflammation

Pharmacological Management
First-line therapy (standard)
Corticosteroids
A: prednisolone (30 -60mg/day or 0.5-1mg/kg/day; initial higher dose, then tapered).
AND
Immunosuppressants – combine with corticosteroids to reduce steroid dose and side effects.
S: azathioprine (AZA) - 1-2 mg/kg/day,

Note: titrate to a target dose that achieves remission while minimizing side effects.
OR
S: mycophenolate Mofetil (MMF) - (PO) 1000 - 2000mg/day.
Note: Not recommended in pregnancy – teratogenic. Regularly monitor CBC and LFTs

Treatment duration and monitoring

- Continue treatment for at least two years after achieving complete biochemical remission
- Liver biopsy is recommended before discontinuing treatment to confirm histological remission.
- Close monitoring of LFTs and IgG levels is essential during and after treatment
- Non-invasive assessment of hepatic fibrosis (e.g., elastography) can be used to monitor fibrosis
- changes after treatment initiation (typically after 6 months).
- Special considerations and refractory cases
- Acute Severe AIH/Acute Liver Failure - Prednisolone followed by liver transplantation if no improvement
- Variant syndromes - consider overlap syndromes with PBC or PSC
- Pregnancy: AZA can be continued; MMF is contraindicated
- Refractory cases - other immunosuppressants (e.g., tacrolimus), biologics, or novel therapies targeting specific pathways may be considered
- Referral to hepatologist is recommended for difficult cases

10.5.3 Metabolic dysfunction-associated fatty liver disease

Defined as steatotic liver disease (evidence by Imaging, blood markers or histology) in the presence of one or more cardiometabolic risk factors (Overweight /Obesity, Type II DM, HTN or Dyslipidemia) and the absence of harmful alcohol intake. The spectrum of MAFLD includes steatosis, metabolic dysfunction-associated steatohepatitis (MASH, previously NASH), fibrosis, cirrhosis and MASH-related hepatocellular carcinoma (HCC).

Investigations

- CBC, ALT, AST, GGT, Fasting blood glucose, HbA1c, Lipid profile,
- FIB-4 (noninvasive fibrosis score)
- Transient Elastography (Fibro scan)
- Liver Biopsy – reserved for unclear or severe cases
- Exclude other etiology of Liver disease such as Viral hepatitis (HBV/HCV), Alcoholic (<20 g daily for females and <30 g daily for males), Metabolic e.g., Wilson's disease or Autoimmune Hepatitis.

Non-Pharmacological Management

- A rational initial approach to treatment focuses on improving insulin sensitivity via diet, exercise and lifestyle modification, all patients should be advised to avoid alcohol.
- Life style modification: Weight loss target ≥ 5% for steatosis, ≥ 7-10% for NASH & Fibrosis regression (Methods advised for weight loss are: Calorie deficit 500-1000kcal/day, Mediterranean or Low carbohydrate diet, Aerobic + resistance exercise (150-200min/week)

Pharmacological Management
For those with a BMI ≥ 30 kg/m2, particularly with other end-organ diseases such as sleep apnea, pharmacologic weight loss treatment may be considered

Pioglitazone effective in biopsy-proven NASH with Type II DM
D: pioglitazone (PO) 30mg 24hourly

Alpha Tocopherol (Vitamin E) (880 IU/day), for non-diabetics with biopsy-confirmed NASH (Caution long term risk of prostate cancer)
D: alpha Tocopherol (Vitamin E) (PO) 880 IU 24hourly

- Surgical (For those with a BMI ≥ 35 kg/ m2 or diabetes, bariatric surgery, particularly gastric bypass, offers the best possibility of correcting obesity and insulin resistance and may lead to resolution of MAFLD and NASH)
- Follow –up: Reassess Fibrosis (FIB-4 or Fibro Scan annually), Monitor metabolic risk eg HbA1c, BMI Or Lipid profile & Manage Comorbidities e.g. HTN, CVD

10.5.4 Portal Hypertension

This is high blood pressure in the hepatic portal system which includes the portal veins and its branches which drains from most of the intestines to the liver. It is indicated when the hepatic venous pressure gradient exceeds 7mmHg, while liver cirrhosis remains the most common cause which in our local setting is commonly caused by chronic viral hepatitis followed by heavy alcohol intake.

Clinical Presentation

- Ascites, Splenomegaly
- Esophageal varices, and hematemesis
- Swollen veins of the anterior abdomen (caput medusa) and hemorrhoids

Investigations

Radiological evidence of shrunken liver, with typical features of cirrhosis.

10.5.4.1 Ascites

Ascites is the pathologic accumulation of fluid in the peritoneal cavity, and its most common cause is cirrhosis.

Pharmacological Management

C: spironolactone (PO) 50mg – 400mg 24hourly incrementally till ascites resolves

OR

S: eplerenone (PO) 50mg 24hourly

AND

A: furosemide (PO) 40mg–160 mg 24hourly or in divided doses incrementally till ascites resolves

AND

A: propranolol (PO) 40mg–160mg 12hourly daily incrementally target heart rate 55-60bpm.

OR

C: carvedilol (PO) 6.25mg 24hourly, increase to 6.25mg (PO) 12hourly unless persistent arterial hypertension, SBP should not decrease <90mmHg.

AND

S: albumin 25% (IV) – in refractory ascites and large volume paracentesis. Give 25g stat, repeat at 15–30min Interval at Max Dose of 250g/48hourly

Minimally invasive interventional radiology procedure;

a) TIPS (Transjugular Intrahepatic Portosystemic Shunt)
   - **Refractory variceal bleeding –** after failed endoscopic therapy
   - **Refractory ascites** – not controlled by diuretics or paracentesis
   - **Portal hypertensive gastropathy**

b) Balloon-occluded Antegrade Transvenous obliteration (BATO)
   - Interventional Radiology procedure highly effective for bleeding ectopic varices especially in patients when TIPS is contraindicated

c) Ballon-occluded retrograde Transvenous obliteration (BRTO)
   - Interventional Radiology procedure to treat primarily gastric varices associated with portal systemic shunts in patients with portal hypertension)

Note:

- Consider discounting βB if SBP <90 or MAP ≤82 mmHg, serum Na <120 mEq/L, AKI, HRS, SBP, sepsis, severe alcoholic hepatitis, poor follow-up.
- Large-volume paracenteses (LVP; >5 L fluid removal): give 6–8g albumin per L fluid removed (above 5 L) as colloid replacement is associated with decreased risk of post- paracentesis circulatory dysfunction and possibly decreased mortality.

10.5.4.2 Spontaneous Bacterial Peritonitis

Spontaneous bacterial peritonitis is an acute bacterial infection of ascitic fluid in the absence of a contagious cause of infection (e.g., intestinal perforation or abscess)

Clinical Presentation

- Fever and chills
- Abdominal pain or discomfort
- Worsening or unexplained encephalopathy
- Diarrhea

Investigations

- Ascites that does not improve following administration of diuretic medication
- Worsening or new-onset renal failure
- Ileus

Diagnosis of Spontaneous bacterial peritonitis is based on the demonstration of an absolute number of polymorphonuclear cells in ascitic fluid equal to or greater than 250/mm3

Pharmacological Management

Community Acquired Spontaneous bacterial peritonitis

B: ceftriaxone (IV) 1g 12-24 hourly for 5- 10days

OR

C: amoxicillin-clavulanic acid (FDC) (IV) 1-2g 6-8hours for 5-10days

OR

C: ciprofloxacin (IV) 200mg 12hourly for 5–10days

AND

S: administration of albumin dose is 1.5 g/kg on day 1 and 1 g/kg on day 3

For Nosocomial Spontaneous bacterial peritonitis

S: meropenem (IV) 1gm 8hourly for 5-7days

Spontaneous bacterial peritonitis prophylaxis

Prophylaxis should be continuous until the disappearance of ascites (i.e., patients with alcoholic hepatitis), death, or transplant.

A: ciprofloxacin (PO) 400mg 24hourly for 10-14days

OR

A: sulfamethoxazole + trimethoprim (PO) 960mg 24hourly for 10-14days

10.5.4.3 Bleeding Esophageal Varices

Esophageal varices are collateral veins within the wall of the esophagus that project directly into the lumen. Acute variceal bleeding is a fatal complication in patients with liver cirrhosis. In patients with decompensated liver cirrhosis accompanied by ascites or hepatic encephalopathy, acute variceal bleeding is associated with a high mortality rate.

Pharmacological Management

S: octreotide (SC) 50–100µg 8hourly for 3days (infusion 50µg/hour for 72hours up to 5days)

AND

Band ligation of bleeding esophageal varices (EVL); 3 – 6 shoots per session.

OR

Sclerotherapy (Histo Acryl Glue Inj. 5 %;(mixed with Lipiodol at a ratio 1:1) Ethanolamine oleate 5%); given 2 -5ml per varix up to 20ml per session.

AND

B: ceftriaxone (IV) 1g 24hourly for 7days

Note: Blood transfusion (PRBC, PLT concentrates and FFP) when required.

10.5.4.4 Hepatic Encephalopathy (HE)

Hepatic encephalopathy (HE) is defined as “a condition which reflects a spectrum of neuropsychiatric abnormalities seen in patients with liver dysfunction after exclusion of other known brain disease.”

Clinical Presentation

Stage	Symptoms
I	Mild confusion, agitation, irritability, sleep disturbance, decreased attention
II	Lethargy, disorientation, inappropriate behavior, drowsiness
III	Somnolent but arousable, slurred speech, confused, aggressive
IV	Coma

Pharmacological Management

S: l-Ornithine L-Aspartate (IV) 10g 8hourly daily for 3-5days

THEN

S: l-Ornithine L-Aspartate (PO) 9g 24hourly in divided doses for 4–12weeks

AND

C: lactulose solution (PO) for bowel cleansing when required

Episode of HE (grade 2 or higher)—enemas:

A: sodium chloride 0.9% 300mL in 1000mL water 2hourly until there is clinical improvement

Episode of HE (able to tolerate oral administration)—(PO): 45mL every hour until there is bowel movement and clinical improvement

Outpatient therapy: 15-45mL 8-12hourly until there are 2-3 bowel movements per day

AND

A: metronidazole (PO) 400mg 8 hourly for 7days

AND

B: ceftriaxone (IV) 1g 12 hourly for 7days (if evidence of spontaneous bacterial peritonitis)

Fluid deficit correction and electrolytes replacements as appropriate (screen for and correct all precipitants of HE as shown in the table below).

Table 10.5: Precipitants of Hepatic Encephalopathy

Category	Precipitant
Electrolyte Imbalance	Hyponatremia, Hypokalemia
Gastrointestinal Causes	Gastrointestinal bleeding, Constipation, Diarrhea, Vomiting
Infections	Infection
Medications	Sedative drugs including narcotics, sleep aids, and antihistamines
Renal Causes	Azotemia
Fluid and Volume Changes	Dehydration, Fluid restriction, Excessive paracentesis, Diuretic use
Metabolic Causes	Metabolic alkalosis
Dietary Factors	Excessive protein intake
Procedures and Physiological Stress	Surgery

Hepatorenal syndrome (HRS) is the development of renal failure in patients with advanced chronic liver disease and, occasionally, fulminant hepatitis, who have portal hypertension and ascites.

Table 10.6: Pharmacological Management

Vasoconstrictor		Recommended Dosage
S: vasopressin **OR**	Bolus	Initially 0.5 mg (IV) 4-6hourly. If no response by day 3 can increase the dosage to 1mg 4-6hourly. Maximum dosage is 2mg 4-6hourly. Maximum duration 14days.
	Continuous infusion	Initially 2mg/day. If no response by Day 3, can increase the dosage to 4mg/day. Maximum dosage is 12mg/day. Maximum duration 14days.
S: norepinephrine	Continuous infusion	0.5-3mg/hour continuously to achieve an increase in mean arterial pressure of 10 mmHg. Treatment is to be continued until serum creatinine concentration is < 1.5mg/dL, or < 133µmol/L.
S: albumin must be given concomitantly with any of the vasoconstrictors at a dosage of 20-40 g/day.		

10.5.5. Biliary Tract Diseases

Cholestasis is a pathologic state of reduced bile formation or flow which can be hepatocellular (Intrahepatic), where an impairment of bile formation occurs or ductular (extra hepatic), where impedance to bile flow occurs after it is formed. Intrahepatic causes of cholestasis include viral hepatitis, alcohol, primary biliary cirrhosis, drug toxicity, Hodgkin's lymphoma and pregnancy. Extrahepatic causes include choledocholithiasis, carcinoma, and ascariasis of the biliary tree.

Clinical Presentation

- Jaundice,
- Dark urine,
- Pale stools, and
- Generalized body itching/pruritis.

Investigations

- Laboratory evidence of elevated serum levels of total bilirubin, direct bilirubin, alkaline phosphatase, gamma-glutamyl transferase, and transaminases. WITH
- Supporting radiological evidence of dilated intra or extra hepatic biliary radicles.

Pharmacological Management

Definitive treatment, identify and treat specific cause

Supportive treatment:

S: cholestyramine (PO) 4–16g/day

OR

S: ursodeoxycholic acid (PO) 20–30 mg/kg/day

Note: Surgical intervention is indicated for extra hepatic cholestasis.

10.5.5.1 Cholelithiasis

Cholelithiasis involves the presence of gallstones which are concretions that form in the biliary tract, usually in the gallbladder. Choledocholithiasis refers to the presence of one or more gallstones in the common bile duct (CBD). Treatment of gallstones depends on the stage of disease.

Clinical Presentation

- Asymptomatic in majority of patients.
- Biliary pain (episodic RUQ or epigastric pain), pain radiating to scapula;
- Pain precipitated by fatty foods; nausea
- Physical exam: afebrile, and/or RUQ tenderness or epigastric pain
- Nonspecific symptoms (e.g., indigestion, dyspepsia, belching, or bloating)

Investigations

- Full Blood count
- Liver function panel
- Pancreatic enzymes (Amylase, Lipase)
- Abdominal radiography (upright and supine) – to exclude other causes of abdominal pain
- Ultrasonography
- CT scan –superior for demonstrating stones in the distal CBD
- MRI with MRCP
- Scintigraphy (HIDA) scans
- Endoscopic retrograde cholangiopancreatography (ERCP)
- Percutaneous transhepatic cholangiography (PTC)

Complications

- Cholecystitis
- Choledocholithiasis leading to cholangitis or gallstone pancreatitis
- Mirizzi syndrome
- Cholecystenteric fistula stone erodes through gallbladder into bowel
- Gallstone ileus: SBO (usually at term ileum) due to stone in intestine that passed through fistula
- Gallbladder carcinoma

Non-Pharmacological Management

- Asymptomatic gallstones – Expectant management
- Symptomatic gallstones – definitive surgical intervention (cholecystectomy)

Pharmacological Management

A: paracetamol (PO) 1g 8hourly for 5days

OR

A: ibuprofen (PO) 400mg 4-6hourly for 3-5days

OR

B: tramadol (PO) 50mg 12hourly for 3-5days

AND

S: ursodeoxycholic acid 8-10mg/kg/day divided once to three times up to 6months

Note: Cholecystectomy (open or laparoscopic) for asymptomatic gallstones may be indicated in the following:

- Those with large (>2 cm) gallstones
- Nonfunctional or calcified (porcelain) gallbladder on imaging studies and at high risk of gallbladder carcinoma
- Those with spinal cord injuries or sensory neuropathies affecting the abdomen
- Sickle cell anemia patients- difficult to distinguish between painful crisis and cholecystitis
- Cholecystectomy, Endoscopic, sphincterotomy, Extracorporeal shockwave lithotripsy

10.5.5.2 Choledocholithiasis

Gallstone lodged in common bile duct (CBD). Occurs in some of patients with gallbladder stones; can form de novo in CBD.

Clinical Presentation

- Asymptomatic
- RUQ pain,
- Epigastric pain due to obstruction of bile flow which leads to increase in CBD pressure,
- Jaundice,
- Pruritus,
- Nausea.

Investigations

- LFT
- Amylase
- Lipase.
- Abdominal (RUQ) Ultrasound
- ERCP, if ERCP unavailable or unsuccessful
- EUS/MRCP

Non-Pharmacological Management
ERCP & papillotomy w/ stone extraction (± lithotripsy) Cholecystectomy typically within 6 weeks unless contraindication

Pharmacological Management
S: cholestyramine (PO) 4-8g 12hourly when required for itching.

Complications
Cholangitis, cholecystitis, pancreatitis, stricture

10.5.5.3 Cholecystitis

Cholecystitis is inflammation of the gallbladder that occurs most commonly because of an obstruction of the cystic duct by gallstones (stone impaction in cystic duct leads to inflammation behind obstruction causing GB swelling and secondary infection of biliary fluid).

Acalculous cholecystitis: Occurs in critically ill. GB stasis and ischemia (without cholelithiasis) leading to necroinflammation.

Clinical Presentation

- RUQ/epigastric pain, radiating to right shoulder/back, nausea, vomiting, fever
- Signs of peritoneal irritation may be present
- Patients with acalculous cholecystitis may present with fever and sepsis alone
- RUQ tenderness, Murphy's sign, palpable gallbladder, jaundice
- The absence of physical findings does not rule out the diagnosis of cholecystitis

Investigations

- FBP, LFT, amylase, lipase
- Ultrasonography RUQ ultrasound: high Sensitivity and specificity for stones but need specific signs of cholecystitis: GB wall thickening >4 mm, pericholecystic fluid and a sonographic Murphy's sign
- Radiography
- Computed tomography (CT)
- Magnetic resonance imaging (MRI)
- Hepatobiliary scintigraphy (HIDA)
- Endoscopic retrograde cholangiopancreatography (ERCP)

Pharmacological Management
In acute cholecystitis, the initial treatment includes bowel rest, IV hydration, and correction of electrolyte abnormalities
A: paracetamol (PO) 1g 8hourly daily ORD: paracetamol (IV) 1g 8 hourly daily (for analgesia cases)
AND
B: metoclopramide (IV/PO) 10mg 12hourly daily (for intractable vomiting)
AND
S: piperacillin + tazobactam FDC (IV) 4.5g 6-8 hourly 7-10 days (for severe/complicated
OR
B: ceftriaxone (IV) 1-2gm 24hourly for 7-10days
OR
C: ciprofloxacin (IV) 200-400mg 12hourly for 7-10days
AND
B: metronidazole (IV) 500mg 8hourly for 7-10days

In cases of uncomplicated cholecystitis, outpatient treatment may be appropriate.
A: ciprofloxacin (PO) 500mg 12hourly for 7days
AND
A: metronidazole (PO) 400mg 12hourly for 7days

Note

- Laparoscopic cholecystectomy (standard of care for surgical treatment of cholecystitis) others include ERCP.
- Endoscopic ultrasound-guided transmural cholecystostomy, Endoscopic gallbladder drainage.
- Percutaneous cholecystostomy

10.5.5.4 Cholangitis

Bile duct (BD) obstruction leads to infection proximal to the obstruction, etiologies include BD stone, malignant (biliary, pancreatic) or benign stricture, infection with fluke (*Clonorchis sinensis*, *Opisthorchis viverrini*)

Clinical Presentations

- Charcot's triad: RUQ pains, jaundice, fever/chills; present in three quarter of patients
- Reynolds' pentad: Charcot's triad + shock and altered mental status; present in 15% of patients

Investigations

- Ultrasound, RUQ USS often demonstrates dilation
- FBP, LFT, amylase, lipase
- Blood cultures
- ERCP; percutaneous transhepatic cholangiogram if ERCP unsuccessful

Pharmacological Management

B: ceftriaxone (IV) 1-2g 24hourly for 7-10days

OR

S: piperacillin+ tazobactam FDC (IV) 4.5g 6-8hourly for 7-10days (for severe/complicated cases)

OR

S: meropenem (IV) 1g 8 hourly for 7-10days

AND

B: metronidazole (IV) 500mg 8hourly for 7-10days

Alternatively

C: ciprofloxacin (IV) 200-400mg 12hourly for 7-10days

AND

B: metronidazole (IV) 500mg 8hourly for 7-10days

Note

- About 80% respond to conservative treatment and antibiotics then, 20% require urgent biliary decompression via ERCP (papillotomy, stone extraction and/or stent insertion)
- If sphincterotomy cannot be performed (larger stones), decompression by biliary stent or nasobiliary catheter can be done; otherwise, percutaneous trans hepatic biliary drainage or surgery

CHAPTER ELEVEN

OBSTETRICS, GYNECOLOGY AND CONTRACEPTION

11.1 Bleeding in Pregnancy

Bleeding during pregnancy is common, especially during the first trimester. Bleeding can sometimes be a sign of something serious, therefore it is important to know the possible causes and take adequate measures.

11.1.1 Abortion

It is a spontaneous loss of a fetus before it is viable (has the potential to survive outside the womb). The World Health Organization (WHO) defines it as expulsion or extraction of an embryo or fetus weighing 500gm or less, approximately at or less than 24 weeks of gestation. In Tanzania abortion is defined as loss of pregnancy before 28 weeks of gestation. Clinical features will depend on the types of abortion.

11.1.1.1 Threatened Abortion

Clinical Presentation

- Mild vaginal bleeding
- Mild/no lower abdominal pain
- Cervix is closed on digital examination

Investigation

- Check Hb level
- Blood group and Rh type
- Pelvic ultrasound
- Beta-HCG levels (where available)

Management of threatened abortion in Dispensary & Health Centre

- Adequate bed rest at home
- Avoid strenuous activities and sexual intercourse until all the symptoms have subsided
- Schedule a follow up within 7 days
- Tell the woman to come immediately if;
    - Bleeding becomes heavy
    - Experiences offensive discharge
    - Severe abdominal pain

Referral

Refer to higher-level health facility with adequate expertise and diagnostics if:

- Bleeding recurs
- Experiences fever
- Experiences offensive discharge
- Experience severe abdominal pain

In higher level health facilities:

- Take thorough history and perform investigations to establish the causes
- Perform ultrasound to confirm pregnancy, gestational age, fetal viability and potential causes of abortion.
- Admit the patient and manage appropriately
- Encourage bed rest
- For unexplained recurrent miscarriage (3 consecutive abortions) or PRL due to luteal phase defect manage with

Pharmacological Management

S: dydrogesterone (PO) 40mg stat then 10mg 12 hourly until the bleeding stops for threatened abortion

OR

S: dydrogesterone (PO) 10mg 24 hourly from conception up to 20 weeks for luteal phase defect.

Additional when needed

S: estradiol (PO) 2mg 12hourly until bleeding stops, then 2mg 24 hourly until 14 to 16 weeks

11.1.1.2 Inevitable Abortion

Abortion is said to be inevitable when it is not possible for the pregnancy to continue and the cervix is dilated, but all the products of conception are in situ.

Clinical Presentation

- Moderate or severe per vaginal bleeding
- Moderate or severe lower abdominal pain
- Membranes may be intact or ruptured with leakage of liquor
- The uterine fundal height may correspond with gestational age
- The cervix is dilated

Management of inevitable abortion in Dispensary & Health Centre (B-EMONC facilities)
Apply Danger, Response, Airway, Breathing, Circulation and Deformity and Exposure (DRABCDE) principles of resuscitation

Pharmacological Management
A: sodium lactate compound (ringer's lactate)(IV)
OR
A: sodium chloride 0.9% (IV) depending of amount of blood loss.

- Perform Manual Vacuum Aspiration (MVA) if gestation age is below 12 weeks or medical regimen with misoprostol
- Manage as incomplete abortion if after augmentation some products of conception remain in the uterus
- Manage as complete abortion if all products of conception are expelled

Referral: Refer to hospital if MVA is not possible and/or bleeding is persisting or severe to necessitate blood transfusion.

Management of Inevitable Abortion at the Hospital

Pharmacological Management
Apply Danger, Response, Airway, Breathing, Circulation and Deformity and Exposure principles of resuscitation
And subsequently Obtain blood samples for Hb, grouping and cross–matching

Give
A: sodium lactate compound (ringer's lactate)(IV)
OR
A: sodium chloride 0.9% aim at replacing 3 times the amount of estimated blood loss and Give blood transfusion if indicated.

If gestational age is 12 weeks or below: Perform surgical evacuation (MVA) OR Medical evacuation with misoprostol

If GA is 13-17: augment with
A: oxytocin 20IU in 500mls RL/NS at 40 - 60 drops/minute.
If augmentation with oxytocin is not possible,
give
A: misoprostol (SL/Bu) 400µg every 3-4 hours until expulsion.

If GA is 18-24: augment with
A: oxytocin 20IU in 500mls RL/NS at 40 - 60 drops/minute.
If augmentation with Oxytocin is not possible,
give
A: misoprostol (SL/Bu) 400µg every 3-4 hours until expulsion.

If GA is 25-27: augment with
A: oxytocin 20IU in 500mls RL/NS at 40 - 60 drops/minute.
If augmentation with oxytocin is not possible,
give
A: misoprostol (SL/Bu) 200µg every 3-4 hours until expulsion.
Manage as an incomplete abortion if, after augmentation, some products of conception remain in the uterus; otherwise, manage as a complete abortion if all products of conception have been expelled.

11.1.1.3 Incomplete Abortion

Abortion is said to be incomplete when after expulsion some of the products of conception get retained in the uterine cavity.

Clinical Presentation

- Severe Cramping lower abdominal pain
- moderate to severe PV bleeding
- Fundus smaller than dates
- The cervix is dilated and products of conception may be felt on or through the cervix on digital examination

Management of incomplete abortion at dispensary & health center (B-EMONC facilities)

- Apply Airway, Breathing, Circulation and Dehydration principles of resuscitation
- Check hemoglobin level

Pharmacological Management

A: sodium lactate compound (ringer's lactate)(IV)

OR

A: sodium chloride 0.9% depending on amount of blood loss

If feasible Perform digital evacuation of products of conception to minimize the PV bleeding also Perform medical (Misoprostol) or surgical evacuation (MVA)

If gestation age (GA) is 12 weeks or below

Medical evacuation regime is

A: misoprostol 600µg buccal or 400µg sublingual (Repeated dose may be given after 3-4 hours to achieve complete expulsion).

If gestation age (GA) is above 12 weeks

Managed at a CEmONC facility (refer if non-CEmONC), Medical evacuation with

A: misoprostol 400µg sublingual /buccal for GA of 13-26 weeks and 200µg for GA of 26-27 weeks. (Repeated dose may be given after 3-4 hours to achieve complete expulsion).

If Misoprostol is unavailable and the client is experiencing severe bleeding, a skilled and experienced providers should perform Dilation and Evacuation (D&E) using forceps (do not use sharp curettage). Assess for infection and provide antibiotics depending on the client's status.

After evacuation give:

A: amoxicillin (PO) 500mg 8hourly for 5 - 7 days

OR

B: amoxicillin + clavulanic acid (FDC) (PO) 625mg 12-hourly for 5 - 7 days

AND

A: metronidazole (PO) 400mg 8-hourly, for 5 to 7 days

AND

A: paracetamol (PO) 1gm 8-hourly for 3 - 5 days

OR

A: ibuprofen (PO) 400mg 12-8hourly depending on severity of pain for 3 - 5 days.

AND

A: ferrous sulfate + folic acid (FDC) (PO) 1 tab 24hourly for 4 weeks if anemic

Referral: Resuscitate the patient and refer to hospital level with an escort of a nurse or clinician if bleeding continues

Management of incomplete abortion at the Hospital level.

If patient is in shock,

- Shout for help, mobilize resources
- Apply ABCD principles of resuscitation
- Obtain blood for HB, grouping and cross–matching
- Blood transfusion if indicated
- Give If sodium lactate compound (ringer's lactate)(IV) OR 0.9% sodium chloride aim at replacing 3times the amount of estimated blood loss
- Digital evacuation of products of conception if feasible to minimize the PV bleeding
- MVA if gestation age is below 12 weeks
- Evacuate uterus in theatre with sharp curette under general anesthesia if pregnancy was more than 12 weeks

Pharmacological Management
Pre-procedure prophylactic antibiotics
B: azithromycin (PO) 500mg stat
OR
A: doxycycline (PO) 200mg stat 30 minutes prior to procedure.

After evacuation give antibiotics if indicated:
A: amoxicillin (PO) 500mg 8-hourly for 5 - 7 days
OR
B: amoxicillin + clavulanic acid (PO) 625mg 12-hourly for 5 - 7 days
AND
A: metronidazole (PO) 400mg 8hourly, for 5 to 7 days
AND
A: paracetamol (PO) 1gm 8hourly for 3 - 5 days
OR
A: ibuprofen (PO) 400mg 12-8 hourly (depending on severity pain) for 3 to 5 days.
AND
A: ferrous sulfate + folic acid (FDC) (PO) 1 tab 24hourly for 4 weeks (if anemic)

Patient education.
- Counsel and educate the patient on possible reasons for abortion and future fertility
- Provide family planning counseling and give appropriate contraceptive method before the patient leaves the facility premises.
- Provide linkage to other reproductive and non-reproductive health services depending on patient needs

11.1.1.4 Complete abortion

Abortion is said to be complete when the Products of conception are completely expelled

Clinical Presentation
- Minimal or no PV bleeding
- Uterus smaller than dates and often well contracted.
- Cervix may or may not be closed
- The patient may be in Shock due to severe bleeding
- Pharmacological Management

Give hematinic if required also Give antibiotics If indicated
A: amoxicillin (PO) 500mg 8hourly for 5 - 7 days
OR
B: amoxicillin + clavulanic acid (FDC) (PO) 625mg 12hourly for 5 - 7 days
AND
A: metronidazole (PO) 400mg 8hourly for 5 - 7 days.

If patient is in shock;
- Shout for help and mobilize resources
- Apply ABCD principles of resuscitation
- Give A: sodium lactate compound (ringer's lactate)(IV) OR sodium chloride 0.9% (IV) 3 liters or more in the first hour
- Insert an indwelling urethral catheter
- Give ampicillin (IV) 1g and metronidazole (IV) 500mg stat
- Obtain blood for HB,

Referral: Resuscitate the patient and refer to hospital with an escort of a nurse or clinician
Management in a hospital
- If patient is stable continue as above;
- If patient is in shock, perform as above and give blood transfusion if indicated

Patient Education
Provide counseling, education and FP services as in income plate abortion above

11.1.1.5 Septic Abortion

Abortion is said to be septic when it is complicated by infections.

Clinical Presentation

- Moderate to severe Abdominal pain following abortion
- Fever may be present
- Foul smelling PV discharge which may be mixed with blood.
- May be in shock
- Tender uterus with or without rebound tenderness
- Cervix is usually open

Management of septic abortion at the dispensary & health center

- Apply ABCD principles of resuscitation
- Give A: sodium lactate compound (ringer's lactate)(IV) OR sodium chloride (IV) 0.9% in case of hypotension or shock. Avoid IV fluid in case of chronic anemia.
- Insert an indwelling urethral catheter
- Obtain blood for Hb or FBC
- Perform Ultrasound if feasible

Pharmacological Management

Stabilize the client and start intravenous antibiotics immediately following one of the options below:

First line:

B: metronidazole (IV) 500mg 8-hourly for 24 - 48 hours

AND

B: ceftriaxone (IV) 2gm 24hourly for 24 - 48 hours

OR

C: amoxicillin + clavulanic acid (FDC) (IV) 1.2gm 12hourly for 24 - 48 hours

AND

A: gentamicin 80mg (IV) 12hourly for 3-5 days

Second line:

B: metronidazole 500mg (IV) 8 hourly for 3 to 5 days then (PO) 400mg up to 10 days

AND

C: ciprofloxacin (IV) 200mg to 400mg 12hourly for 3 to 5 days

OR

D: ceftriaxone + sulbactam 1.5gm 24hourly for 3 to 5 days

Provide necessary pain medication.

Managed at a CEmONC facility as she may need laparotomy or blood transfusion (refer if non-CEmONC).
If products of conception are retained, evacuate as soon as possible

Referral: Resuscitate and immediately refer the patient to hospital with an escort of a nurse.

Management at the Hospital:

- Full Blood Count (FBC)
- Draw Blood for culture and susceptibility testing
- Check abdominal pelvic ultrasound as appropriate
- IV RL/NS depending on individual patient needs
- Give blood transfusion if indicated
- Evacuate the uterus with Dilatation and evacuation using atraumatic forceps (NOT SHARP CURETTAGE)

Give antibiotics and antipain as described above if indicated and when the patient is stable continue with;

A: metronidazole (PO) 400mg 8hourly for 7days

AND

B: amoxicillin+ clavulanic acid (FDC) (PO) 625mg 12hourly for 7days

AND

A: paracetamol (PO) 1g 8 hourly for 3 to 5 days

Patient Education

Counsel educate and provide appropriate contraceptive methods as per CPAC package

11.1.1.6 Molar Pregnancy

A molar pregnancy is a gestational trophoblastic disease which grows into a mass in the uterus that has swollen chorionic villi. These villi grow in clusters that resemble bunches of grapes. Once diagnosed it should be treated right away.

Clinical Presentation

- Vaginal bleeding
- Uterus that is bigger than gestational age.
- Exaggerated pregnancy symptoms (Severe nausea and vomiting)
- Vaginal discharge of tissue that resemble grapes
- Heavy PV bleeding when the mole abort spontaneously

Management of Molar pregnancy at the dispensary and Health centers

- Apply Airway, Breathing, Circulation and Dehydration principles of resuscitation
- Check hemoglobin level
- If the patient is actively bleeding, catheterize, Establish Iv line and Give IV RL/NS 2lts at a rapid rate

Referral: Resuscitate and refer the patient to higher level facility with a nurse escort for appropriate management

Management of molar pregnancy at the Hospital

- Apply Airway, Breathing, Circulation and Dehydration principles of resuscitation
- If the patient is patient is actively bleeding or in shock shout for help and mobilize resources
- Cheek HB, Blood grouping and Cross matching
- Perform quantitative serum Beta Human Chorionic Gonadotropin (bHCG)
- Check abdominal pelvic Ultrasound to confirm the diagnosis (Snowstorm appearance)
- Infuse sodium lactate compound (ringer's lactate)(IV) OR 0.9% sodium chloride (IV) as needed
- Initiate blood transfusion if indicated
- Perform suction curettage in operating theatre-take endometrial sample for histopathology
- Perform other investigations as appropriate (chest X ray, RFT, LFT, Chemistry panel)

Follow up for Molar pregnancy after Molar Evacuation

- Check weekly bHCG until when it becomes normal (5-10mIU/ml) for 3 weeks consecutively
- Then check monthly bHCG and pelvic ultrasound for 12 months
- Advice the patient to use effective contraception during follow up as per guideline (preferably COCs)

11.1.1.7 Missed Abortion

This happens when a Fetus less than 24weeks die in utero, but it's not expelled out

Clinical Presentation

- History of amenorrhea
- Regression of the pregnancy symptoms
- Uterine size smaller than dates
- Mild of no PV bleeding

Management of a missed abortion at the dispensary and Health center

Referral: Refer to higher level health facility with adequate expertise and diagnostics/equipment

Management of missed abortion at the hospital
Investigations

- Abdominal pelvic ultrasound
- Full blood count, Blood Grouping and cross matching
- Clotting indices (PT, APTT, INR)

Pharmacological Management
If the GA is less than 10 weeks (Including blighted ovum/anembryonic pregnancy)
C: mifepristone (PO) 200µg wait for 24 – 48 hours
THEN
A: misoprostol (BU/SL/P) 800µg stat

If the GA is 10 -12 weeks
C: mifepristone (PO) 200µg wait for 24 – 48 hours
THEN
A: misoprostol (BU/SL/PV) 800µg every 3 hours until expulsion

Alternatives for GA of 12 weeks or less perform MVA. (If cervical ripening is necessary, give
A: Misoprostol (Bu/SL/PV) 400µg 1-3 hours before the procedure).
If the GA is 13-17 weeks
C: mifepristone (PO) 200µg wait for 24 – 48 hours
THEN
A: misoprostol (BU/SL/PV) 400µg every 3 hours until expulsion

If the GA is 18-24 weeks
C: mifepristone (PO) 200µg wait for 24–48 hours
THEN
A: misoprostol (BU/SL/PV) 400µg 3hourly until expulsion

If the GA is 25-27 weeks
C: mifepristone (PO) 200µg wait for 24 – 48 hours
THEN
A: Misoprostol (BU/SL/PV) 200µg 3hourly until expulsion

Note Avoid misoprostol in case of previous uterine scar

Patient education.
Counsel and provide appropriate contraception.

MIFEPRISTONE AND MISOPROSTOL DOSING CHART
Recommended Regimens 2025

< 12 weeks	**13 –17 weeks**	**18 –24 weeks**	**25 – 27 weeks**	**≥ 28 weeks**
Missed abortion / Blighted ovum;<10 weeks: Mifepristone 200mg PO Wait 24 - 48 hours then, Misoprostol 800µg BU/SL/PV once 10 – 12 weeks Mifepristone 200mg PO Wait 24 - 48 hours then, give Misoprostol 800µg BU/SL/PV every 3 hours until expulsion.	**Missed Abortion:** Mifepristone 200mg PO Wait 24 - 48 hours then, Misoprostol 400µg every 3 hours BU/SL/PV until expulsion	**Foetal Demise:** Mifepristone 200mg PO Wait 24 - 48 hours then, Misoprostol 400µg every 3 hours BU/SL/PV until expulsion	**Foetal Demise:** Mifepristone 200mg PO Wait 24 - 48 hours then, Misoprostol 200µg every 4 hours BU/SL/PV until expulsion	**Foetal Demise:** Mifepristone 200mg PO Wait 24 - 48 hours then, Misoprostol 25-50µg every 4 hours PV OR Misoprostol 50-100µg every 2 hours PO
Incomplete Abortion: Misoprostol 400µg SL once Misoprostol 600µg PO once Misoprostol 800µg BU once	**Incomplete Abortion:** Misoprostol 400µg every 3 hours BU/SL until expulsion	**Incomplete Abortion:** Misoprostol 400µg every 3 hours BU/SL until expulsion		
Legal termination of pregnancy; ≤10 weeks: Mifepristone 200mg PO Wait 24 - 48 hours then, Misoprostol 800µg BU/SL/PV once 10 – 12 weeks Mifepristone 200mg PO Wait 24 - 48 hours then, give Misoprostol 800µg BU/SL/PV every 3 hours until expulsion.	**Legal termination of pregnancy:** Mifepristone 200mg PO Wait 24 - 48 hours then, Misoprostol 400µg every 3 hours BU/SL/PV until expulsion	**Legal termination of pregnancy:** Mifepristone 200mg PO Wait 24 - 48 hours then, Misoprostol 400µg every 3 hours BU/SL/PV until expulsion	**Legal termination of pregnancy:** Mifepristone 200mg PO Wait 24 - 48 hours then, Misoprostol 200µg every 4 hours until expulsion BU/SL/PV	**Legal termination of pregnancy:** Follow regimen of induction of labor as per uterotonic guidelines.
	Inevitable abortion: If augmentation with oxytocin is not possible, give Misoprostol 400µg sub-lingual/ buccal every 3-4hours until expulsion	**Inevitable abortion:** If augmentation with oxytocin is not possible, give Misoprostol 400µg sub-lingual/ buccal every 3-4hours until expulsion	**Inevitable abortion:** If augmentation with oxytocin is not possible, give Misoprostol 200µg sub-lingual/ buccal every 3-4hours until expulsion	**Note:** BU=Buccal SL=Sublingual PV=Per Vagina PO=Per Oral (PO) **<12 weeks legal termination & missed abortion can be self-managed at home.**

11.2 Ectopic Pregnancy

Ectopic pregnancy (EP) is defined as a pregnancy in which the implantation of the embryo occurs outside the uterine cavity, most frequently in one of the two fallopian tubes or, rarely, in the abdominal cavity.

11.2.1 Un-ruptured Ectopic Pregnancy

Clinical Presentation

- History of amenorrhea
- PV Sport bleeding in early pregnancy
- Unilateral Abdominopelvic pain. Unilateral(localized) abdominal tenderness

Management of Un-ruptured ectopic pregnancy
Referral: Patients should be referred to higher level facilities with equipment and expertise
At higher level facilities un-ruptured EP may be managed surgically or pharmacologically depending GA and available expertise

Pharmacological Management
S: methotrexate (IV) 50mg/M2 single dose (Maximum dose of 100mg in 24 hours)
OR
S: methotrexate (PO) 1mg/Kg 24 hourly (Maximum dose of 100mg) for 5 days (in case IV methotrexate is not available)
AND
S: folinic acid 0.1 mg/kg for 5 days

Perform weekly pelvic ultrasound to ensure regression of Gestation sac
Note: Laparoscopic procedure can be done in facility with expertise's and clear indications

Note: Contraindications of methotrexate include a ruptured ectopic, ectopic mass greater than 3.5 cm, fetal cardiac activity, high level hCG value (10,000 IU), breastfeeding and immunodeficiency

11.2.2 Ruptured Ectopic Pregnancy

Clinical Presentation

- History of amenorrhea
- Acute generalized abdominal-pelvic pain
- Hypotension
- Fast and weak pulse
- Abdominal distension and tenderness with rebound tenderness

Management of ruptured ectopic at the dispensary and Health Center (B-MONC facilities)

- Apply ABCD principles of resuscitation
- Perform abdominal pelvic ultrasound if available
- Check Hb
- Start sodium lactate compound (ringer's lactate)(IV) OR 0.9% sodium chloride (IV) infuse at a rate of 500mls per hour

Referral: Ectopic pregnancy is an obstetric emergency, resuscitate and refer the patient immediately, with an escort by skilled attendant.

Management of Ectopic pregnancy at the Hospital (C-EMONC facilities)

Investigations

- Abdominal pelvic/Transvaginal ultrasonography
- FBP or Hb level
- Grouping and cross-matching

Pharmacological Management
A: sodium lactate compound (ringer's lactate)(IV)
OR
A: sodium chloride 0.9% (IV) depending on amount of blood loss

Blood transfusion if indicated depending on the blood loss

Pre operative antibiotics
B: cefazolin (I/V) 1.5gm stat,
OR
A: ampicillin (I/V) 2gm stat,
AND
B: metronidazole (I/V) 500mg stat

Perform Emergency laparotomy

11.3 Antepartum Hemorrhage

It is the bleeding from the birth canal after the 28th week of gestation but before the onset of labor. The main forms are placenta previa and abruption placenta. Other rare cause may include VASA previa, heavy show and gynecological malignancies (cervical cancer)

11.3.1 Placenta Previa

It is an obstetric complication in which the placenta embeds itself partially or wholly in the lower segment of the uterus. It is an obstetric emergency which should be managed in a facility offering CEMONC services

Clinical Presentation
Sudden onset of bright red fresh painless bleeding after 28weeks of gestation

Non- Pharmacological Management

- If partial Placenta Previa and asymptomatic – Bed rest at home and follow up every 2 weeks
- If complete placenta previa then
  - Admit for close monitoring and observation
  - Perform ultrasound to localize the placenta
  - Perform FBP, Coagulation tests, Blood grouping and cross matching. Keep at least 2 units of blood ready in the bank for transfusion in case of acute bleeding
  - Consider Blood transfusion if indicated
  - Avoid vaginal digital examination
- If >34weeks and no PV bleeding or contraction, expectant management
  - Deliver by Cesarean section preferably at 37–38 weeks of gestation
  - Deliver by caesarean section by C/S any time in case of onset of labor or severe PV bleeding
- Partial or marginal placenta previa: Carefully perform amniotomy for vaginal delivery if the head is engaged.

Pharmacological Management

A: nifedipine (PO) 20mg 8hourly until labor symptoms subside (consider blood pressure monitoring due to risk of hypotension).

AND

D: dexamethasone (PO) 6mg 12hourly for 48 hours if pregnancy is <34weeks for fetal lung maturation

AND

A: magnesium sulfate as per protocol for protection of birth asphyxia and Hypoxic-ischemic encephalopathy complications (Refer to eclampsia section).

11.3.2 Placental Abruption

It is PV bleeding due to premature separation of a normally situated placenta in pregnancy after 28 weeks of gestation.

Clinical Presentation

- Vaginal bleeding of dark colored blood or clots. Sometimes bleeding can be concealed
- Abdominal pain is moderate to severe but may be absent in revealed AP
- The uterus may be enlarged and very tender or persistent-tetanic like contractions
- Fetal demise or fetal distress may be present

Management of Placenta Abruption at Dispensary and Health center.

- Apply the ABCD principles of resuscitation
- Insert large bore cannula IV line, start rapid infusion with RL/NS
- Insert Urethral catheter

Refer: resuscitate and refer immediately to the hospital with an escort of a skilled health attendant

Management of Placenta Abruption at the hospital Investigations

- Ultrasound: Fetal wellbeing, placenta localization and evidence of retro placental clot
- Full blood count and cross–match
- Renal function test, Liver function test and electrolytes
- Fibrinogen tests if available, D-dimer, PT, PTT, INR

Note: The diagnosis of placental abruption is mainly clinical

Maternal resuscitation

- Apply the ABCD principles of resuscitation
- Insert two (2) large bore IV lines and give Normal Saline/Ringers Lactate. Replete crystalloids at ratio of 1 unit of blood loss: 3 unit of crystalloids
- Blood Transfusion is usually necessary
- Give oxygen supplementation at a flow of 6L/min
- Insert a urinary catheter to monitor input/output
- If Disseminated Intravascular Coagulation: Give fresh frozen Plasma 1 Unit/hour, give whole blood 2–4 units
- Monitor blood pressure, pulse, bleeding, hourly, full blood count, clotting profile every 2 hours

Obstetrical Management

- If the fetus is alive and viable: emergency Caesarean section
- If the fetus is dead: Normal vaginal delivery is preferable if no contraindication for vaginal delivery (e.g. uterine scar)
- Perform artificial rupture of membrane,

Pharmacological Management

If no spontaneous labor: induce with

A: oxytocin infusion 5IU in 500 ml sodium chloride 0.9% beginning with 10 drops/min increase the rate after every 20min until optimal contractions are achieved.

- Do active management of third stage of labor and uterine massage
- Emergency Caesarean section should be considered if:
  > Worsening of maternal condition
  > Failure/Non progressing vaginal delivery

Prophylactic antibiotics

A: ampicillin (IV) 2g stat.

OR

B: cefazolin 1g stat

AND

B: metronidazole (IV) 500mg stat.

OR

C: amoxicillin + clavulanic acid (FDC) (IV) 1.2g stat.

AND

B: metronidazole (IV) 500mg stat.

11.4 Obstructed Labor

Also known as labor dystocia, is when despite adequate uterine contractions the baby does not exit the pelvis during due to being physically blocked. Obstructed may commonly be caused by; big baby, narrow maternal pelvis, malpresentation and malposition.

Clinical Presentations

- Prolonged labor (>8hours of active labor)
- Delayed second stage of labor (>1hour)
- Fetal distress
- Severe molding (3+)

Management of obstructed labour at B-EMONC facilities

- Insert IV line with and start RL/ DNS infusion 2L
- Insert urethral catheter
- Check Hb
- Severe caput succedaneum
- Maternal dehydration (neglected obstructed labour)
- Bundle's ring (sign of neglected obstructed labour)
- Encourage the patient to lay in left lateral position

Management of Obstructed labour at the C-EMONC facilities

- Optimize hydration by RL/NS 2lt before caesarean section
- Ensure the patient is catheterized,
- Perform FBP/Hb estimation
- Perform emergency caesarean section.
- Keep catheter for 3 or more days depending on assessment

Pharmacological Management

A: sodium lactate compound (ringer's lactate)(IV)/sodium chloride (IV) 0.9% to ensure adequate hydration.

AND

A: ampicillin (IV) 2g within 30m before CS, continue 1g 8hourly for 3days.

OR

B: ceftriaxone (IV) 1g stat within 30min before CS, continue 1g 24hourly for 3days.

OR

C: amoxicillin + clavulanic acid (FDC) (IV) 1.2g within 30min before CS, continue 1.2gm 12 hourly for 3days.

AND

B: metronidazole (IV) 500mg within 30min before CS, continue 500mg 8hourly for 3days.

AND

A: gentamicin (IV) 80mg 12 hourly for 3-5 days

11.5 Postpartum Hemorrhage (PPH)

It is abnormal uterine bleeding following delivery through 6 weeks (42 days). It is sub classified in to Primary and Secondary PPH

11.5.1 Primary Postpartum Haemorrhage

It is typically loss of more than 500 ml of blood from the genital tract after vaginal delivery or more than 1000 ml after Caesarean section in the first 24 hours. OR it is any amount of blood loss after delivery that would result in hemodynamic instability.

Management of PPH at Dispensary and Health center

- Insert 2 large bore cannula IV line, start rapid infusion with sodium lactate compound (ringer's lactate)or sodium chloride
- Start oxytocin (IV) 20IU in 500mls NS at a rate for 20drops per minute
- Ensure no retained placental tissues
- Clamp or ligate bleeding perineal tears if any.
- Massage the uterus
- Insert Urethral catheter

Referral: If bleeding continues, immediately refer the patient to the hospital with an escort of a skilled health attendant. Maintain IV infusion during transfer.

Management of PPH at the hospital- at a comprehensive obstruction facility

- Shout for help and mobilize resources
- Obtain blood samples for Hb, blood grouping and cross matching
- Insert 2 large bore cannulas and start infusing compound sodium chloride or sodium chloride (IV) rapidly
- Blood Transfusion depending on amount of blood loss

Non-Pharmacological Management

Perform maneuvers like balloon tamponade, TAH, Iliac artery ligation, B-Lych suture including surgical interventions depending on patient condition and available expertise.

Minimal invasive interventional radiology procedure

Uterine artery embolization for retractable hemorrhage PPH, when conventional medical and surgical measures fail, uterine artery embolization (UAE) offers a life-saving, uterus-sparing alternative. Minimally invasive alternative to hysterectomy in higher centers.

Pharmacological Management

Provide the "clinical care bundle- first response bundle for PPH":
Start
A: oxytocin (IV) 20IU in 500mls sodium lactate compound (ringer's lactate)or 0.9% sodium chloride (IV) titrate at 20 drops per minute

OR

A: misoprostol (PO) 1000mcg or per rectal

AND

C: tranexamic acid (IV) 1gm bolus diluted in 20cc to give over 10 minutes. Repeat after 30 minutes if bleeding is still on-going
Prevention of PPH –Active management of Third Stage of Labour (AMSTL)
Ensure no remaining second twin

A: oxytocin (IM)10IU stat

AND

(In High-risk women as per guidelines)
A: misoprostol (PO) 600mcg - 1200mcg stat

OR

B: carbetocin 100mcg stat as 3rd line management after other interventions

Controlled cord traction (CCT) is recommended for vaginal births. Sustained uterine massage is not recommended as an intervention to prevent PPH in women who have received prophylactic oxytocin.

Prevention of PPH in Cesarean section

Cord traction is the recommended method for the removal of the placenta in Cesarean section

A: oxytocin (IV/IM) 10IU (is the recommended uterotonic drug for the prevention of PPH plus MOTIVE bundle as per PPH guidelines when indicated)

OR

B: carbetocin (IV/IM) 100mcg stat as 3rd line management per guideline

11.6 Prelabour Rupture of Membranes (PROM)

It is the rupture of membranes (breakage of the amniotic sac) before the onset of labor. If rupture occurs before 37weeks it is called preterm prelabour rupture of membranes (PPROM). Prolonged PROM is a case of premature rupture of membranes in which more than 24 hours have passed between the rupture and the onset of labour. Prolonged PROM for more than 18 hours is a risk of ascending infection which can lead to chorioamnionitis (infection of chorion, amnion and amniotic fluid.

Clinical Presentation
Leakage of watery fluid per vagina confirmed by performing a sterile speculum examination.

Management of PROM at the dispensary and health center
Give the following antibiotics for prophylaxis against chorioamnionitis
A: erythromycin (PO) 500mg 8hourly for 7days
AND
A: metronidazole (PO) 400mg 8hourly for 7days

Referral: Refer to the hospital for further evaluation and management

Management of PROM at the hospital
Investigations
- Ultrasound for fetal well-being, amount of liquor and gestation age.
- Perform a sterile speculum examination to confirm leakage
- Perform HVS for culture and susceptibility testing
- Urinalysis, screen for other infections

Pharmacological Management
If PROM at term: Delivery within 24 hours
Assess Bishop's Score and Induce Labour accordingly with
A: misoprostol (PO) 25mcg 8hourly (Max 3doses) if unfavorable cervix.
OR
A: oxytocin (IV) 5IU in 500ml of D5% titrate beginning with 10dpm if favorable cervix
Monitor FHR vigilantly during the process of IOL. Deliver by C/S if vaginal delivery is contraindicated, fetal distress or failed induction of labour.

For Preterm PROM:
If no sign of infection, wait for foetal maturity and give
B: dexamethasone (IM) 6mg 12hourly for 48 hours if pregnancy is <34weeks for fetal lung maturation
AND
A: magnesium sulfate for birth asphyxia and HIE complications protection as per protocol
AND
A: nifedipine (PO) 20mg 8hourly for tocolysis (Consider blood pressure with risk of hypotension)
Monitor for infection (FBP, CRP, Pulse, Fever) and fetal wellbeing (fetal movement, FHR, obstetric ultrasound)

Administer prophylactic antibiotics
A: ampicillin (IV) 2gm stat
THEN
A: erythromycin (PO) 500mg 8hourly for 7-10 days
OR
B: amoxicillin + clavulanic acid (FDC) (PO) 625mg 8hourly for 7-10 days
AND
A: metronidazole (PO) 400mg 8hourly 7-10 days.

Deliver irrespective of gestation age in case of infection

If there are signs of infections-pyrexia, foul smelling liquor (chorioamnionitis)
B: metronidazole (I/V) 500mg 8hourly for 24 hours
THEN
A: metronidazole (PO) 400mg 8hourly for 5-7 days
AND
B: ampicillin (I/V) 1gm 8hourly for 5-7 days
OR
C: amoxicillin + clavulanic acid (FDC) (IV) 1.2g 12hourly for 5-7days
OR
D: ceftriaxone + sulbactam (FDC) (IV) 1.5g 12hourly for 5-7 days

11.7 Antenatal Care

The aim of the antenatal care is to provide a positive pregnancy experience that allows a positive transition to birth and motherhood. Basic laboratory testing during antenatal care visits are as follows:

First visit:

Investigations

- Full blood count / Hemoglobin level
- Blood grouping and Rhesus typing, (Indirect coombs test for Rh-Negative mothers)
- Hepatitis B surface antigen screening (HBsAg)
- Rapid plasma regains (RPR)/VDRL (For Positive results, TPHA is recommended)
- Malaria rapid diagnostic test (MRDT) or Blood smear for malaria
- Blood glucose by Oral glucose tolerance test or HbA1c or random blood sugar (RBG)
- Urine analysis
- Stool analysis
- HIV (with partner as well)
- Obstetric ultrasound (if available).

Subsequent visits:

- Full blood count / Hemoglobin level
- Malaria rapid diagnostic test (MRDT) or Blood smear for malaria
- Urine analysis
- Obstetric ultrasound depending on Clinician's opinion/decision.
- HIV (with partner as well) after 3months from last test

11.7.1 Anemia in Pregnancy

It is hemoglobin levels less than 11 g/dl in pregnancy. Mild anemia– hemoglobin: 8–11g/dl; Severe anemia– hemoglobin<7g/dl. Iron deficiency anemia during pregnancy has been associated with an increased risk of low birth weight, preterm delivery and perinatal mortality.

Clinical Presentation

- Tiredness, weakness, palpitations and dyspnea
- Exercise intolerance
- Pallor of skin and mucous membranes
- Dizziness, faintness, headache
- Intermittent claudication (ache, cramp, numbness or sense of fatigue)

Note: Some patients with anemia in pregnancy may be asymptomatic

Investigations

- Full blood count and blood cross-match - red cell morphology
- Red blood cell electrophoresis if haemoglobinopathies suspected
- Blood smear for malaria
- Stool and urine analysis
- HIV test
- MCA-PSV Doppler (For suspected fetal anemia)

Non-Pharmacological Management

- Iron rich diet (fish, eggs, fruits and vegetables etc.)
- Prevent and early treatment of malaria
- Investigate and treat associated worm infestations

Pharmacological Management

Prophylaxis in Antenatal Care

A: ferrous sulfate (PO) 200mg 24hourly (60mg elemental iron and 0.4mg folic acid per day).

OR

A: multiple micronutrient supplement (MMS) (PO) 1 tab/cap 24 hourly (Target is to give 60 mg of elemental Iron per day)

If Hb is <7g/dl in 1st and second trimester give:

A: ferrous sulphate + folic acid (FDC) (PO) 1 tab 12hourly for 4 weeks.

OR

A: multiple micronutrient supplement (MMS) (PO) 1 tab/cap 24 hourly or 12hourly (Target is to give 90- 120 mg of elemental Iron per day).

If HB is <7g/dl in 3rd trimester or in case of signs for severe anemia (features of heart failure)

Refer/admit the patient for blood transfusion at least 2 units of Packed RBCs

Continue with ferrous and folic acid, or multiple micronutrient supplementation (MMS) 1 tab/cap 12 hourly (Target is to give 90 120 mg of elemental Iron per day) as above after blood transfusion

Note: Women at high risk for neural tube defect should receive high dose of folic acid (5mg 24hourly starting 3 months before pregnancy to 12 weeks of pregnancy. After 12 weeks, normal dose of 400mcg resumes).

11.7.2 Hypertensive Disorders in Pregnancy

Hypertension is blood pressure (BP) 140/90 mmHg or greater, measured on two occasions at least four hours apart or elevated systolic BP >30mmHg, or diastolic BP 15mmHg from the baseline.

11.7.2.1 Chronic Hypertension

This is hypertension that is present at the booking visit or before 20 weeks or if the woman is already hypertensive before conception. Most women with chronic hypertension are asymptomatic. New onset chronic hypertension should have further evaluation to find underlying cause e.g., renal artery stenosis, chronic renal disease, Cushing syndrome etc.

Pharmacological Management

A: methyldopa (PO) 250–500mg 8hourly

AND

A: nifedipine (PO) 20mg 12hourly

For eclampsia prophylaxis, consider adding:

A: acetylsalicylic acid 75 mg 24hourly

AND

C: calcium + vitamin D 1 tab/1 cap 24hourly

11.7.2.2 Pregnancy induced hypertension (gestational hypertension)

Gestational hypertension or pregnancy-induced hypertension (PIH) is the development of new hypertension in a pregnant woman after 20 weeks of gestation without the presence of protein in the urine or other signs of preeclampsia. Usually disappears within 12 weeks postpartum.

Non-Pharmacological Management

- Adequate rest at home and avoid strenuous activities
- Eat a normal balanced diet and plenty of oral fluids
- Schedule antenatal visits every 2 weeks up to 32 weeks and every week thereafter
- Recommend to deliver in the hospital and should be delivered at 37 completed weeks of gestation

Pharmacological Management

For mild hypertension 140–159 mmHg systolic and/or 90–109 mmHg diastolic.

A: methyldopa (PO) 250–500mg 8hourly

OR

A: nifedipine (PO) 20mg 12hourly

OR

C: labetalol (PO) 100mg 12hourly a day

AND

(When indicated consider adding)

A: acetylsalicylic acid 75 mg 24 hourly

AND

C: calcium + vitamin D 1 tab/1 cap 24 hourly

11.7.2.3 Severe hypertension

Severe hypertension is Blood Pressure (BP) of 160/110 mmHg or higher. Admit the patient to hospital

A: methyldopa (PO) 500mg 8hourly

AND

B: hydralazine 10mg (slow IV) stat (over 4-5 minutes); recheck the BP after 20 minutes if DBP is more/equal to 110mmHg give another dose of hydralazine (IV slowly) 5–10mg.

AND

A: nifedipine (PO) 20mg 12hourly

OR

C: labetalol (PO)100mg 12hourly

Referral: Refer to the next level facility in case there is no improvement

11.7.3 Pre-eclampsia

Is diagnosed when blood pressure is ≥ 140/90 mmHg after 20 weeks of pregnancy plus proteinuria of 300 mg per 24 hours or >2+ on urine dipstick. Or elevation of BP in pregnancy with features of end organ damage (eg pulmonary edema, renal or liver damage).

Diagnostic Criteria

- Most patients are asymptomatic, but symptoms may include headaches, dizziness, blurred vision, and epigastric pain.
- Blood pressure of ≥ 140/90 mmHg
- Proteinuria (≥ 300mg per 24 hours)
- Generalized edema may be present (not a necessary criteria)

Investigations

- Urine for Proteinuria (qualitative/quantitative 24-hour urine collection)
- Obstetric Ultrasound and biophysical profile
- Urea, creatinine, electrolytes, liver function test and uric acid
- FBP and clotting profile
- Fundoscopy

Non-Pharmacological Management

- Pregnancy < 37 weeks of gestation
- Hospitalization and close monitoring
- Bed rest
- Monitoring BP, urine output, proteinuria, fetal movement and fetal heart beats (every day)
- Pregnancy >37 weeks of gestation: admit and deliver accordingly.

Pre-eclampsia with Severe Features:

This is diagnosed when BP ≥ 160/110 mmHg (especially diastolic ≥110 mmHg), or BP of≥140/90mmHg with features of end organ damage e. g severe headache, epigastric pain, blurring of vision +/_vomiting, pulmonary oedema, renal or liver damage, features of hemolysis and low platelets.

Pharmacological Management

B: Hydralazine (IV) 5mg in 10ml sterile water over 4minutes' initial dose. Followed by boluses 5–10mg as needed every 20 minutes until when the diastolic BP is less than 110mmHg)

AND

A: methyldopa (PO) 500mg 8 hourly

AND

A: nifedipine (PO) 20mg 8 hourly until BP is stabilized (Dosage should be monitored due to risk of Hypotension)

OR

(if hypertension is refractory to hydralazine)

C: labetalol (IV bolus)10–20mg stat repeat each 10–20 minutes, with doubling doses not exceeding 80mg in any single dose for maximum total cumulative dose of 300 mg.

Antenatal corticosteroids

B: dexamethasone (I.M) 6mg 12hourly for 48hours if the pregnancy is less than 34 weeks' gestation and preterm delivery is anticipated, to enhance fetal lung maturation.

Prophylaxis for Seizures

A: magnesium sulfate (IV) 1g hourly in 250 mililitre of Compound Ringers Lactate

OR

A: magnesium sulfate (IV) 5g of 50% magnesium sulfate 4 hourly or alternate buttocks for 24 hours if GA is ≤34 weeks or until 24 hours post-delivery if GA is≥34 weeks (Refer to eclampsia section)

Obstetrical Management

If at term deliver immediately when stable, preferably vaginal delivery

11.7.4 HELLP syndrome

It is a life-threatening complication of pre-eclampsia characterized by **H**aemolysis, **E**levated **L**iver enzymes and Low **P**latelets

Diagnostic criteria

Haemolysis

- Abnormal peripheral smear
- Total bilirubin > 1.2 mg/dL
- Lactic dehydrogenase > 600 U

Elevated Liver Functions

- Serum glutamic oxaloacetic transaminase > 70 U/L
- Lactic dehydrogenase > 600 U/L

Low Platelets

- **Platelets** < 1,000,000/mm3

Management of HELLP syndrome

The management is the same as for severe pre-eclampsia

11.7.5 Eclampsia

Eclampsia is a condition peculiar to pregnancy and post-partum periods, characterized by elevated BP and tonic-clonic convulsions which are not caused by epilepsy, severe malaria, meningitis, hypoglycemia or other causes of convulsions. Majority (50%) occur preterm. Eclampsia may occur without prior elevation of BP.

Diagnostic Criteria

- Signs of severe pre-eclampsia (BP >160/110mm Hg)
- Loss of consciousness
- Tonic-clonic seizures, coma

Investigations

- Full blood count and crossmatch
- Clotting profile
- Ultrasound for GA and fetal viability
- Blood smear to exclude malaria
- Urea and creatinine + electrolytes
- Blood sugar estimation to exclude hypoglycemia.
- Liver enzymes tests
- Lamber puncture may be indicated to exclude meningitis
- 24h urine collection for proteinuria

Pharmacological Management

Manage with antihypertensives as in pre-eclampsia with severe features and magnesium sulfate (IV)

Loading dose: magnesium sulfate (IV) 4g of 20% slowly over 5minutes.

If having **A:** 50% magnesium sulfate, dilute it to make it **A:**20% magnesium sulfate by Drawing 8mls of 50% magnesium sulfate by adding 12mls water for injection.

OR

- Draw 10mls (5gms) of 50% magnesium sulfate into each syringe 1ml of **A**: 2% lidocaine in each syringe then give deep IM into each buttock. Continue with maintenance dose until 24hours post-delivery or since the last episode of convulsion:

OR

- With magnesium sulfate infusion 1g per hour (in 200–300 ml of Ringer's Lactate),

OR

- Magnesium sulfate 5g undiluted 50% of magnesium sulfate injection (add 1ml of lidocaine 2%) apply deep intra-muscular (IM) injection into each buttock every 4hrs for about 24 hours after delivery or the last seizure whichever come last.

If having 10% (W/V) **A:** magnesium sulfate Loading dose 4 gm = 4 ampules given direct I/V slowly for 30 minutes,
Maintenance dose 8gm = 8 Ampules in 500mls of R/L or N/S to run for 8 hours then repeat until 24 hours to make total of 3 doses in 24 hours.

Note: The magnesium sulfate infusion should only be given if patellar reflexes are present, respiration rate is ≥ 12 per minute, and urine output is >100mls in 4 hours.

If convulsions recur within 15 minutes give;
A: magnesium sulfate 2g. Draw 4mls of 50% of magnesium sulfate (2gm), add 6mls of water for injection to make it 10mls of 20% magnesium sulfate then give IV slowly over 5 minutes.

If having 10% (W/V) magnesium sulfate
A: magnesium sulfate 2 gm = 2 ampules given direct I/V slowly for 30 minutes

Features of Magnesium Sulphate toxicity
- Respiratory depression (<16cycles/min
- Reduced urine output(<30mls/hour)
- Loss of deep tendon reflexes

In case of magnesium sulphate toxicity
- Stop magnesium sulphate administration
- Measure serum Magnesium level for monitoring progress if available

A: calcium gluconate (IV) 1g slow bolus in 2 to 3 minutes

Obstetrical management
Patients with eclampsia should be delivered within 12hours after the onset of seizures, even if the fetus is premature. Expectant management is contraindicated. If not in labour, and no contraindications, induce labour with misoprostol according to uterotonic and induction of labor protocols/guideline 50µg (PO), 4hourly or 25µg vaginally and repeat 6-8 hourly up to a total of four doses maximum as per uterotonic guideline.
- If failure of induction or contraindication to vaginal delivery, immediate Caesarean section is indicated
- Recommend delivery at facility with neonatal care unit and prepare resuscitation for the new born as per protocol.

Prevention of pre-eclampsia and eclampsia
- Ensure effective antenatal care
- Calcium supplementation at doses of 1.5–2.0g elemental calcium/day for those at high risk of developing pre-eclampsia.
- Low-dose acetylsalicylic acid (aspirin, 75 mg) is recommended for the prevention of pre- eclampsia in women at high risk of developing pre-eclampsia.

11.7.6 antiphospholipid syndrome (APS) in Pregnancy

It is an autoimmune disease characterized by the presence in maternal circulation of one or more auto antibodies against membrane phospholipids. It is an acquired condition. Antiphospholipid syndrome (APS) is characterized by venous or arterial thrombosis and/or an adverse pregnancy outcome. APS occurs either as a primary condition or in the setting of an underlying disease, usually systemic lupus erythematosus (SLE).

Clinical Presentation
- Recurrent pregnancy adverse outcome e.g. (miscarriages) recurrent miscarriage, intrauterine growth restriction, early severe pre-eclampsia and preterm birth.
- Unexplained venous thrombosis (DVT) or arterial thrombosis (Stoke) or myocardial infarction
- Thrombocytopenia (common finding but among the clinical classification criteria)

Classification with APS requires one clinical and one laboratory manifestation:
Clinical manifestations
- A documented episode of arterial, venous, or small vessel thrombosis
- 1 or more unexplained deaths of a morphologically normal fetus ≥ 10-week GA
- 3 or more unexplained consecutive spontaneous abortions before the 10th weeks of GA with anatomic, hormonal or chromosomal causes excluded
- Eclampsia or severe pre-eclampsia according to standard definitions, or recognized features of placental insufficiency

Laboratory:
- Anti-cardiolipin IgG and/or IgM measured on 2 or more occasions, not less than 12 weeks apart;
- Anti-β2 glycoprotein I IgG and/or IgM measured on 2 or more occasions, not less than 12 weeks apart
- Lupus anticoagulant detected on 2 occasions not less than 12 weeks apart.

Pharmacological Management
A: acetylsalicylic acid (PO) 75-100mg 24hourly beginning as soon as the pregnancy is confirmed throughout pregnancy
AND
C: unfractionated heparin (SC) 5000–10000 units 12hourly
OR
D: low molecular weight heparin (SC) 30–40mg 24hourly

Patients with Thrombosis such as stroke or pulmonary embolism need therapeutic anticoagulation.
C: unfractionated heparin (SC) 5,000 bolus and subsequent 15,000–20,000 doses at 12hourly intervals
OR
D: low molecular weight heparin (SC) 1mg/kg 12hour

Note: Warfarin should be avoided in pregnancy due to the risk of teratogenicity. The aPTT needs to be checked and is best done midway between the 12hourly doses, 24hourly. A target of 1.5-2.5 times the control should be aimed

Referral: Refer immediately to a level where expertise and monitoring for treatment through laboratory testing is available

11.7.7 Deep Vein Thrombosis in Pregnancy

Deep vein thrombosis (DVT) and acute pulmonary embolism (PE) are two manifestations of venous thromboembolism (VTE. The risk of VTE is increased in pregnancy by about five times because of a more hyper-coagulable state. VTE contributes to significant maternal morbidity and mortality. The mainstay of therapy for DVT is anticoagulation, provided there is no contraindication.

Clinical Presentation

- Pain on the affected limb
- Swelling or redness of the calf or thigh
- Homan's sign (pain in the calf in response to dorsiflexion of the foot)

Investigations

- Venous doppler ultrasound/Compression duplex ultrasound (CDUS)
- Venography (CT MRI)
- Fibrin degradation product (FDP) or D-dimer

Prevention of DVT

- Early passive and active ambulation in women undergoing major obstetric surgery
- Compressive stockings in women ≥100kg undergoing obstetric surgery
- LMWH prophylaxis 5000IU within 1-hour post-surgery to at risk women.
- For patient with swollen leg, elevation of leg plus elastic compression stocking help to reduce oedema

Pharmacological Management

C: unfractionated heparin (SC) 5,000 units bolus and subsequent 15,000–20,000 units doses at 12hourly intervals (under supervision of a specialist)

OR

D: low molecular weight heparin (SC) 1mg/kg 12hourly

OR

C: warfarin (PO) 5mg 24hourly (in delivered women) consider bridging warfarin with Heparin for 5days as it takes longer to act. Warfarin to be continued up to 6 weeks postpartum and continue with management as per DVT protocols

Minimally invasive interventional radiological procedure

- Catheter directed thrombolysis/thrombectomy
- Inferior Vena Cava filter placement

Note:
Check PTT every 4hours and PTT should be maintained at 1.5–2.5 X control. Once steady state has been achieved measure PTT levels daily. Change heparin to SC route after 5–10days

Referral: Immediate referral to a hospital with expertise and monitoring of the treatment through laboratory testing is recommended [Refer to cardiovascular management protocol]

11.7.8 Pulmonary Embolism in Pregnancy

It is a blockage, usually a blood clot that prevents oxygen from reaching the tissues of the lungs; it can be life-threatening

Diagnostic Criteria

- Acute onset of shortness of breath (dyspnea)
- Pleuritic chest pain
- Cough and/or hemoptysis
- Low grade fever
- Tachypnea
- Diminished oxygen saturation
- Diminished breath sounds

Investigations

- Venous Doppler ultrasound/Compression duplex ultrasound (CDUS)
- Pulmonary angiography
- Electrocardiogram (ECG)
- ECHO
- Chest X-ray (CXR) performed
- CT scan,
- MRI
- D-dimer
- Bleeding indices (PT, aPTT, INR)

Non-Pharmacological Management

Respiratory support and Oxygen supplementation

Pharmacological Management

C: unfractionated heparin (UFH) is the treatment of choice Loading dose 150 U/kg (or minimum of 5000 U) followed by Initial infusion 15–25 U/kg/hour (or minimum of 1000U/hourly)

OR

D: low molecular weight heparin (SC) 1mg/kg 12hourly

Referral

Immediate referral to a health facility where expertise and monitoring of the treatment through laboratory tests is available is recommended. [Refer to cardiovascular management protocol]

11.7.9 Vomiting in Pregnancy and Hyperemesis Gravidarum

It is excessive nausea and vomiting in early pregnancy requiring hospital admission and rehydration.

Clinical Presentation

- Weight loss
- Excessive nausea and vomiting typically in early pregnancy
- Dehydration
- Altered general status (fast pulse, restlessness)

Investigations

- Full blood count
- Blood for urea, electrolytes and serum creatinine
- Urinalysis, micro urine and culture, ketonuria
- Liver function tests
- Thyroid function tests
- Obstetric ultrasound to exclude multiple pregnancy and GTD
- Helicobacter pylori stool antigen test

Non-Pharmacological Management

- Nil per oral (nothing by mouth) for 24–48 hrs.
- Input/output monitoring for 24–48 hrs.
- Monitor electrolytes for 24hrs
- Counselling and Reassurance
- Emotional support
- Rest and Lifestyle adjustment
- Ensure adequate hydration
- Frequent small carbohydrate meal

Pharmacological Management

A: sodium lactate compound (ringer's lactate)with 5% dextrose

AND

A: sodium chloride 0.9% according to daily needs and severity.

AND

C: thiamine (vitamin B1) (IV)100mg 24hourly mix in intravenous rehydration solution

AND

B: metoclopramide (IM) 5–10 mg 8hourly till vomiting stops.

OR

A: promethazine (IM) 12.5 mg 12hourly a day

OR

B: pyridoxine + doxylamine (FDC) (PO) 10mg/10mg 8hourly till vomiting stops

OR

D: ondansetron (IV) 4mg stat then depending on severity of condition

Referral: Depends on the status of the patient, refer to a hospital if vomiting is intractable and if there is a need for high volume replacement.

11.7.10 Heartburn in Pregnancy

Heartburn (also called acid indigestion or acid reflux) is a burning sensation that often extends from the bottom of the breastbone to the lower throat. It is caused by some of the hormonal and physical changes in pregnant women. exclude peptic ulcer disease and enteric fever (Helicobacter pylori stool antigen test, stool for occult blood, and stool salmonella typhi testare indicated in severe form)

Non-Pharmacological Management

Pregnant women should avoid:

- Food and beverages that cause gastrointestinal distress
- Tobacco and alcohol
- Do not eat big meals, instead eat several small meals throughout the day
- Drinking large quantities of fluids during meals
- Do not eat close to bedtime, they should give themselves 2–3 hours to digest food before they lie down
- Sleep propped up with several pillows or a wedge.

Pharmacological Management
A: compound magnesium trisilicate (PO) as needed until when the heartburn subsides.
OR
A: omeprazole (PO) 20–40mg 24hourly
OR
C: pantoprazole (PO) 40mg 24hourly

11.7.11 Other Medical Disorders in Pregnancy and Gynecology

Other medical disorders in pregnancy/other gynecological disorders include diabetes mellitus, glucose intolerance, malaria, HIV/AIDs complications, Pelvic Inflammatory Diseases (PID) etc. All these complications are discussed under specific disease chapters.

11.7.12 Hyperglycemia in Pregnancy

Gestational Diabetes Mellitus (GDM) is any degree of glucose intolerance first recognized in pregnancy. Diabetes in pregnancy refers to those with pre-existing diabetes, whether diagnosed or not.

Screening at first antenatal visit
Perform screening in all women at the first antenatal clinic attendance if they have:

- BMI > 25 kg/m2
- previous history of GDM
- previous big baby
- poor obstetric history
- family history of DM
- known impaired glucose tolerance/ impaired fasting glucose
- grand multipara
glycosuria.

Women in early pregnancy with levels of HbA1c≥6.5% or blood glucose levels fasting ≥7.0 mmol/l or two hours 75g OGTT ≥11.1 mmol/l which are diagnostic of diabetes should be treated as having diabetes in pregnancy. Women with HbA1c 6.0–6.4%, fasting glucose 5.1– 6.9 mmol/l (92-125 mg/dl) or two-hour glucose 8.6–11.0 mmol/l (153-199 mg/dl) should be assessed to determine the need for immediate home glucose monitoring and, if the diagnosis remains unclear, assessed for gestational diabetes by 75 g oral glucose tolerance test (OGTT) at 24–28 weeks.

Screening later in Pregnancy

- All women with risk factors (see above) should have a 75gm OGTT at 16–20 weeks
- A fasting plasma glucose at 16–20 weeks is recommended in low-risk women OR where 75gm OGTT is not practically feasible.

Diagnostic criteria for Hyperglycemia in pregnancy

Category	Test	Plasma Glucose Level
Diabetes in Pregnancy (Overt Diabetes)	Fasting plasma glucose	≥ 7.0 mmol/L (126 mg/dL)
	2-hour plasma glucose (75 g OGTT)	≥ 11.1 mmol/L (200 mg/dL)
	Random plasma glucose	≥ 11.1 mmol/L (200 mg/dL) in the presence of symptoms
Gestational Diabetes Mellitus (GDM)	Fasting plasma glucose	5.1–6.9 mmol/L (92–125 mg/dL)
	1-hour plasma glucose (75 g OGTT)	≥ 10.0 mmol/L (180 mg/dL)
	2-hour plasma glucose (75 g OGTT)	8.5–11.0 mmol/L (153–199 mg/dL)

Note: All women during pregnancy should not miss an opportunity to be screened for diabetes mellitus and be counselled on appropriate nutritional practice during pregnancy.

Non-Pharmacological Managements
All women intending to become pregnant should:

- Be encouraged to achieve excellent glycemic control using glucose monitoring of both
- Fasting and postprandial values
- Be prescribed high-dose (5mg) pre-pregnancy folate supplementation, continuing up to 12 weeks' gestation
- Have an eye exam and be informed of the risk of developing and/or progression of diabetic retinopathy
- Have a kidney assessment (random urine albumin/creatinine ratio and serum creatinine) and referred if urine protein ≥ 1g.

A combined health-care team (obstetrician, diabetologist or internist, diabetes educator, pediatrician/neonatologist) is required. Review SMBG, blood pressure and urine protein and ketones by dipstick at each visit and eye examination in each trimester.
Target glycaemia:

- Pre-prandial blood glucose 3.5–5.5mmol/L
- Postprandial blood glucose 5–7.5mmol/L

Lifestyle management is the preferred means of managing gestational diabetes.

- Diet is based on the principles of optimal nutrition and controlled weight gain. A carbohydrate-controlled meal plan that promotes adequate nutrition with appropriate weight gain, normoglycemia, and the absence of ketosis. Diet and nutrition therapy should be the first line of treatment offered together with other services.
- Exercise can be helpful in lowering BG levels: the most acceptable form of exercise for most women are walking in their normal daily routine OR a planned 30mins/day brisk walking.

Glucose-lowering therapy should be considered in addition to diet + exercise where fasting or two hours glucose levels are above target, for example, where two or more values per fortnight are:

- fasting or pre-prandial ≥5.5 mmol/L, or two hours postprandial ≥7 mmol/L at ≤35 weeks
- fasting or pre-prandial ≥5.5 mmol/L, or two hours postprandial ≥8 mmol/L at >35 weeks
- any postprandial values are >9 mmol/L.

When pharmacologic treatment of gestational diabetes is indicated, insulin and oral medications are equivalent in efficacy, and either can be an appropriate first-line therapy.

Insulin should be considered as the first-line treatment in women with GDM who are at high risk of failing on oral anti-diabetic drug therapy, including some of the following factors:

- Diagnosis of diabetes <20 weeks of gestation
- Need for pharmacologic therapy >30 weeks
- Fasting plasma glucose levels >110 mg/dL (6.1mmol/dl)
- 1-hour postprandial glucose >140 mg/dL (7.8 mmol/dl)
- Pregnancy weight gain >12 kg

Pharmacological Management
A: metformin 500mg 12hourly, maximum 2000mg in 2–3 doses
OR
A: glibenclamide 2.5mg 24hourly to a maximum of 10mg daily

Note
Oral hypoglycemics (except for metformin and glibenclamide) are contraindicated in pregnancy

Insulin
The rapid-acting insulin analogs (lispro and aspart) lower postprandial blood glucose and decrease the risk of nocturnal hypoglycemia. Patients on lispro and aspart prior to conception may continue them during pregnancy. Patients on regular insulin may be switched to lispro or aspart if 1–hour postprandial blood glucose levels are above target and/or the patient is also experiencing pre-meal or nocturnal hypoglycemia.

Postnatal Follow Up

- Women with gestational diabetes should be screened at 6–12 weeks postnatal to ensure return to normal glucose tolerance. Thereafter, a 1–2 yearly follow up is recommended.
- Metformin **AND** glibenclamide may be used even if a woman is breastfeeding.
- Encourage women to breastfeed.
- If retinopathy, check eyes 1 year postpartum

Family planning – this should be based on the medical eligibility criteria (category 1 for all the methods, unless when has vascular changes – COC and DMPA category 3)

Breastfeeding – Women should be supported to breastfeed. It helps with postpartum weight loss, prevention of hypoglycemia and incidence of childhood obesity.

Infections – They have ↑ risk for genitourinary, uterine, surgical site infections. Mastitis breast abscess - because large-sized neonates do not suckle well. Should have a high index of suspicion for early identification and management of infections.

11.7.13 Pelvic congestion syndrome/pelvic chronic pain

A chronic condition caused by venous insufficiency of the ovarian and pelvic veins.

Clinical condition

- Typically affects women of childbearing age, especially multiparous women.
- Presents with non-cyclic pelvic pain, often worsened by: prolonged standing, menstruation, sexual intercourse (dyspareunia), and post-coital ache

Minimally invasive interventional radiology procedure
Ovarian vein embolization

Ideal candidates:

- Chronic pelvic pain >6 months
- Dilated ovarian/pelvic veins on imaging (US/MRI/CT)
- Negative work-up for other causes (gynecologic, urologic, GI)

Diagnosis aided by:

- Transvaginal Doppler US: Dilated veins >5 mm, reversed/slow flow
- MR or CT venography
- Venography during procedure is gold standard

11.7.14 Stimulation of Labour and Myometrial Relaxation

Myometrium stimulants should be used with great care before delivery especially in porous women. Use in obstructed labour should be avoided

Oxytocics are indicated for: –

- Augmentation of labour
- Induction of labour
- Active management of third stage of labour.
- Uterine stimulation after delivery for management of PPH due to uterine atony

Induction of Labour Indications/Contraindications

- The indication for induction must be documented, and discussion should include reason for induction, method of induction, and risks, including failure to achieve labour and possible increased risk of Caesarean section.
- If induction of labour is unsuccessful, the indication and method of induction should be re- evaluated.

Pre-induction assessment

- Health care providers should assess the cervix (using the bishop score) to determine the likelihood of success and to select the appropriate method of induction.
- The bishop score should be documented.
- Care providers need to consider that induction of women with an unfavorable cervix is associated with a higher failure rate and increased rate of operative deliveries.

Post-dates induction

- Women should be offered induction of labour between 41+0 and 42+0 weeks as this intervention may reduce perinatal mortality and meconium aspiration syndrome without increasing the Caesarean section rate
- Women who chose to delay induction >41+0 weeks should undergo twice-weekly assessment for fetal wellbeing

Options for Cervical Ripening/Induction: Unfavorable Cervix

- Intracervical Foley catheters are acceptable agents that are safe both in the setting of a vaginal birth after Caesarean section and in the outpatient setting
- Double lumen catheters may be considered a second-line alternative

Pharmacological Treatment

A: misoprostol (PO) 25µg 2hourly for 24hours or Misoprostol (PV) 25µg 6hourly for 24hours can be considered a safe and effective agent for labour induction with intact membranes and on an inpatient basis.

Note:

- Misoprostol should not be used in the setting of vaginal birth after Caesarean section due to the increased risk of uterine rupture.
- Oxytocin should be started no earlier than 4hours after the last dose of misoprostol.

Options for induction with a favorable cervix

- Amniotomy should be reserved for women with a favorable cervix. Care should be given in the case of unengaged presentation because there is a risk of cord prolapse.
- After amniotomy, oxytocin should be commenced early in order to establish labour. • In the setting of ruptured membranes at term, oxytocin should be considered before expectant management.
- Women positive for group B streptococcus (GBS) should be started on oxytocin as early as possible after ruptured membranes in order to establish labour within 24 hours.
- Both high- and low-dose oxytocin may be considered within a hospital protocol.
- Because of the various concentrations, oxytocin infusion rates should always be recorded in mU/min rather than mL/hr.
- Oxytocin induction maybe considered in the hospital setting of vaginal birth after Caesarean section.
- For induction of labour use: Oxytocin IV, the dose will depend on parity

Primigravida

A: oxytocin (IV) 5IU in 500mls of 0.9% sodium chloride the initial dose should be 8-10drops/Minute, the titration may be gradually increased at intervals not shorter than 20 minutes and increments of not more than 5drops/minute, until a contraction pattern similar to that of normal labour is established. The recommended maximum rate is 40d/m.

Multiparous

A: oxytocin (IV) start with low dose (e.g., 2.5IU in 500mls of fluid titrate as above. Regulate the dose according to response.)

Note

- Induction of labour with uterotonic drugs requires vigilant monitoring
- Induction of labour should only be attempted at hospitals with capacity to perform Caesarea section

Augmentation of Labour
If labour progress is not optimum labour augmentation is necessary. Can be achieved by:
A: oxytocin as above
OR
Artificial rupture of membranes (ARM) and oxytocin. If membranes are already ruptured and no labour progress the steps above should be followed; rule out obstruction before augmenting labour with oxytocin.

Myometrial stimulation after delivery

A: oxytocin (IM) 10IU after delivery of the infant; when no response give oxytocin (IV infusion) 20 units in 500mls of NS running at 10–20 drops per minute.

After delivery consider maintaining myometrium contractility by the use of MOTIVE bundle as per uterotonic guideline

Myometrium relaxation (Tocolysis)
It is done to relax the uterus in order to:
- Relieve fetal distress immediately prior to Caesarian section
- Prevent uterine rupture
- Stop uterine contractions in premature labour
- Perform external cephalic version

Pharmacological Management
A: nifedipine (PO) 20 mg stat, followed by 10–20mg 6–8hourly
OR
A: salbutamol (PO) 4mg stat, when required (maximum daily dose 3

Note
- β -stimulants should never be used if the patient had an antepartum hemorrhage
- β -stimulants are contra-indicated for cardiac disease and severe anemia in pregnancy

11.7.15 Trial of Labor after Cesarean (TOLAC)/Vaginal Birth after Cesarean (VBAC).

Trial of Labor after Cesarean (TOLAC) is the planned attempt to deliver vaginally in a woman with a history of one prior cesarean delivery. A successful TOLAC is referred to as Vaginal Birth after Cesarean (VBAC).

Eligibility Criteria for TOLAC
Single prior low-transverse cesarean scar, Singleton pregnancy, Cephalic presentation, Term gestation (≥37 weeks), Clinically adequate pelvis, No contraindications to vaginal birth, Efw less than 3.5kgs

Contraindications to TOLAC
Prior classical (vertical) or T-shaped uterine incision, History of uterine rupture, Prior extensive uterine surgery (e.g., myomectomy involving the endometrial cavity), Placenta previa or other contraindications to labor ≥2 previous cesarean deliveries with no prior vaginal delivery, Patient declines VBAC after counseling

Intrapartum Management of TOLAC

1. Pre-labor Counseling
- Discuss risks and benefits of VBAC vs. elective repeat cesarean delivery (ERCD)
- Highlight ~70–75% success rate of TOLAC in appropriate candidates
- Uterine rupture risk: 0.5–0.9% with one prior low-transverse scar

2. Timing of Delivery
- Await spontaneous labor up to 41 weeks in the absence of maternal/fetal complications
- Mechanical induction (e.g., Foley catheter) may be considered after 41-week
  Misoprostol is contraindicated due to high rupture risk

3. Labor Monitoring
- Continuous electronic fetal monitoring (EFM) is recommended
- Close monitoring of uterine activity(contractions) you can use CTG if available
- Early recognition of signs of uterine rupture: fetal bradycardia, loss of station, sudden abdominal pain

4. Labor Augmentation
- Low-dose oxytocin augmentation may be used with caution if labor stalls after spontaneous onset
- Avoid high-dose protocols

5. Preparation for Emergency Cesarean
- Ensure immediate surgical and anesthesia backup
- Informed consent and blood availability

6. Potential Complications
- Uterine rupture, Scar dehiscence, Postpartum hemorrhage, Birth asphyxia or neonatal encephalopathy

Note: Risk of uterine rupture is higher with induced labor and with shorter underdeliver intervals (<18 months)

Postpartum Follow-Up

- Monitor for signs of hemorrhage and uterine tenderness
- Discuss outcome of delivery and implications for future pregnancies
- Emphasize importance of early ANC attendance in subsequent pregnancies
- Consider family planning counseling
- Advise hospital delivery in future pregnancies, preferably by 36–37 weeks to avoid unmonitored labor at home

Key Evidence Summary

TOLAC should be offered in Hospitals with readiness to offer emergency cesarean delivery, with access to surgical and neonatal support. VBAC has a high success rate, especially with a previous vaginal delivery.

11.7.16 Rhesus Incompatibility

Incompatibility between an infant's blood type and that of its mother, resulting in destruction of the infant's red blood cells (hemolytic anemia) during pregnancy and after birth by antibodies from its mother's blood circulation.

Investigations

- Maternal Blood group+ Rhesus factor
- Paternal blood group+ Rhesus factor
- Infant Cord blood at delivery for grouping, FBC, Coombs test to detect maternal antibodies and Total Bilirubin

Prevention of Rhesus isoimmunization

If the mother is Rhesus negative give
C: recombinant Monoclonal anti D immunoglobulin 300 microgram (IM) within 72 hours of delivery

Antepartum

C: recombinant monoclonal anti D immunoglobulin 300 microgram (IM) at 28-32weeks of gestation

Abortion in Rhesus negative mother give

C: recombinant monoclonal anti D immunoglobulin 300 microgram (IM) within 72hours of abortion

Note: For the management of other medical conditions in pregnancy e.g. Malaria, Peripartum cardiomyopathy, Diabetes and Renal disease in pregnancy refer to specific chapters in this guideline.

11.8 Postpartum Care

11.8.1 Mastitis

It is the inflammation of the breast usually associated with breastfeeding mostly caused by *Staphylococcus aureus, Streptococcus pyogenes*

Clinical Presentation

Fever, headache, breast pain, body malaise, burning sensation, swelling, Redness, hard lump with tenderness, warmth, acute lymphadenitis in armpit, no nipple retraction.

Non-pharmacological Treatment

- Increase breastfeeding, warm compression,
- Emptying breastfeed by using pump to reduce pressure
- Elevate the breast/Breast support by using pump
- Elevate the breast by using breast support

Pharmacological Management

Mild form, Oral antibiotics and Antipain
B: amoxicillin + clavulanic acid (FDC)(PO) 625mg 12hourly for 5-7days
OR
C: flucloxacillin + amoxicillin (FDC) (PO) 500mg 12hourly for 5-7days
AND
A: ibuprofen (PO) 400mg 8hourly for 5days
OR
A: paracetamol (PO) 500–1000mg 8hourly for 5days

Severe form, Admission and parenteral antibiotics/antipain
B: amoxicillin + clavulanic acid (FDC) (IV)1.2gm 12 hourly for 2-5 days then Oral
AND
B: metronidazole (IV) 500mg 8 hourly for 2-5 days then Oral
AND
D: paracetamol (IV) 1gm 8 hourly for 1-2 days then Oral
OR
A: diclofenac (75mg) (I/M or I/V) for 1-2 days then Oral

11.8.2 Puerperal Sepsis

It is the infection of the uterus, surrounding tissues and lower genital parts within 6 weeks postpartum manifesting as postpartum metritis, postpartum endometritis parametritis, peritonitis or septicaemia. Commonly caused by Anaerobes, Aerobes, MRSA

Clinical Presentation

- Fever (Hyper and Hypothermia),
- Lower abdominal pain,
- headache,
- body malaise,
- backache,
- foul smelling vaginal discharge,
- diarrhea,
- infected perineal tear with redness,
- Incisional site discharge,
- subcutaneous hematoma,
- Temperature raises
- Low, Tachycardia,
- Tenderness,
- involuted uterus,
- Surgical site infection,
- redness, wound discharge

Investigations

- Full blood picture/HB and Cross Matching
- Check LFT, RFT, Electrolytes
- Blood culture in case of suspected septicaemia
- Abdominal pelvic ultrasound
- Urinalysis

Management of Puerperal sepsis at Dispensary and Health Center

Pharmacological Management
Establish IV line and give
A: compound sodium lactate
AND
A: sodium chloride 0.9% 2l then continue as required
AND
B: amoxicillin + Clavulanic acid (FDC) (PO) 625 12hourly for 5days
AND
A: metronidazole (PO) 400mg 8hourly for 5days
AND
A: gentamicin (IV) 80mg 12hourly for 24-48hours.

Referral: resuscitate and refer immediately to hospital for further investigations and management.

Management of puerperal sepsis at the hospital
Note: Start with Triple therapy
Mild form: - (Two oral antibiotics and I/V Gentamicin)

Severe form: - commonly presents with Hypotension, Tachycardia HR->100/min, Temp >38, Peritonitis, Shock, Organ failure, abscesses, RPOC, fluid in the pouch of douglas, hydronephrosis, altered mental status, and rebound tenderness

- Blood transfusion in anemic
- Continue with the above antibiotic for 5-7 days:

When to do Surgical interventions/Laparotomy: -
Presence of RPOC-Evacuation, generalized peritonitis, abscess, no improvement after 48 hours on proposed conservative management, use physical examination and ultrasound to detect fluid in the peritoneal cavity, Consider Drainage to monitor progress

Note: Culdocentesis and Paracentesis are not recommended, use physical examination and Ultrasound to detect fluid in the peritoneal cavity or abscess

Pharmacological Management

B: metronidazole (IV) 500mg 8hourly for 5-7days
AND
D: ceftriaxone + sulbactam (FDC) (IV) 1.5g 12hourly for 5-7 days
OR
C: amoxicillin + clavulanic acid (FDC) (IV) 1.2gm 12hourly for 5-7 days

Consider Culture and Sensitivity to align with AMR/MDR, adjust drugs depending on the susceptibility test results or if not available and there is no improvement after 3 days of treatment with above antibiotics switch to

S: piperacillin + tazobactam (FDC) (IV) 4.5g 6-8hourly for 5-7days
OR
S: imipenem + cilastatin (FDC) (IV) 1g 8hourly for 5 - 7 days

Prevent Puerperal infections by
Observation of aseptic technique when performing all obstetric procedures including Pelvic examinations during labour. Administration of prophylactic parenteral antibiotics within 30 minutes before performing a Caesarean section or manual removal of Placenta, PROM more than 8 hours, PPH patients, avoid unnecessary cauterization

B: metronidazole (IV) 500mg stat
AND
A: ampicillin (IV) 2g stat
OR
C: cefazolin 1g stat
OR
C: amoxicillin + clavulanic acid (FDC)(IV) 1.2g stat
OR
D: ceftriaxone + sulbactam (FDC) (IV)1.5g stat

11.8.3 Abnormal Uterine Bleeding (AUB)

It is the uterine bleeding in perimenopausal periods or abnormally heavy and or prolonged menstrual bleeding. Abnormal uterine bleeding (AUB) is a common condition affecting women that has significant social and economic impact.

The causes of AUB are classified and summarized into an Acronym; PALM-COEIN

- P-Polyps
- A-Adenomyosis
- L-Leiomyoma
- M-Malignancy
- C-Coagulopathy
- O-Ovulatory dysfunction
- E-endometrial causes
- I-Iatrogenic
- N-Not yet Classified

Clinical Presentation
Polyps
Abnormal vaginal discharge, Pelvic pain, Pelvic/Vaginal heaviness, Uterine bleeding, Tenderness, Mass felt per abdomen, Mass protruding through the cervix, Bulky-soft uterus

Adenomyosis
Heavy menses, prolongation of menses, painful menses, premenstrual pain, intermenstrual bleeding, pain during sexual intercourse, bloating, Bulky uterus with softness, tenderness on touch

Leiomyoma
Heavy and/or prolongation of menses, painful menses, Abdominal mass with irregular margins and distension, Bulky uterus with softness or firm,

Malignancy

- Presentation depends on type of malignancy
- Abnormal intermenstrual or postmenopausal contact bleeding (cervical cancer)
- Foul smelling bloody or mucoid vaginal discharge
- Weight loss, loss of appetite, early satiety

Note: Refer to specific gynecological malignancy

Coagulopathy

- History of bleeding tendencies
- Heavy and or prolonged menstruation
- Easy bruises, puncture site, petechial hemorrhage, fresh/non clotting bleeding

Anovulatory dysfunction

- Irregular bleeding, often heavy
- Infertility or subfertility
- Heavy/prolongation of menses, common on age extremity (Young and elderly), periods of amenorrhea, painful menses

Endometrial causes

- Heavy or prolonged menstruation
- Irregular menstruation associated with endometrial hyperplasia
- Common in advanced age, diabetic, obesity and low/null parity women

Investigations

- Investigate according to the possible cause of AUB basing on clinical suspicion
- A complete blood count (CBC)
- Pregnancy test in reproductive age to exclude pregnancy
- LFT, RFT, Electrolytes
- Hysteroscopy, Cystoscopy, Proctoscopy in case of suspected malignancy
- Examination under anaesthesia and biopsy in case of malignancy
- Cervical and vaginal swab
- Abdominal pelvic Ultrasound, CT scan, MRI, Xray as indicated

Pharmacological Management

Treatment will depend on the causative factor.

- Biopsy in case of suspected malignancy
- Specific Tumor markers in certain suspected malignancies e.g., ovarian tumors.
- Testing for coagulation disorders should be considered only in women who have a history of heavy menstrual bleeding beginning at menarche or who have a personal or family history of abnormal bleeding

C: tranexamic acid (PO) 500 –1000mg 6–8hourly as required until the bleeding is controlled
OR
A: ethinylestradiol 30mcg+Levonorgestrel 150mcg (PO) Useful for anovulatory bleeding.
OR
A: medroxyprogesterone acetate (PO) 5–10mg 24hourly for 10–14days initially and repeated for 10days each month thereafter
OR
C: norethisterone (PO) 5mg 24hourly for 10days. Then 5mg 12hourly from days (5 of cycle to 19) 19 to 26 of the two subsequent cycles, should be given to prevent recurrence of the condition.
OR
S. dydrogesterone 10mg to 20mg from 5th day for 14 days for 3 cycles.

Note: In severe form, Combination of Tranexamic acid and Progesterone (Norethisterone or dydrogesterone) is recommended.

B: levonorgestrel intrauterine system (LNG-IUS)

GnRH analogs (pre-surgery or for temporary shrinkage),
S: leuprolide (GnRH agonist) 3.75 mg IM every 4 weeks (limit to 6 months pre-surgery).

Surgical management
AUB due to organic causes may be amenable to surgical intervention. The decision regarding the approach and the timing for surgical intervention should depend on final diagnosis, expertise and other resources. Evacuation (D&C) is contraindicated unless specific for diagnostic biopsy like endometrial polyp/hyperplasia following risk of endometrial synechiae (Asherman syndrome)

Minimally invasive interventional radiology procedure
Uterine fibroid embolization

Referral: Immediately refer to the next level facility with capable for appropriate evaluation and management is recommend

11.8.4 Dysmenorrhea

It is a painful menstruation preventing normal activities and requires medication. There are 2 types of dysmenorrhea:

Primary (no organic cause). Typically, pain occurs on the first day of menses, usually about the time the flow begins, improves with age, shortly after menarche.

Secondary (pathological cause) e.g., usually the pain is due to other underlying causes involving reproductive organs e.g., PID, endometriosis, etc. late on-set (72 hours and more) of menstrual cycle, low back pain

Pharmacological Treatment
A: ibuprofen (PO) 200–600mg 8hourly (maximum 2.4 g/day)
OR
A: acetylsalicylic acid (PO) 300–600mg 4hourly
OR
C: diclofenac (PO) 50–100mg 8–12hourly
OR
B: mefenamic acid (PO) 500mg 8hourly
AND
A: hyoscine butyl bromide (PO) 20mg 8hourly for 5days
AND
C: norethisterone 5mg (PO) 24 hourly to start on 5th day of cycle for 14 days for 3 cycles, 10mg 24 hourly to start on day 5 of cycle for 14 days for patient not responding well on small dose
OR
S: dydrogesterone 10mg (PO) 24 hourly to start on 5th day of cycle for 14 days for 3 cycles, 20mg 24 hourly to start on day 5 of cycle for 14 days for patient not responding well on small dose.

11.8.5 Endometriosis

It is the presence of endometrial glands and stroma in locations other than the uterine endometrium and musculature. The common locations of endometriosis include the pelvis, small intestines, bowels, appendix, anterior abdominal wall and incision scars

Clinical Presentation

- Chronic pelvic pain, lower back pain and rectal pain
- Dysmenorrhea
- Dyspareunia
- Dysfunctional uterine bleeding
- Infertility

Management of Endometriosis Dispensary and Health center

Pharmacological Management

A: ibuprofen (PO) 200–400mg 8hourly (maximum 2.4 g/day)

OR

A: acetylsalicylic (PO) acid 300–600mg 4hourly

OR

A: diclofenac (PO) 50–100mg 8–12hourly

OR

B: mefenamic acid (PO) 500mg 8hourly

OR

A: hyoscine butyl bromide (PO) 20mg 8hourly for 5days

Referral: Refer the patient with endometriosis to hospital for further investigations and management.

Management of endometriosis at Hospital level

Investigations

- Abdominal pelvic/transvaginal ultrasound
- CT scan
- MRI
- Laparoscopy

Pharmacological Management

A: ethinylestradiol 30mcg + levonorgestrel 150mcg (PO) 1 tab 24hourly for 3months, skip brown tablets (ferrous fumarate) if not anemic

OR

A: medroxyprogesterone acetate (IM) 300mg monthly for 6months.

OR

S: danazol (PO) 200-400mg 12hourly depending on the severity, Consider the androgenic effect on long duration use Continue with management to maintain amenorrhea.

OR

S: goserelin (IM) 3.6mg monthly for 3 to 6 months

OR

S: leuprolide acetate 3.75mg IM/SC monthly for 3-6months

11.9 Contraception

11.9.1 Short term Contraceptive Methods

Short-term hormonal contraceptives

Before initiating hormonal contraceptives:

- Check blood pressure
- Perform vaginal examination (to check normal size of uterus)
- Check for contraindications like deep vein thrombosis

Follow up:

- Instruct women to always inform the doctor or nurse that they are on contraceptives while attending clinic or hospital.
- Women on oral contraceptives need regular physical check-ups including blood pressure measurement every six months
- Need to withdraw Contraceptives in:
    - Pregnancy
    - Severe headaches especially associated with visual disturbances
    - Numbness or paresis of extremities
    - Unexplained chest pain or shortness of breath
    - Severe leg pains etc.
    - Deep vein thrombosis.

The recommended short-term hormonal contraceptives are:
A: ethinylestradiol 30mcg + norgestrel 300mcg (FDC) (PO) 24hourly
OR
A: ethinylestradiol 30mcg + levonorgestrel 150mcg (FDC) (PO) 24hourly
OR
A: ethinylestradiol 30mcg + desogestrell 150mcg (FDC) (PO) 24hourly
OR
A: medroxyprogesterone acetate (IM) 150mg every three months
OR
A: levonorgestrel (PO).30mcg 24hourly

Note
- Take the first pill on the 5th day of menstruation and then continue every day without any interruptions
- Check blood sugar and hypertension after every 6 months
- Avoid use in women with severe hypertension and women without proven fertility

Post-coital contraception
The method is applicable mostly after rape and unprotected sexual intercourse where pregnancy is not desired. Within 3 days (72 hours) of unprotected sexual intercourse, give:

A: levonorgestrel (PO) 1.5mg stat
OR
A: levonorgestrel (PO) 0.75mg 12hourly. 2 doses
OR
B: copper T 380A Intrauterine Contraception Device (IUCD) may also be used.

Note: Emergency contraception should not be used as a routine method of contraception. Clients should be advised to use regular effective contraceptive methods of their choice.

Barrier methods (condoms)
- Male Condoms
- Female Condoms
- Correct use of both male and female condoms is required with every act of sexual intercourse for greatest effectiveness.

Note: Condoms are the only contraceptives that can protect against both pregnancy and STIs

11.9.2 Long-term Contraceptive methods

Implant Contraceptives
Implants are contraindicated to:
- Severe hypertension
- Thromboembolism
- Active liver disease
- Sickle cell anaemia
- Genital bleeding
- Severe headaches

Pharmacological Management
A: etonogestrel 68mg in single silastic capsule with applicator is implanted in the left upper arm with local anesthesia. Is effective for 3 years
OR
A: levonorgestrel 75mg in two silastic capsules implanted subdermal in the left upper arm with local anesthesia. Is effective for 5 years and is recommended for women who have completed their family or are not ready for sterilization or those not able to take estrogen-containing contraceptives.

Note: Implants may be inserted during the immediate postpartum period, or after 4 weeks postpartum

Intrauterine Contraceptive Device
It is the device containing copper or Levonorgestrel that is inserted in the uterus to prevent pregnancy

B: CuT380A Intrauterine Contraception Device (IUCD) may also be used

It can be inserted during the immediate postpartum period, within 48hours postpartum or after 4 weeks postpartum

The contraindication to postpartum IUD includes

- Active postpartum haemorrhage
- Puerperal sepsis/chorioamnionitis, active PID
- Allergy to copper
- Period within 48 hours and 4 weeks

B: levonorgestrel releasing intrauterine device as optional for Copper T IUCD

Note: Use the WHO Medical eligibility criteria (MEC) wheel on providing FP methods

11.9.3 Permanent (surgical) Contraceptive Methods

The available permanent contraceptive options include;

- Bilateral tubal ligation (female sterilization) for women who will not want more children
- Laparoscopic BTL
- Vasectomy for men who will not want more children to be linked to urologist/surgeon

11.10 Infertility

Infertility is a condition of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse.
A detailed history taking, and physical examination are invaluable for the diagnosis for causes of infertility

Investigation: Not every fertility test will be done for every case**.**

Women:
For women, fertility testing may include basic gynaecological examination

- VDRL tests
- Urine routine and microscopic
- Cervical mucus examination
- Abdominal pelvic/Transvaginal USS
- HSG (hysterosalpingogram)for tubal patency
- Saline Infusion Sonohysterography (SIS) for tubal patency with use of ultrasound
- Hysteroscopy-for unexplained irregularity of menses (AUB/oligomenorrhea/amenorrhea)
- Diagnostic laparoscopy- This test is only done when symptoms point to possible endometriosis, as part of treatment for blocked fallopian tubes, or in some cases of unexplained infertility.
- Hormonal profile- FSH, LH, TSH, AMH, T3 & T4, Testosterone, prolactin, estradiol and progesterone.

Men:
Perform the following

- Semen analysis
- VDRL tests
- Hormonal profile-FSH, Testosterone, but sometimes also LH, estradiol, or prolactin
- Scrotal ultrasound to exclude obstructive causes (Varicose veins)
- Consider sperm donation when indicated under Assisted Reproductive Therapy

Treatment will depend on the underlying cause

Non-Pharmacological Management

- Weight reduction in obese clients.
- Educate the couple on the importance of having regular sexual intercourse during the fertile window
- Try to avoid smoking/excessive drinking
- Counsel regarding age-related fertility decline

Pharmacological Management
Ovulation stimulation;
C: clomiphene citrate (PO) 50mg 24hourly for 5days from the 2nd–5th day of menstruation. (Maximum 6 cycles)

For patients not responding on clomiphene citrate, consider
S: tamoxifen (PO) 20mg 24hourly for 5 days from 2nd day to 5th day of menstruation

Note: Do follicular tracking uss start on day 10 for 28 days cycle, for longer cycles (e.g., 32 days), start around Day 12, For shorter cycles (e.g., 24 days), start around Day 8 and Serum progesterone as indicated

11.10.1 Polycystic ovarian syndrome (PCOS)

A: metformin (PO) 500mg 24 hourly is used for PCOS treatment, alone or along with other fertility drugs. Dose adjustment depends on indication

AND

S: letrozole (PO) 2.5–5 mg 24 hourly for 5 days starting day 2–5 of the cycle

11.10.2 Hyperprolactinemia

C: bromocriptine (PO) 2.5–5mg 24hourly until the prolactin level is within the normal range

OR

S: cabergoline (PO) 0.25–0.5mg once or twice weekly initially then the dose is gradually increased monthly until prolactin levels normalize. Doses of less than 3mg per week are usually enough to achieve this goal

11.10.3 Hirsutism

C: spironolactone (PO) 25mg 24hourly in case of hyperandrogen

AND

S: dydrogesterone (PO) 10mg 24hourly for 14 days starting on day 11 of menstrual cycle

Minimally invasive interventional radiology procedure
For Women: -Therapeutic Fallopian Tube Recanalization
For Men: -Varicocele embolization

Advanced reproductive therapy (ART) and special cases (IUI, IVF/ICSIS)
Should be done by trained fertility specialist at a facility well equipped with embryology and andrology laboratory. ART will follow proper indication, inclusion criteria, pre-treatment diagnostic workup, lifestyle management, advice on 1st line treatment options available

Ovulation induction:
C: clomiphene citrate or **S:** letrozole, or **S:** tamoxifen as described above

AND

S: menotropin 75 IU (I.V) on alternate days 3rd day, tailored treatment to patient with risk of ovarian sensitivity such as age and BMI
Subsequent dose should be reduced or increased aiming for 2 to maximally 3 dominant follicles

Monitoring:
Usually done on day 12 to 14 of cycle but earlier (around day 10) if concern for multiple follicular development
Assess endometrial thickness (ET), follicle size and number, decide the need for serum E2, serum progesterone, and serum LH measurement
Repeat assessment as indicated until leading follicle ≥18mm and ET≥7mm
Assess mid-luteal phase progesterone unless ovulation was well established in previous cycles

S: human chorionic gonadotrophins, 5,000 unit on day 9 to 12 of cycle depending on length of cycle, perform urinary hCG when leading follicle ≥18mm and ET ≥7mm unless spontaneous LH surge detected.

Insemination: Do a single insemination 24-36 hours after LH surge

Number of cycles: Offer 3-4 cycles of IUI provided adequate response to ovarian stimulation and suitable post-wash sperm quality

IVF and **ICSI** are done with treatment protocols, this guideline highlights the steps and medications used

Indications

- Bilateral tubal blockage
- Severe Endometriosis
- Unexplained infertility (After failed expectant management or failed IUI)
- Poor ovarian reserve
- Failed other infertility treatment

STEPS INVOLVED IN IVF/ICSI

I. Controlled Ovarian Stimulation Long protocol treatment (Using GnRH –agonist)
S: goserelin Acetate 3.6 mg (SC)

OR

S: leuprolide Acetate 3.75mg (IM)

Short protocol treatment (Using GnRH – antagonist)
S: cetrorelix acetate 0.25 mg (SC)

Soft stimulation (Low dose FSH menotropin 10IU/KG/24 hours: FSH plus LH
S: lutropin hormone 10 IU/KG/24 hours in combination with clomiphene citrate, or letrozole as per protocol

II. Egg retrieval (Ultrasound–guided Ovum Pick-up) done in theater at 36 hours after the time of trigger with hCG. The WHO Safety Checklist should be observed as in any other surgical procedures.
The Embryologist should immediately examine the aspirated fluid under microscope in theater to look for oocyte before transferring to the IVF Lab

III. Fertilization and Embryo culture are done few hours after the egg retrieval using the culture media and incubator in a tightly controlled IVF laboratory.
The embryologist should monitor the process of fertilization, embryos development and grading them according to how the develop at each stage
The husband/partner should produce the sample on the day of the egg retrieval. The sperm sample is best produced by masturbation. It is recommended that the husband/partner should abstain from intercourse (No ejaculation) for two days before the egg retrieval in order to give a good sperm sample.

IV. Embryo Transfer done under trans abdominal Ultrasound and the patient should be advised to have a full bladder before the procedure. The fertility specialist and Embryologist should discuss with the patient/couple on the number of embryos to be transferred at once, based on the specific patient circumstances, age of the woman and quality & number of the embryos available.
It should be noted that transferring more than one embryo carries the risks of multiple pregnancies (twins or triplets) which are serious. As globally most of ART units are moving towards single embryo transfer, it is recommended to consider transferring of single or two embryos

V. Luteal Phase Support achieved by supplementation of progesterone 400mg per vagina twice a day from the day of egg retrieval and continued depending on indications

VI. Pregnancy test Serum beta-hCG should be tested 10-12 days after the embryo transfer. If the test is positive, repeat it two days later to check the rise of beta- hCG. In case of rise of beta-hCG, booking for a date of the first ultrasound scan should be done for six weeks later.
In case of negative pregnancy test, the patient/couple should be given a follow up appointment with a fertility specialist to discuss the cycle and further management

Surgeries under Infertility cases should be done under specialist care with consideration for fertility sparing modalities:

- Tubal surgery for Tubal blockage under laparoscopic or open surgery approach
- Myomectomy for uterine fibroids under laparoscopic or open surgery approach
- Ovarian drilling is a possible surgical treatment for PCOS–related infertility under laparoscopic or open surgery approach

Referral: Refer all patients with infertility to a gynecologist/super-specialist under infertility and ART

CHAPTER TWELVE

SEXUALLY TRANSMITTED INFECTIONS

Sexually transmitted infections (STIs) are generally acquired by sexual contact with a person who has an STI. The organisms (bacteria, viruses or parasites) that cause sexually transmitted diseases may pass from person to person in blood, semen, or vaginal and other bodily fluids. Reproductive tract infections (RTIs) occur in the genital tract and affect both women and men. Some RTIs, such as syphilis and gonorrhea, are sexually transmitted, but many are not. In women, overgrowth of endogenous microorganisms normally found in the vagina may cause RTIs (yeast infection, bacterial vaginosis).

Clinical Presentation

- Sores or bumps on the genitals or in the oral or rectal area.
- Painful or burning urination.
- Discharge from the penis.
- Vaginal discharge that is abnormal in colour, odour, amount or consistency.
- Itching or irritation of the
- vulva or vagina.
- Unusual vaginal bleeding.
- Pain during sex.
- Lower abdominal pain
- Genital ulcers, sores or blisters
- Swelling, lumps or ulcer in the groin area

12.1 STIs/RTIs Management Approaches

Management of STIs/RTIs can be done in either of the following approaches:

- **Aetiological laboratory approach:** By identification of causative agents through laboratory methods and sensitivity pattern to the medicine to used, followed by disease- specific treatment.

- **Aetiological clinical approach:** By targeting disease treatment based on suspected causative agents diagnosed clinically. This is not appropriate at any health facility because of its demands on the clinical acumen of the service provider and the danger of incorrect diagnosis and, hence, insufficient treatment.

- **Syndromic approach:** This identifies clinical syndromes (symptoms and signs) followed by syndrome-specific treatment that targets causative agents which cause the syndrome.

Management of STIs/RTIs using Aetiological Laboratory Approach

It identifies causative agents through laboratory methods, followed by disease-specific treatment. This is the best approach to be used at a Health Facility (HF) which has a Laboratory capable of doing the Laboratory Investigation and producing timely result(s) so as to enable the clinician to prescribe medicine (s) according to the causative agent(s) and sensitivity pattern.

12.2 Chlamydia

A common sexually transmitted infection caused by Chlamydia trachomatis, often asymptomatic but associated with significant reproductive complications if untreated.

Clinical Presentation

- Often asymptomatic, especially in women.
- When symptomatic, may present as:
  - Urethral discharge, dysuria, urethral itching (men).
  - Vaginal discharge, burning urination, lower abdominal pain, dyspareunia (women).
  - Rectal pain, discharge, or bleeding (rectal infection).
  - Pharyngitis (rare, oropharyngeal infection).

Investigations

- Preferred: Nucleic acid amplification tests (NAATs) from urine or swabs (urethral, cervical, rectal, or oropharyngeal sites).
- If NAAT unavailable: Gram stain (limited sensitivity), culture, or ELISA where available.
- In resource-limited settings, syndromic management based on symptoms is recommended.

Pharmacological Management

Non-pregnant adults and adolescents

A: doxycycline (PO) 100mg 12hourly for 7 days

OR

A: azithromycin (PO) 1g single dose

Pregnant and breastfeeding women

A: azithromycin (PO) 1g single dose

OR

A: amoxicillin (PO) 500mg 8hourly for 7 days

OR

A: erythromycin (PO) 500mg 6hourly for 7 days

Note:

- Counsel patients on sexual abstinence until treatment completion and consistent condom use.
- Partner notification and treatment are essential to prevent reinfection and reduce transmission.
- Follow-up is recommended if symptoms persist or reinfection is suspected.
- Test-of-cure is generally not required except in pregnancy, persistent symptoms, or suspected treatment failure.

12.3 Gonorrhea

A sexually transmitted infection caused by the bacterium *Neisseria gonorrhoeae*, affecting the urogenital tract, rectum, pharynx, and eyes.

Clinical Presentation

- Men: Urethral discharge, burning or painful urination, itchy urethra, increased frequency/urgency.
- Women: Vaginal discharge, dysuria, intermenstrual bleeding, lower abdominal pain, dyspareunia.
- Both sexes: Rectal pain/discharge (if anorectal infection), pharyngitis (if oropharyngeal infection), conjunctivitis (rare but severe).
- Complications: Pelvic inflammatory disease (PID), epididymo-orchitis, infertility, disseminated gonococcal infection.

Investigations

- Nucleic acid amplification tests (NAATs) from urine, urethral, cervical, rectal, or pharyngeal swabs (high sensitivity and specificity).

Other options (where available):

- Gram stain: Gram-negative intracellular diplococci (especially in symptomatic men).
- Culture and sensitivity: Essential for antimicrobial resistance surveillance and in cases of treatment failure.

Syndromic approach:

- If laboratory testing is unavailable, manage based on clinical syndrome (urethral/vaginal discharge, PID, etc.).

Pharmacological Management

First-line regimen for uncomplicated genital, anorectal, and oropharyngeal gonorrhea (adults and adolescents):

A: ceftriaxone (IM) 500 mg single dose
If >150 kg body weight, consider 1g IM single dose
AND
A: doxycycline (PO) 100 mg 12hourly for 7 days (if chlamydia not excluded)

If doxycycline contraindicated or not available,
A: azithromycin 1g PO) single dose

Alternative Regimens
A: gentamicin (IM) 240mg single dose
AND
A: azithromycin (PO) 2g single dose
OR
A: cefixime (PO) 800mg single dose

Table 12.1 Special considerations and partner management

Condition/Aspect	Management
Pregnancy	Ceftriaxone is recommended and considered safe. Avoid Doxycycline; use Azithromycin if chlamydia coinfection is suspected.
Neonatal Conjunctivitis	**B:** ceftriaxone 50 mg/kg IM/IV as a single dose (maximum 125 mg).
Partner Management	Treat all sexual partners within the last 60 days. Advise abstinence until treatment is completed and symptoms have resolved in both patient and partners. Promote and provide condoms.
Follow-up	• Test-of-cure: Recommended for pharyngeal infection, persistent symptoms, or alternative regimens. • Re-testing: Re-screen at 3 months due to high risk of reinfection.

12.4 Syphilis

A chronic sexually transmitted infection caused by the bacterium *Treponema pallidum*. It progresses in stages and can involve multiple organ systems if untreated.

Clinical Presentation

- Primary syphilis: Painless genital, anal, or oral ulcer (chancre) and non-tender lymphadenopathy.
- Secondary syphilis: Generalized non-itchy rash (often on palms/soles), mucous patches, condylomata, fever, malaise, lymphadenopathy.
- Latent syphilis: Asymptomatic; detected by serology.
- Tertiary syphilis: Rare; gummatous lesions, cardiovascular or neurologic disease.
- Congenital syphilis: Stillbirth, neonatal death, or multisystem disease in infants.
- Neurosyphilis, ocular syphilis, otosyphilis: Can occur at any stage; present with neurological, visual, or auditory symptoms.

Investigations

Serologic testing:

- Non-treponemal: RPR, VDRL (for screening and monitoring).
- Treponemal: TPPA, FTA-ABS, EIA (for confirmation).

Direct detection: Darkfield microscopy or NAAT from ulcer exudate/tissue (if available).

CSF examination: For neurologic, ocular, or otic symptoms (cell count, protein, VDRL).

HIV testing: Recommended for all patients with syphilis.

Pharmacological Management
Early Syphilis (Primary, secondary, or early latent <2 years)
A: benzathine benzylpenicillin (IM) 2.4MU single dose

Late Latent Syphilis or Syphilis of Unknown Duration

A: benzathine benzylpenicillin (IM) 2.4MU once weekly for 3 consecutive weeks (Do not exceed 14 days between doses)

Syphilis in Pregnancy
- Benzathine benzylpenicillin is the only proven regimen to prevent congenital syphilis
- Desensitization and penicillin treatment are recommended for allergic pregnant women.

Neurosyphilis, Ocular Syphilis, Otosyphilis
A: benzylpenicillin (IV) 18–24 million units per 24hours, administered as 3–4 million units every 4 hours or continuous infusion for 10–14 days.

For patients with penicillin allergy, the approach prioritizes confirming the allergy (e.g., via skin testing, as many reported allergies are not true IgE-mediated reactions) and considering penicillin desensitization.

When desensitization is not feasible
A: ceftriaxone 1–2 g daily (intramuscularly or intravenously) for 10–14 days can be used.

Table 12.2: Adjunctive Therapy, Partner Management, and Follow-Up

Component	Recommendation
Adjunctive Therapy	Corticosteroids may be considered in severe ocular or otic syphilis (consult specialist). Monitor for Jarisch–Herxheimer reaction (acute febrile reaction occurring within 24 hours of initiating therapy).
Partner Management	Notify, test, and treat all sexual partners exposed within the infectious period (past 3–12 months, depending on stage). Partner treatment is essential to prevent reinfection and further transmission.
Follow-Up	Conduct clinical and serological follow-up at 6, 12, and 24 months after therapy. Monitor non-treponemal titres (RPR/VDRL) to assess treatment response. Repeat CSF examination at 6-month intervals if initial abnormalities are present (in neurosyphilis).

12.5 Mycoplasma genitalium
A sexually transmitted bacterium that causes non-gonococcal urethritis (NGU) and is associated with cervicitis and pelvic inflammatory disease (PID). It is notable for high antimicrobial resistance, especially to macrolides.

Clinical Presentation
Urethritis, cervicitis; often asymptomatic.

Investigations:
NAAT specific for M. genitalium (if available).

Pharmacological Management
A: doxycycline (PO) 100mg 12hourly for 7 days
THEN
A: azithromycin (PO) 1g 24hourly, then 500mg 24hourly for 3days.

Resistance testing is recommended where possible.

12.6 Ectoparasites
Parasites that live on the surface of the host (skin or hair) rather than inside the body. They commonly infest humans and can cause irritation, skin disease, and transmit infections. Ectoparasites are transmitted through close contact, poor hygiene, overcrowding, or contaminated clothing/bedding.

Clinical Presentation
Intense itching, visible lice or mites, excoriations.

Investigations
Clinical diagnosis by inspection.

Pharmacological Management
D: permethrin 5% w/v cream/lotion apply topically 12 hourly for 7days
OR
D: malathion 0.5% lotion applied topically 12 hourly for 7days.

Treat close contacts; wash clothing and bedding.

12.7 Trichomoniasis

A sexually transmitted infection caused by the protozoan parasite *Trichomonas vaginalis.* It commonly affects the urogenital tract and is often asymptomatic, especially in men.

Clinical Presentation
Frothy, yellow-green vaginal discharge, vulvar itching, dysuria.

Investigations
Wet mount microscopy, culture, NAAT.

Pharmacological Management
A: metronidazole (PO) 2g single dose
OR
A: metronidazole (PO) 400mg 12hourly for 7 days.

Treat sexual partners simultaneously.

12.8 Lymphogranuloma Venereum (LGV)

A sexually transmitted infection caused by invasive strains (L1, L2, L3) of Chlamydia trachomatis. It is characterized by transient genital lesions followed by painful lymphadenopathy or proctocolitis.

Clinical Presentation
Painful inguinal buboes, genital ulcers, rectal pain and discharge.

Investigations
NAAT for C. trachomatis serovars L1-L3, PCR.

Pharmacological Management
A: doxycycline (PO) 100mg 12hourly for 21 days.

Surgical drainage of buboes if necessary.

12.9 Genital Herpes (Herpes Simplex Virus type 2)

A sexually transmitted viral infection caused mainly by Herpes simplex virus type 2, though Herpes simplex virus type 1 can also cause genital disease.

Clinical Presentation
Painful vesicles and ulcers on genitalia, dysuria, systemic symptoms.

Investigations
PCR, viral culture, serology.

Pharmacological Management
B: acyclovir (PO) 400mg 8hourly daily for 7 days (initial episode).
Suppressive therapy or episodic treatment for recurrences.

12.10 Anogenital Warts (Human Papillomavirus - HPV)

Anogenital warts are caused by infection with Human papillomavirus, most commonly types 6 and 11 (low-risk types). They present as benign proliferative lesions affecting the anogenital region.

Clinical Presentation
Flesh-colored, cauliflower-like growths on genital or anal skin.

Investigations
Clinical diagnosis; biopsy if uncertain.

Non-Pharmacological Management
- Cryotherapy,
- Surgical removal, or laser therapy for extensive lesions.

Pharmacological Management
D: podophyllin 10-25% Solution/Gel/0.15% Cream: Apply to genital warts 12hourly for 3 days, followed by 4 days without treatment, if no resolution repeat a weekly cycle for up to 4–5 weeks.

Management of STIs/RTIs using Syndromic Approach

This approach is recommended if the HF is not able to conduct appropriate Laboratory Investigation(s) and producing timely result(s) to enable the clinician to prescribe the medicine in accordance with causative agent(s).

Syndromic management of STIs is based on the diagnosis of defined symptoms and easily recognizable clinical signs. Each syndrome can be caused by several different causative agents.

For each syndrome, a well-defined standard treatment which has been proven to be effective against most endemic causative agents for the syndrome are used.

Syndromic approach of managing STIs/RTIs entails the service provider to follow laid down steps in a flow chart which guides him/her in making rational management decisions for treating the client. These are therefore known as treatment flow-charts. They may also be known as treatment algorithms, treatment protocols or treatment decision trees.

They guide the provider through a series of decisions and actions that need to be made. Each decision or action is enclosed in a box, with one or two routes leading out of it to another box, with another decision or action. Upon learning a patient's symptoms and signs, the service provider turns to the flow chart for the relevant syndrome and works through the decisions and suggestions it guides to manage the client accordingly. Each flow chart is made up of a series of three steps. These are:

- The clinical problem (the patients presenting symptoms and signs),
- The decision that needs to be taken,
- The action that needs to be carried out.

12.11 Urethral Discharge Syndrome (UDS)

UDS refers to the presence of abnormal secretions in the distal portion of the urethra Caused by *Neisseria gonorrhoeae* and *Chlamydia trachomatis.*

Clinical Presentation

Urethral discharge, Burning or painful micturition, Itchy urethra and increased frequency and urgency of micturition.

Note

- Persistent or recurrent symptoms of urethritis may be due to drug resistance, poor compliance or re-infection. In some cases, there may be infection with Trichomonas vaginalis (TV).
- Male patients complaining of urethral discharge and/or dysuria should be examined for evidence of discharge. If none is seen per inspection, the urethra should be gently milked from the ventral part of the penis towards the meatus.
- Delayed or inadequate treatment may result into orchitis, epididymitis, urethral stricture and/or infertility.

Investigations

- Culture and Sensitivity
- Gram stain
- ELISA
- Quantitative or qualitative PCR
- Genetic sequencing

Note: Management of UDS (**see flow chart 12.1**)

12.12 Vaginal Discharge Syndrome (VDS)

VDS refers to change of colour, odour and/or amount of vaginal secretions caused by *T. vaginalis, C. albicans, Bacterial Vaginosis, Neisseria gonorrhoeae and Chlamydia trachomatis.*

Clinical Presentation

- Abnormal vaginal discharge,
- Burning or painful micturition,
- Itchy vulva,
- Increased frequency and urgency of micturition and/or painful coitus.

Note

- A spontaneous complaint of abnormal vaginal discharge is most commonly due to a vaginal infection.
- *T. vaginalis, C. albicans* and *Bacterial Vaginosis* are the commonest causes of vaginal infection while
- *Neisseria gonorrhoeae* and *Chlamydia trachomatis* cause cervical infection.
- The clinical detection of cervical infection is difficult because a large proportion of women with gonococcal or chlamydia infections are asymptomatic.
- Vaginal discharge is therefore highly indicative of vaginal infection, but poorly predictive for cervical infection
- Due to the high prevalence of gonorrhea and chlamydia, all women presenting with VDS should receive treatment for both vaginal and cervical infections.
- Delayed or inadequate treatment of VDS may result to endometritis, salpingitis, oophoritis or ectopic pregnancy.
- Gonococcal or chlamydial cervical infection may be asymptomatic

Investigations

- Wet preparation
- Gram stain
- Culture and Sensitivity
- Fluorescent Microscopy
- Pap test (Papanicolau test)
- ELISA
- Quantitative or qualitative PCR
- NB starts simple to complex

Management of VDS (**see flow chart 12.2**)

12.13 Lower Abdominal Pain Syndrome or Pelvic Inflammatory Disease (PID)

PID is defined as the inflammation of the uterus, fallopian tubes, ovaries and pelvic peritoneum. It is also known as lower abdominal pain syndrome. It commonly occurs as a result of infection ascending from the cervix. It can also occur as a result of trans-cervical procedure. Mainly caused by *Neisseria gonorrhoeae, Chlamydia trachomatis* and Anaerobic bacteria

Clinical Presentation
Lower abdominal pain and tenderness, Painful micturition, Painful coitus, Abnormal vaginal discharge, Menometrorrhagia, fever and sometimes nausea and vomiting.

Note

- Delayed or inadequately treated PID may lead to chronic lower abdominal pain,
- Pelvic abscess,
- Ectopic pregnancy,
- Dysmenorrhea and infertility.

Investigations

- Wet preparation
- Gram stain
- Culture and Sensitivity
- Fluorescent Microscopy
- Pap test (Papanicolaou's test)
- ELISA
- Quantitative or qualitative PCR

Management of PID **(see flow chart 12.3)**

In-Patient Management of PID

Pharmacological Management
All patients with PID who have fever or body temperature ≥ 380C should be admitted for closer care. The recommended in-patient treatment options for PID are as follows:

Regimen 1:
A: cefixime (PO) 400mg 12hourly for 7-14days
AND
A: doxycycline (PO) 100mg 12hourly for 7-14days **OR**
AND
A: metronidazole (PO) 400mg 8-12hourly for 7-14days
OR
B: metronidazole (IV) 500mg 8-12hourly for 7-14days

OR

Regimen 3
S: clindamycin (IV) 900mg 8hourly for 7-14days
AND
A: gentamicin (IV) 1.5 mg/kg 6-8hourly 7-14days

Regimen 2:
B: ceftriaxone (IM) 1gm 24hourly for 5-7days
AND
A: doxycycline (PO) 100mg 12hourly for 7-14days
AND
A: metronidazole, (PO) 400mg 8-12hourly 7-14days
OR
B: metronidazole (IV) 500mg 8-12hourly 7-14day

Note

- For all three regimens, therapy should be continued for two days after the patient has improved and then be followed by doxycycline (PO) 100 mg 12hourly for 14days.
- Patients taking metronidazole should be cautioned to avoid alcohol.
- Doxycycline is contraindicated in pregnancy.

12.14 Painful Scrotal Swelling (PSS)

PSS is the inflammation of the epididymis and testis, often accompanied with scrotal pain, swelling and tenderness. It is also known as epididymorchitis. Mainly caused by *Neisseria gonorrhoea* and *Chlamydia trachomatis*

Clinical Presentation

Scrotal pain, Scrotal swelling and tenderness, Scrotal oedema, Fever.

Note: Among the common complications of painful scrotal swelling include infertility and scrotal abscess.

Investigations

- Gram stain
- Culture and Sensitivity
- ELISA
- Quantitative or qualitative PCR
- Genetic sequencing

Management of PSS (**see flow chart 12.4)**

12.15 Ano-rectal Syndrome (ARS)

Defined as soreness, burning, itching or other irritation of the rectum together with redness in the area of anus. Sometimes it is accompanied by diarrhea and it may occur as a toxic side effect of oral administration of certain broad-spectrum antibiotics mainly caused by *Neisseria gonorrhoeae, Chlamydia trachomatis, Treponema pallidum, Herpes Simplex Virus, Shigella spp., or Entamoeba histolytic.*

Clinical Presentation

- Purulent rectal discharge
- Mucous rectal discharge
- Watery rectal discharge
- Soreness, burning, itching or other irritation of the rectum together with redness in the area of anus
- There may also be ineffectual straining to defecate ("tenesmus"), sometimes mistakenly described as "constipation" by patients.
- The anus and rectum may be intensely painful, with external and internal ulceration
- Abdominal pain or cramping, abdominal swelling, distention or bloating;
- Bloody stool (blood may be red, black, or tarry in texture),
- Burning feeling,
- Change in bowel habits, constipation, diarrhea;
- Fecal incontinence (inability to control stools),
- Flatulence; pain, which may be severe, in the abdomen, pelvis, or lower back
- Urgent need to pass stool and watery diarrhea including multiple episodes.
- A proctoscopic examination (which should be done, if feasible) will reveal rectal pus, bleeding or ulceration

Note

- Proctitis may be caused by Salmonella spp., Shigella spp., or Entamoeba histolytica as a part of gastroenteritis, which may manifest as diarrhoea with fever, anorexia, and abdominal cramps.
- Antibiotics that destroy normal intestinal bacteria and allow other bacteria to grow in their place may also cause proctitis.
- Herpes proctitis may be mistaken for the rectal manifestation of ulcerative colitis or Crohn's disease.
- Proctitis typically causes painless bleeding or the passage of mucus (sometimes mistaken for diarrhoea) from the rectum.
- All cases of proctitis in MSM should be treated for gonorrhoea and chlamydia infections.
- Symptoms of diarrhoea, bloody stools, abdominal cramping, nausea, and/or bloating may indicate Giardia spp infection or amoebic dysentery.

Other non-STI causes of ARS include:

Anal fissure, Fecal impaction, Food intolerance, Gastroenteritis (bacterial and viral), Inflammatory bowel disease (includes Crohn's disease and ulcerative colitis), Neurological damage, and Perirectal or perianal abscess.

Other symptoms might occur with rectal discharge include gastrointestinal symptoms which vary depending on the underlying disease, disorder or condition. These may include:

- Abdominal pain or cramping, abdominal swelling, distention or bloating; bloody stool (blood may be red, black, or tarry in texture), burning feeling, change in bowel habits, constipation, diarrhea; fecal incontinence (inability to control stools), flatulence; pain, which may be severe, in the abdomen, pelvis, or lower back, urgent need to pass stool and watery diarrhea including multiple episodes.

Investigations

- Wet preparation
- Gram stain
- Pap test (Papanicolaou's test)
- Culture and Sensitivity
- Rapid Plasma Reagin (RPR)
- Treponema palladium particle agglutination (TPPA)
- ELISA
- Quantitative or qualitative PCR
- Genetic sequencing
- Fluorescent Microscopy

Management of ARS (**see flow chart 12.5.)**

12.16 Oropharyngeal Syndrome

Oral sex can lead to oropharyngeal STIs (infections of mouth and throat). The causative agents include Human Papilloma Virus, Herpes Simplex Virus, *N. gonorrhoea*, *Chlamydia spp*, *Treponema pallidum*

Clinical Presentation
Pharyngitis, History of unprotected oral sex

Investigations

- Wet preparation
- Gram stain
- Pap test (Papanicolaou's test)
- Culture and Sensitivity
- Rapid Plasma Reagin (RPR)
- Fluorescent Microscopy
- Treponema pallidum particle agglutination (TPPA)
- ELISA
- Quantitative or qualitative PCR
- Genetic sequencin

Management of Oropharyngeal syndrome (**see flow chart 12.6**)

12.17 Genital Ulcer Disease (GUD)

GUD is a loss of continuity of skin or mucous membrane producing one or more lesions in the genital area caused by *Treponema pallidum, Haemophilus ducreyi, Chlamydia trachomatis, Herpes simplex virus type 2 (HSV), Klebsiella granulomatis*

Clinical Presentation
Ulcer, Sore, Vesicle

Investigations

- Wet preparation
- Gram stain
- Culture and Sensitivity
- Fluorescent Microscopy
- Treponema palladium particle agglutination (TPPA)
- Rapid Plasma Reagin (RPR)
- ELISA
- Quantitative or qualitative PCR
- Genetic sequencing

Management of GUD (**see flow chart 12.7)**

12.18 Neonatal Conjunctivitis (Ophthalmia Neonatorum)

Ophthalmia Neonatorum (ON) means inflammation of the conjunctiva of a newborn baby of less than 1 month of age.
Is a potentially sight threatening condition. If the baby is older, the cause is unlikely to be an STI. The main Causative agents include *Neisseria gonorrhoeae* and *Chlamydia trachomatis.* Other non-STI causes of neonatal conjunctivitis include *Staphylococcus aureus, Streptococcus pneumoniae, Haemophilus and Pseudomonas spp,* Viral, chemical and physical irritation.

Clinical Presentation
Reddish conjunctiva, Oedema/swelling of the eyelids, Purulent eye discharge

Prevention and control measures

- Screening of pregnant women,
- Early treatment of VDS in pregnant women
- Routine eye chemoprophylaxis in the newborn by providing
- A: 1% oxytetracycline eye ointment to all newborns.

Note: Examine the neonate and exclude other congenital diseases

Management of Neonatal conjunctivitis **(see flow chart 12.8)**

12.19 Inguinal Bubo (IB)

Inguinal and femoral bubos are localized enlargements of the lymph nodes in the groin area, which are painful and may be fluctuant. They are frequently associated with lymphogranuloma venereum and chancroid. The main Causative agents include *Chlamydia trachomatis* and *Haemophilus ducreyi.*

Clinical Presentation

- Localized enlargements of the lymph nodes in the groin area,
- Painful and may be fluctuant.
- Pain,
- Fever
- Tenderness.

Note

- In many cases of chancroid an associated genital ulcer is visible, but occasionally may not be.
- Non-sexually transmitted local and systemic infections (e.g. infections of the lower limb) can also cause swelling of inguinal lymph nodes. These should therefore be ruled out.

Investigations

- Culture and Sensitivity
- ELISA
- Quantitative or qualitative PCR
- Direct Fluorescent Antibody (DFA)

Management of Inguinal BUBO (**see flow chart 12.9**)

12.20 STI/RTI flow charts

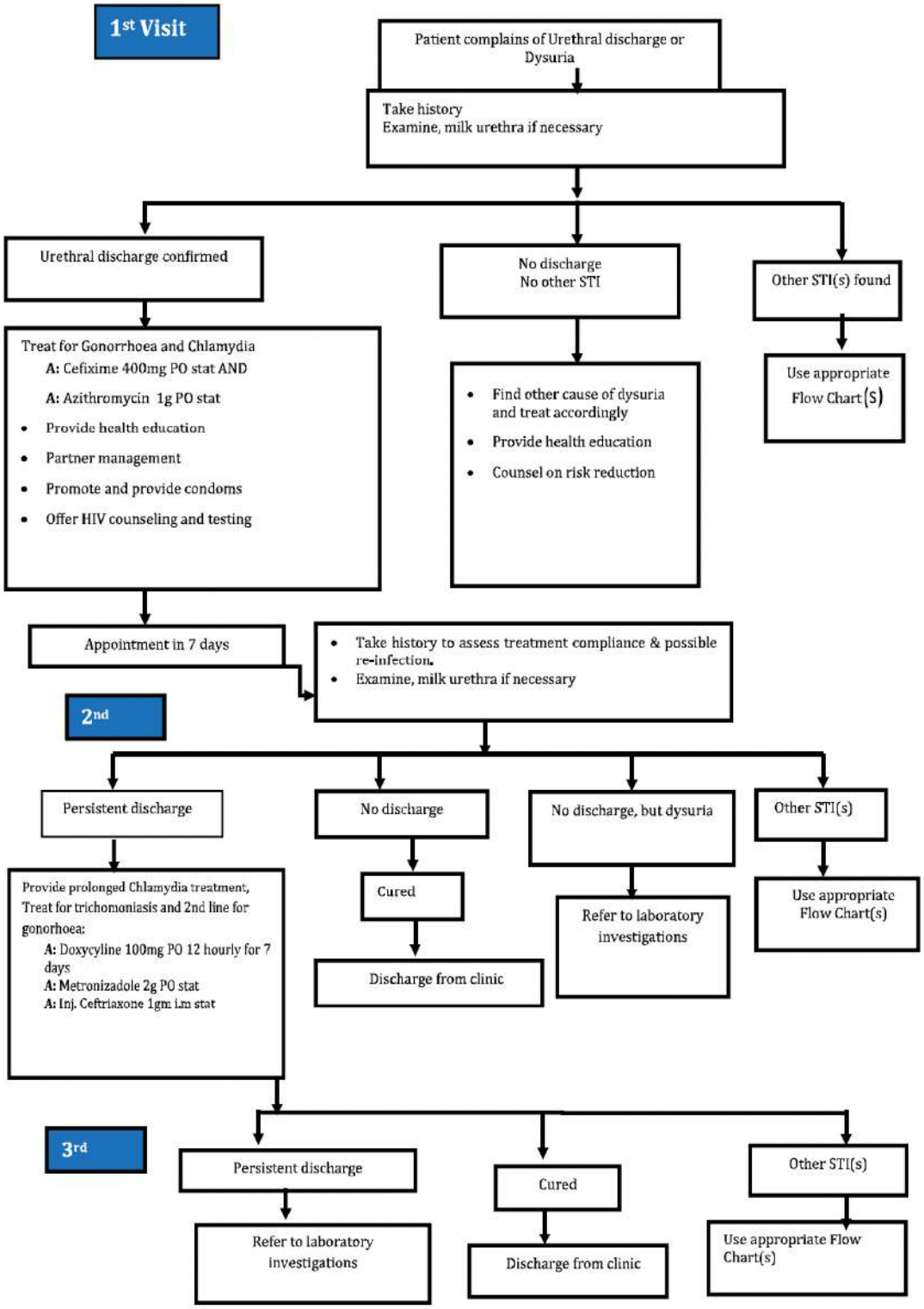
Steps in using the flow charts:

- Start by asking the patient for his/her symptoms.
- Find the appropriate flow chart, stated in the clinical problem box with “Patient Complaints of.”
- The clinical problem box usually leads to an action box, which asks you to examine the patient and/or take the history.
- Next, move to the decision box. After taking the history and examining the patient you should have the necessary information to choose Yes or No accurately.
- Depending on your choice, there may be further decision boxes and action boxes.

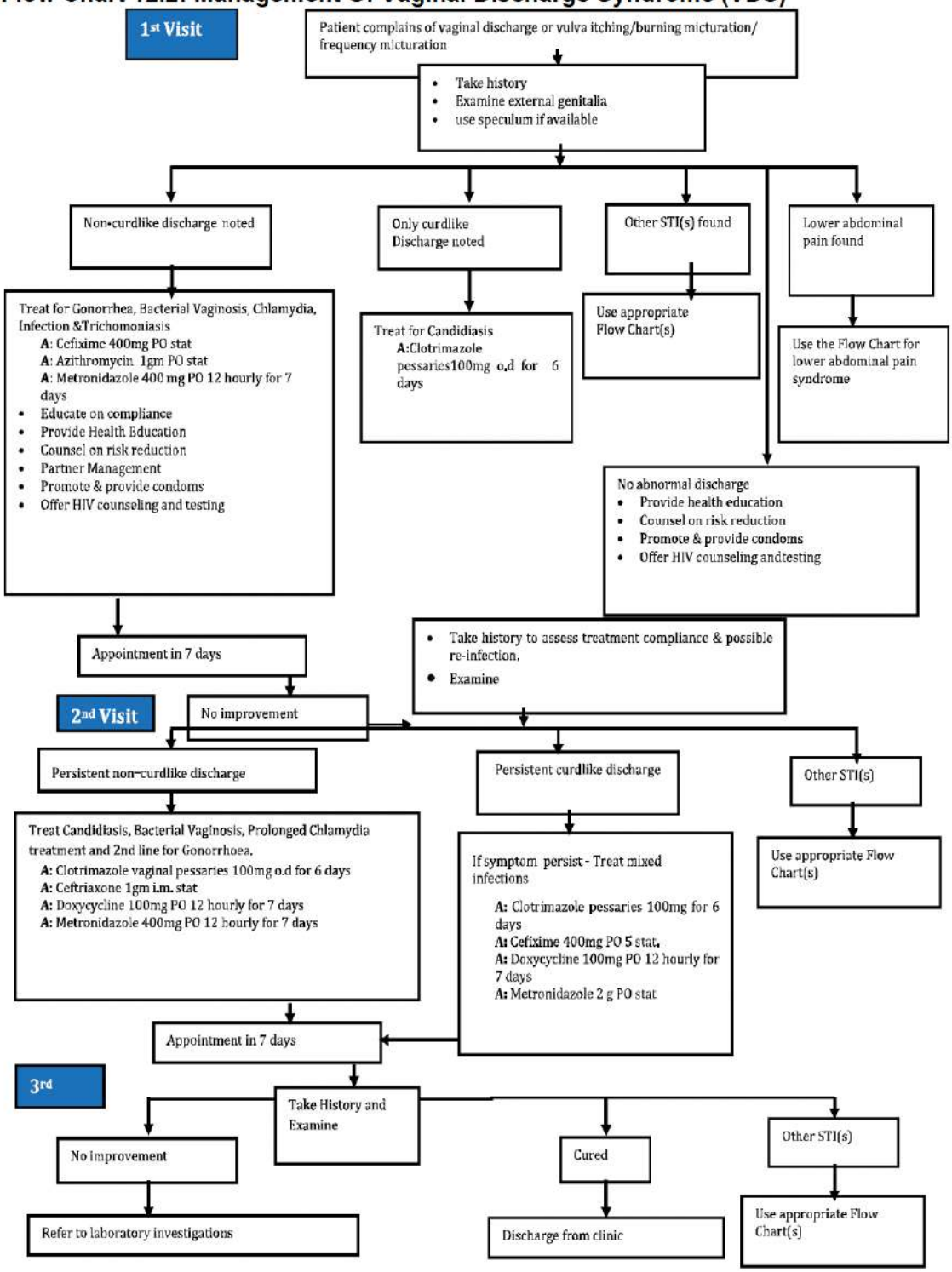
Note

For the appropriate management of STIs/RTIs syndrome, drugs in the watch group (azithromycin, cefixime and ceftriaxone) are the standard recommended for use as a first line treatment for the most STIs/RTIs starting at the Dispensary level, therefore, should be used only for STIs/RTIs at Primary HFs)

Flow Chart 12.1: Management of Urethral Discharge Syndrome (UDS)

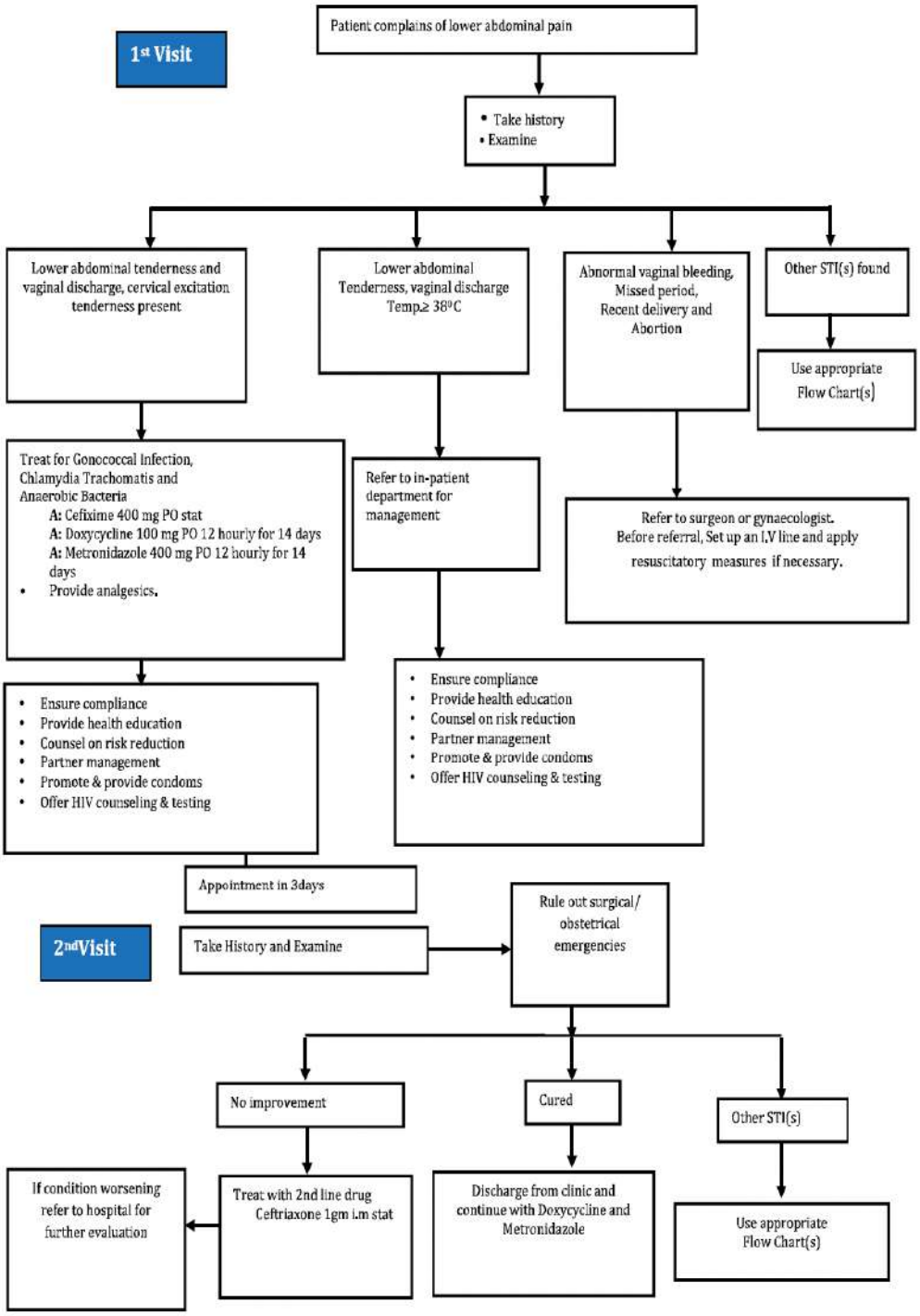


Flow Chart 12.2: Management Of Vaginal Discharge Syndrome (VDS)

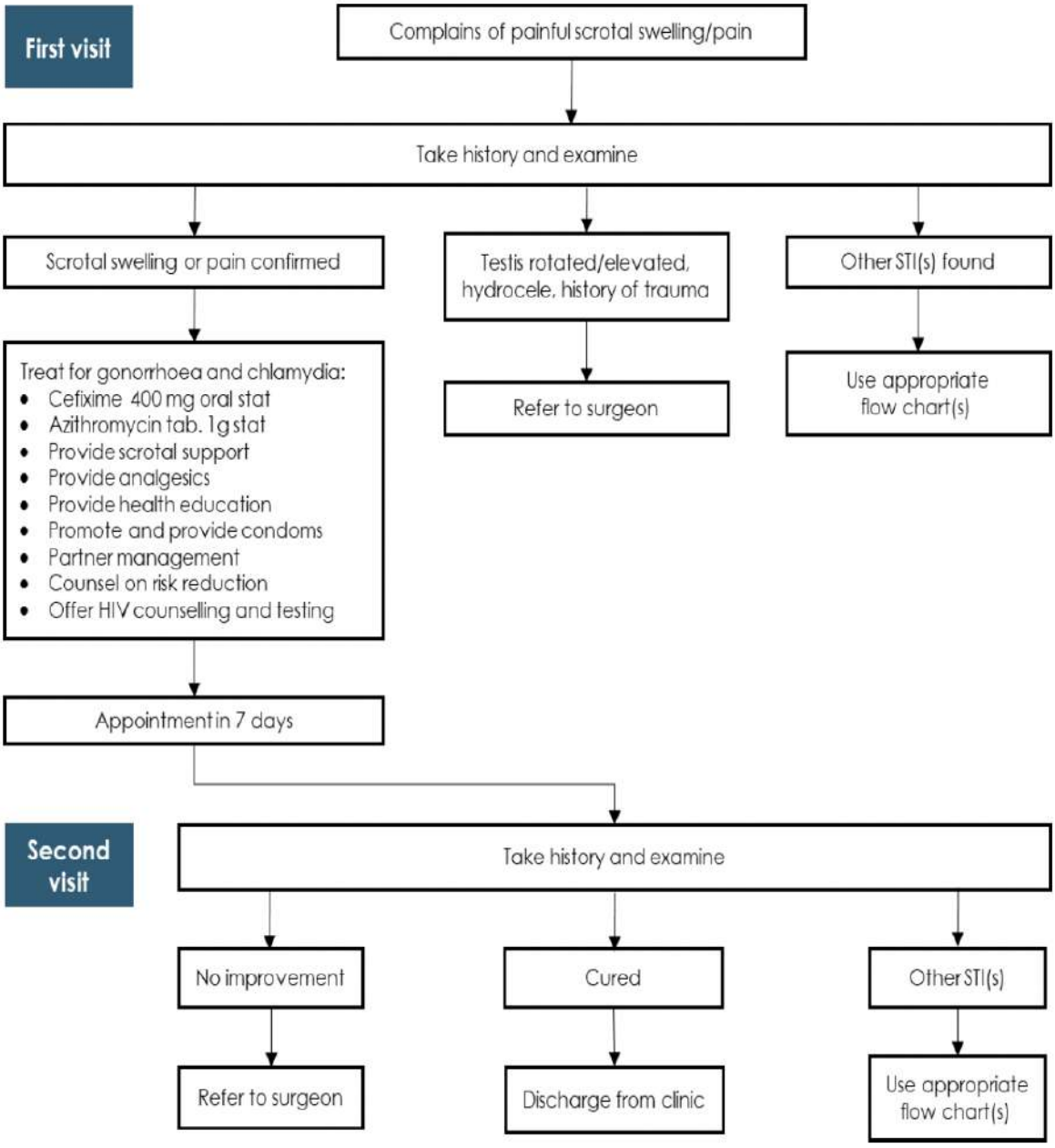


- Do not give Metronidazole in 1st trimester of pregnancy;
- Do not give doxycycline or ciprofloxacin in pregnancy or to lactating mother: Substitute with erythromycin 500 mg 8 hourly for 7 days and ceftriaxone 250 mg i.m. stat.

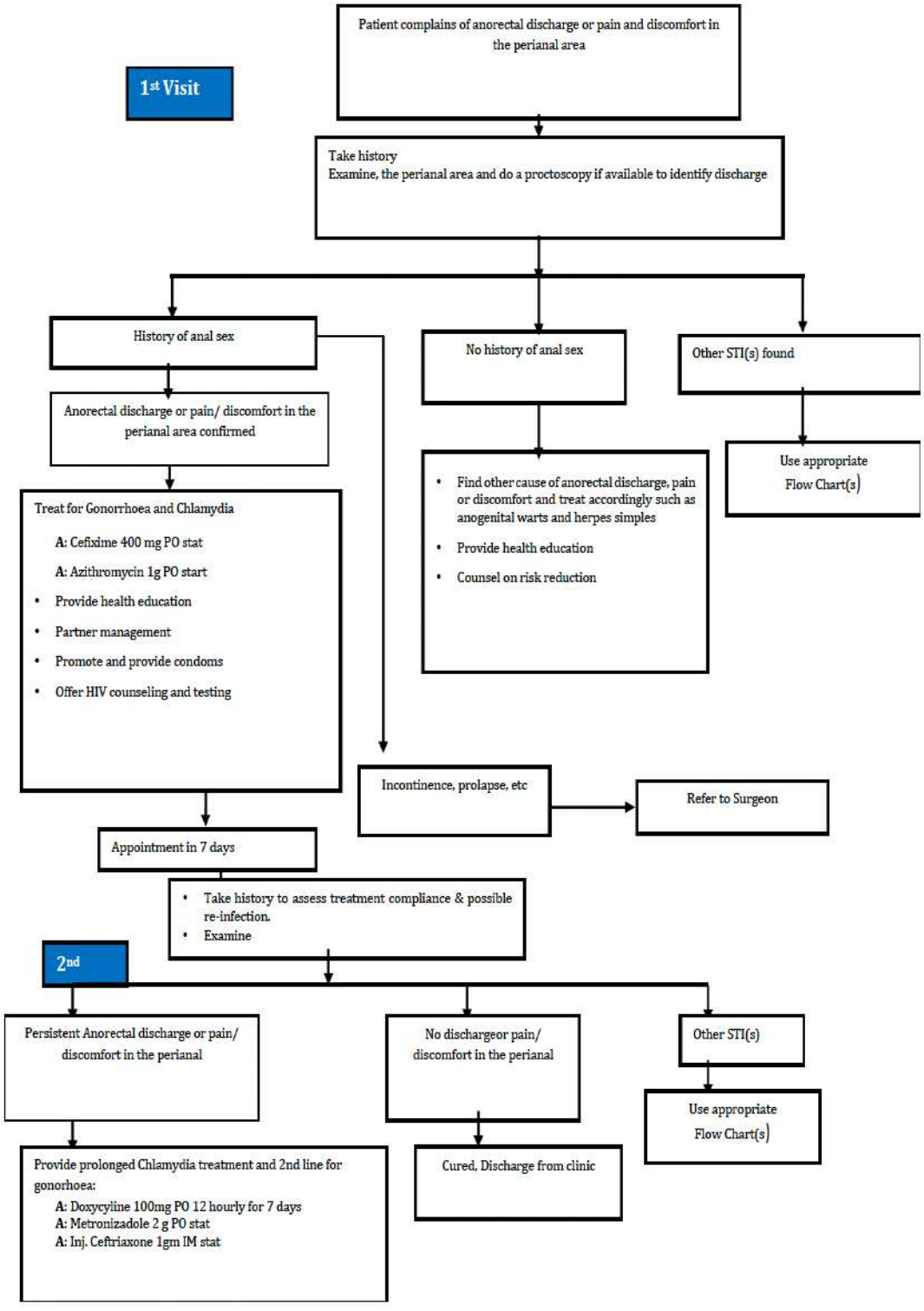
Flow Chart 12.3: Management of Lower Abdominal Pain Syndrome (PID)



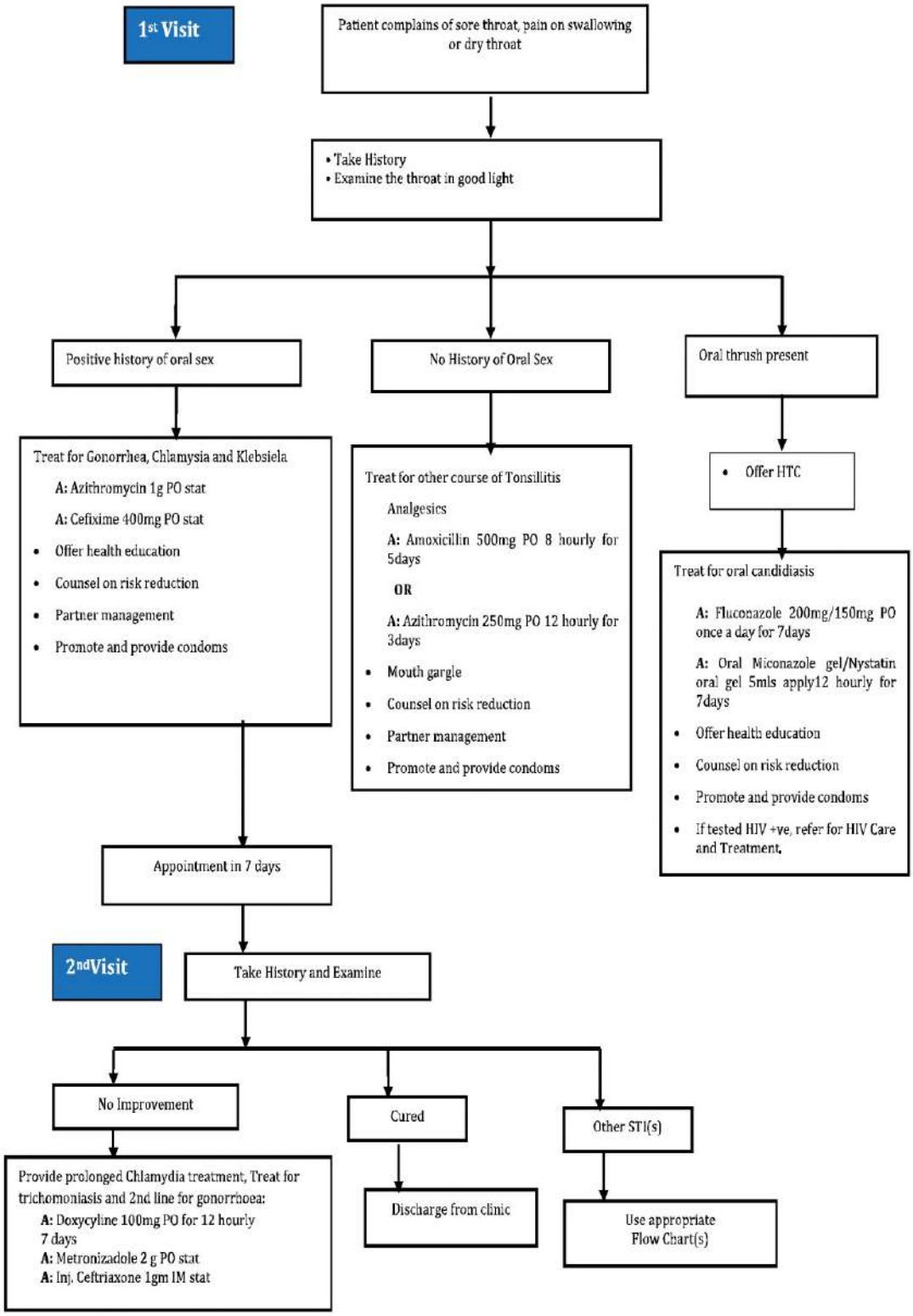
Flow Chart 12.4: Management of Painful Scrotal Swelling (PSS)



Flow Chart 12.5: Management of Anorectal Syndrome (ARS)



Flow Chart 12.6: Management of Oropharyngeal Syndrome



Flow Chart 12.7: Management of Genital Ulcer Disease (GUD)

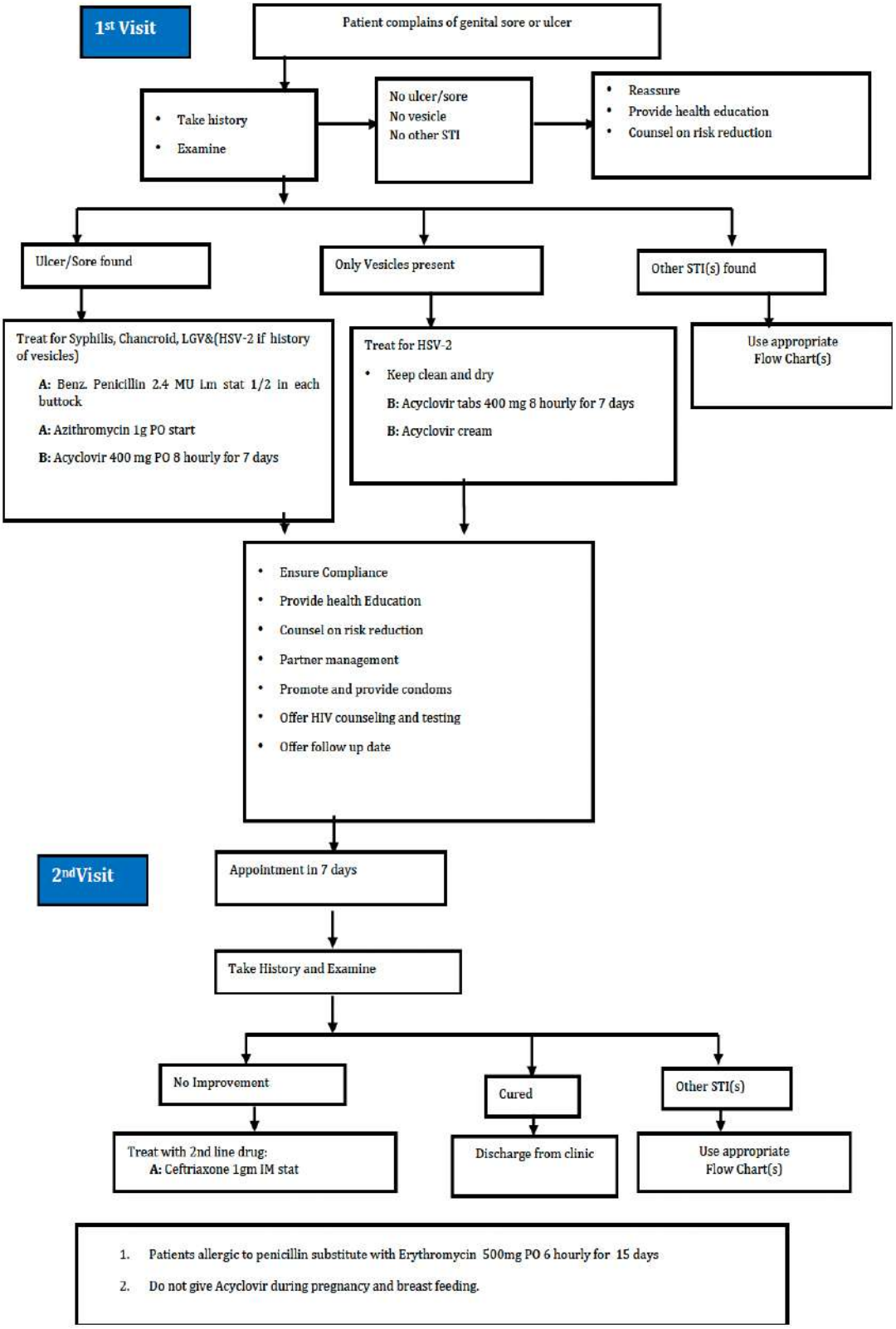
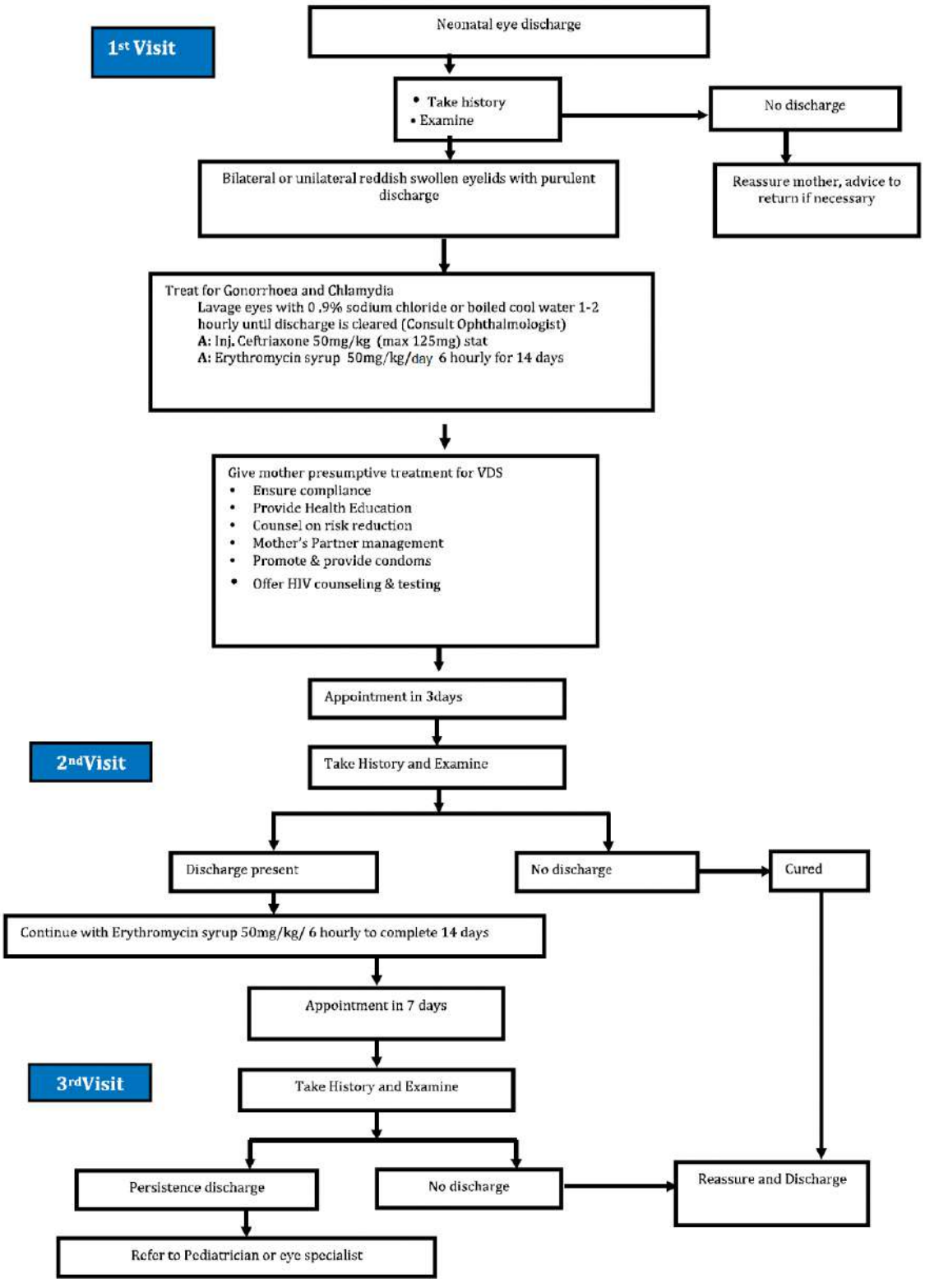


Chart 12.8: Management of Neonatal Conjunctivitis



- Both parents be examined and treated as per flow chart for genital discharge syndrome.

Flow Chart12.9: Management of Inguinal Bubos (IB)

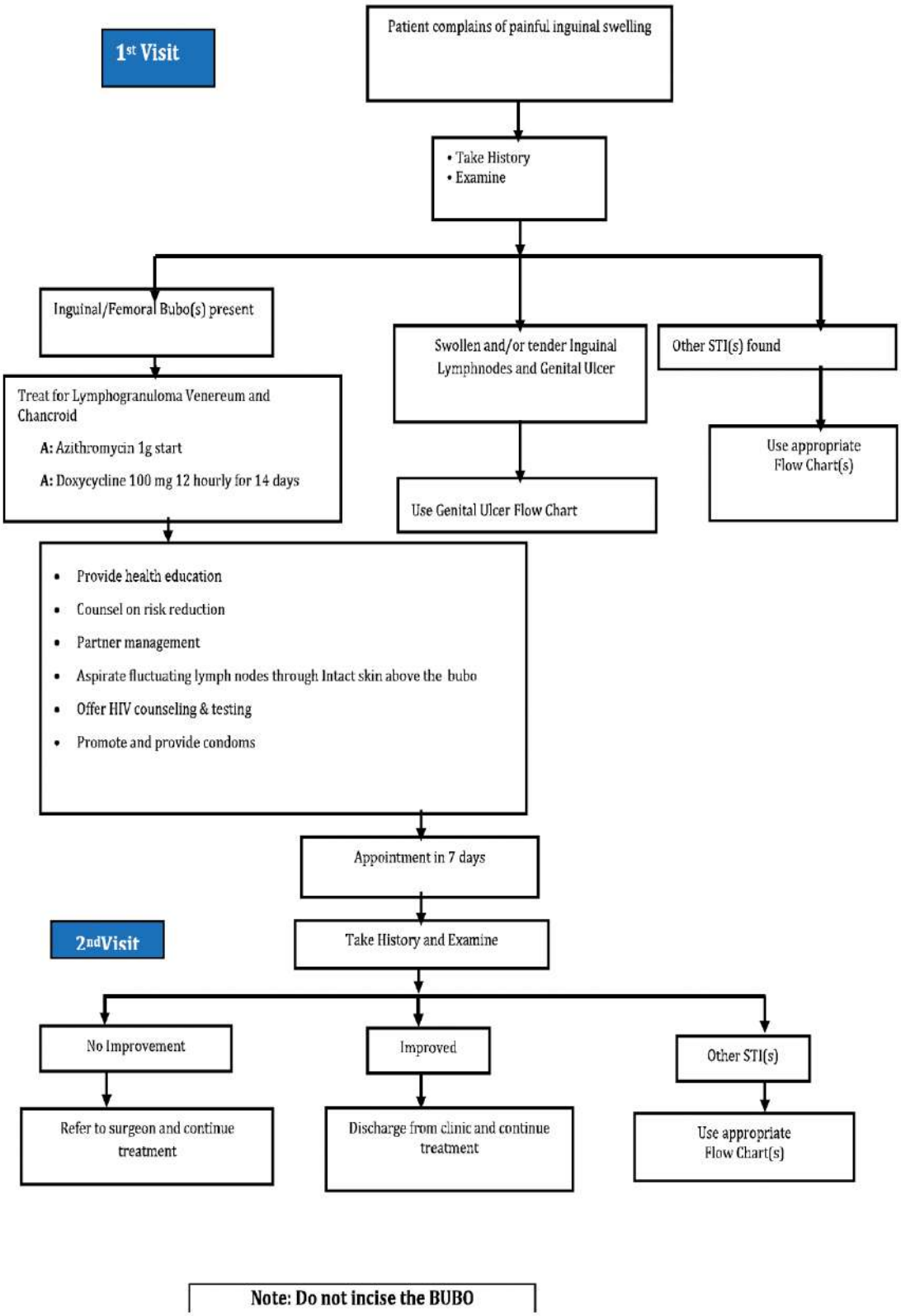


Table 12.3 Pharmacological Management of Mixed Infections

Mixed Sexually Transmitted Infections	Drug treatment (new episode)
Urethral Discharge Syndrome +Scrotal Swelling Syndrome **(UDS + SSS)**	**A:** ceftriaxone (IM) 250mg stat **AND** **A:** azithromycin (PO) 1g per week for 2weeks **AND** **A:** metronidazole (PO) 2g stat Supportive therapy: to reduce pain advice bed rest, scrotal elevation with a scrotal support (T-bandage) and analgesics.
Urethral Discharge Syndrome+ Balanitis **(UDS + Balanitis)**	**A:** cefixime (PO) 400mg stat **OR** **A:** ceftriaxone (IM) 250mg stat **AND** **A:** azithromycin (PO) 1g stat **OR** **A:** doxycycline (PO) 100mg 12hourly for 7days **AND** **A :** metronidazole (PO) 2g stat **AND** **A :** clotrimazole cream, local apply 12hourly for 7days
Urethral Discharge Syndrome + Genital Ulcer Syndrome **(UDS + GUS)**	**A:** cefixime (PO) 400mg stat **OR** **A:** ceftriaxone (IM) 250mg stat **AND** **B:** acyclovir (PO) 400mg 8hourly for 7days **AND** **A:** benzathine benzylpenicillin* (IM) 2.4MU stat **AND** **A:** azithromycin (PO) 1g stat **OR** **A :** doxycycline* (PO)100mg 12hourly for 7days **AND** **A:** metronidazole (PO) 2g stat
Vaginal Discharge Syndrome+ Lower Abdominal Pain Syndrome **(VDS + LAPS)**	**A:** ceftriaxone (IM) 250mg stat **AND** **A:** azithromycin (PO) 1g per week for 2weeks **AND** **A:** metronidazole (PO) 400mg 12hourly for 7–14days. **ADD** **A:** clotrimazole pessary, if vulva oedema, itching, excoriations or curd-like discharge present
Vaginal Discharge Syndrome + Genital Ulcer Syndrome **(VDS + GUS)** (non-pregnant)	**A:** cefixime 400mg stat **OR** **A:** ceftriaxone (IM) 250mg stat **AND** **A:** metronidazole (PO) 2g stat **AND** **A:** benzathine benzylpenicillin* (IM) 2.4 MU stat **AND** **A:** azithromycin (PO) 1g stat **OR** **A:** doxycycline* (PO) 100mg 12hourly for 7days **AND** **B:** acyclovir (PO) 400mg 8 hourly for 7 days. **ADD** **A:** clotrimazole pessary , if vulva oedema, itching, excoriations or curd-like discharge present

Mixed Sexually Transmitted Infections	Drug treatment (new episode)
Vaginal Discharge Syndrome + Genital Ulcer Syndrome **(VDS + GUS)** (Pregnant, breastfeeding)	**A:** cefixime 400mg stat **OR** **A:** ceftriaxone (IM) 250mg stat **AND** **A:** metronidazole (PO) 2g stat **AND** **A:** benzathine benzylpenicillin* (IM) 2.4 MU stat **AND** **A:** azithromycin (PO) 1g stat **OR** **A:** erythromycin* (PO) 500mg 6hourly for 7days **AND** **B:** acyclovir (PO) 400mg 8hourly for 7days. **ADD** **A: clotrimazole** pessary, if vulva oedema, itching, excoriations or curd-like discharge present
Lower Abdominal Pain Syndrome + Genital Ulcer Syndrome (**LAP + GUS)**	**A:** ceftriaxone (IM) 250mg stat **AND** **A:** metronidazole (PO) 400 mg 12hourly for 7–14days **AND** **A:** benzathine benzylpenicillin* (IM) 2.4MU stat **AND** **A:** azithromycin (PO) 1g per week for 2weeks **OR** **A:** doxycycline* (PO) 100 mg 12hourly for 7–14days **AND** **B:** acyclovir (PO) 400 mg 8hourly for 7days
Scrotal Swelling Syndrome + Genital Ulcer Syndrome **(SSS + GUS)**	**A:** ceftriaxone (IM) 250mg stat **AND** **A:** benzathine benzylpenicillin* (IM) 2.4MU stat **AND** **A:** azithromycin (PO) 1g per week for 2weeks **OR** **A:** doxycycline* (PO) 100mg 12hourly for 7–14days **AND** **B :** acyclovir (PO) 400mg 8hourly for 7days

Note: In Penicillin-allergic patients: Give Doxycycline (non-pregnant women/men) or Erythromycin (pregnant women) for 14days instead of 7days

12.21 Management of Other Common STI Conditions

12.21.1 Late Syphilis

This refers to Syphilis infection of more than 2years.

Pharmacological Management

A: benzathine benzylpenicillin (IM) 2.4MU once weekly for 3 consecutive weeks.

AND

A: azithromycin (PO) 2g stat.

12.21.2 Syphilis in Pregnancy

Pregnant women should be regarded as a separate group requiring close surveillance to detect possible re-infection after treatment has been given. It is also important to treat the sexual partner(s).

Pharmacological Management
A: benzathine benzylpenicillin (IM) 2.4MU, as a single dose
In case of late syphilis 3 doses of benzathine benzylpenicillin should be provided.

12.21.3 Congenital Syphilis

All infants born to sero-positive mothers should be treated with a single intramuscular dose of benzathine benzylpenicillin, 50000IU/kg whether the mothers were treated during pregnancy (with or without penicillin).

Pharmacological Management
Treatment regimens for early congenital syphilis (up to 2 years of age), and Infants with abnormal cerebrospinal fluid:
A: benzylpenicillin (IV) 100000–150000IU/kg/day administered as 50000IU/kg/dose 12hourly, for the first 7days and every 8hourly thereafter for a total of 10days

For congenital syphilis in children 2 or more years
A: benzylpenicillin (IV or IM) 200000 – 300000IU/kg/day administered as 50000IU/kg every 4–6hourly for 10–14days
OR
A: erythromycin (PO) 7.5–12.5 mg/kg 6hourly for 30days.
As an alternative regimen for penicillin allergic patients, after the first month of life

12.21.4 Syphilis and HIV Infection

All patients with syphilis should be encouraged to undergo testing for HIV because of the high frequency of dual infection and its implications for clinical assessment and management.

12.21.5 Genital Warts (Venereal Warts)

Human papilloma virus (HPV) is a common sexually transmitted pathogen. Genital warts are painless but may lead to serious complications. The removal of the lesion does not mean cure of the infection. No treatment is completely satisfactory. Recommended regimens for venereal warts are as follows:

Pharmacological Management
D: podophyllin 10–25% in compound tincture of benzoin, applied carefully to the warts, avoiding normal tissue. External genital and perianal warts should be washed thoroughly 4–6 hourly after the application of podophyllin.

Podophyllin applied to warts on vaginal or anal epithelial surfaces should be allowed to dry before removing the speculum or anoscope. Treatment should be repeated at weekly intervals.

Other treatment approaches Available at Referral level Health Facility
Cryotherapy with liquid nitrogen, solid carbon dioxide, or a cryoprobe. Repeat applications every 1-2 weeks OR
Electrosurgery OR Surgical removal

Vaginal Warts
Recommended regimens for treatment of vaginal warts are:
D: cryotherapy (with liquid nitrogen)
OR
D: podophyllin 10–25% (allow to dry before removing speculum)

Cervical Warts
Treatment of cervical warts should not be started until the results from a cervical smear test are known

Meatal and Urethral Warts
D: Cryotherapy
OR
D: podophyllin 10–25

CHAPTER THIRTEEN

SKIN DISEASES

13.1 Bacterial Skin Infection

Staphylococci and streptococci cause most bacterial skin infections, ranging from common conditions such as impetigo and cellulitis to severe multisystem disorders, including toxic shock syndrome.

13.1.1 Impetigo

Impetigo is a contagious, superficial bacterial infection that is most frequently observed in children. It can be bullous or nonbullous. The most common pathogen is Staphylococcus aureus.

Clinical Presentation:

- Polycyclic flaccid vesicles or bullae with clear yellow fluid
- May become pustules that enlarge and rapidly break down to form thick, adherent yellowish crusts
- May be associated with mild lymphadenopathy and fever



Investigations:
Skin swab for culture and sensitivity

Non-Pharmacological Management

- Regular hand washing
- Avoid sharing towels or clothes
- Avoid touching or scratching infected areas
- May keep away from school infected individuals
- Remove crusts with soap, water or saline

Pharmacological Management
Limited Disease

A: gentian violet paint (topical) 12hourly for 5days

OR

C: mupirocin ointment (topical) 12hourly for 7days

OR

C: fusidic acid cream (topical) 12hourly for 7days

Extensive (Severe) Disease

B: cefalexin (PO) 250 to 500mg; paediatric 25-50 mg/kg 6hourly for 7days

OR

A: erythromycin (PO): Adult 500mg; paediatric 25-50mg/kg 8hourly for 10days

OR

B: amoxicillin + clavulanic acid 625mg (PO) 8hourly for 7days

13.1.2 Bacterial Folliculitis

Folliculitis is an infection of the hair follicles commonly due to *Staphylococcus aureus, and Gram-negative bacteria such as Pseudomonas, Klebsiella, Enterobacter, and Proteus species*

Clinical Presentation:

- Follicular pustules and inflamed, follicular papules
- Common areas include the scalp, face, upper trunk, buttocks, and legs
- Pruritus is common
- Tender lesions may be present.

Investigation:

- Skin swab for culture and sensitivity

Non-Pharmacological Management

- Wearing loose-fitting clothing
- Avoid scratching or shaving of the affected areas
- Hair should be left to grow to at least 1 mm long.
- Proper hygiene for the affected area
- Use clean razors and shaving technique to minimize trauma

Pharmacological Management
Refer to the management of impetigo

13.1.3 Folliculitis Decalvans

Folliculitis Decalvans (FD) is a chronic and relapsing neutrophilic scarring alopecia that presents with alopecic patches, pustules, and tufted hairs. The aetiology of FD remains uncertain, but it may represent an interaction between the infection by S. aureus and the host.

Clinical Presentation:

- One or more areas of scarring alopecia on the scalp
- Multiple pustules on the scalp, particularly at the periphery of areas of alopecia
- Tufting of hair shafts
- Perifollicular scale extending onto the hair shaft



Investigations:

- Skin biopsy for histopathology
- Skin swab for culture and sensitivity

Pharmacological Management:

A: doxycycline (PO) 100mg 12hourly for 2-4weeks

OR

S: clindamycin (PO) 300mg 12hourly for 3months

AND

D: clobetasol propionate cream/ointment/gel (topical) 24hourly for not less than 16weeks

OR

S: triamcinolone (intralesional) 10mg/ml monthly for 6-9 months

In recalcitrant cases

S: dapsone (PO) 100mg 24hourly for 6months

OR

S: Isotretinoin (PO) 20-40mg 24hourly for 3 to 6 months

13.1.4 Abscess

An abscess is a collection of pus within the dermis or subcutaneous tissue caused by *Staphylococcus aureus.*

Clinical Presentation:

- Painful, fluctuant, erythematous nodules filled with pus
- Spontaneous drainage of purulent material may occur
- Fever and chills are often absent

Surgical Treatment

- Incision and drainage
- If incision and drainage are not performed, apply hot compresses several times per day to the swelling until it breaks.

Pharmacological Management:

A: sulfamethoxazole + trimethoprim (cotrimoxazole) (PO) 480-960mg; paediatric 8-12 TMP mg/kg 12hourly for 5-7 days

OR

B: cefalexin (PO) 250 to 500mg; paediatric 25-50 mg/kg 6hourly for 7days

13.1.5 Erysipelas and Cellulitis

Cellulitis and erysipelas develop as a result of bacterial entry via breaches in the skin barrier. The most common causes of cellulitis are beta-hemolytic *streptococci*, and *S. aureus* is a notable but less common cause.

Clinical Presentation:

- A prodrome of fever, chills and malaise
- Skin erythema, edematous and warm
- Petechiae and/or hemorrhage may be present
- Nearly always unilateral
- Lower extremities most common site
- Cellulitis involves the deeper dermis and subcutaneous fat
- Erysipelas involves the upper dermis and superficial lymphatics

Non-Pharmacological Management

- Treatment of skin conditions and the point of microorganism entry
- Elevation of the affected part
- Bed rest

Pharmacological Management

A: weak potassium permanganate soaks, 1:40000 (0.025%) solution 12hourly for 3– 4days, with each session lasting for 15–20minutes

AND

A: silver sulfadiazine cream (topical) 12- 24hourly

OR

C: mupirocin (topical) ointment 12hourly for 5–7days

OR

C: fusidic acid (topical) cream 12hourly for 5–7days

AND

A: phenoxymethylpenicillin (PO): adult 250–500mg; paediatric 25 mg/kg 6hourly for 5– 7days

OR

B: cefalexin (PO) 250 to 500mg; paediatric 25-50 mg/kg 6hourly for 7days

AND

A: ibuprofen 400mg (PO) 6hourly for 5days

Note: Consider parenteral antibiotics if there are signs of toxicity such as fever >38^{o}C, hypotension and tachycardia or if there are extensive erythema and high-risk neutropenia. BUT it should be guided by the results of culture and sensitivity

Referral: Refer if there are local or general signs of severity of developing necrotizing fasciitis.

13.1.6 Paronychia

Paronychia is an inflammation affecting the lateral and proximal nail folds. It can be either acute or chronic. It often occurs after injury or minor trauma and is caused by *Staphylococcus aureus or Streptococcus pyogenes,* or by drugs (in acute cases), or by repeated exposure to irritants or allergens (chronic cases).

Clinical Presentation

- Painful, erythematous, and swollen proximal and lateral nail folds
- A superficial abscess is frequently present.

Non-Pharmacological Management

- Keep hands dry
- Warm water or antiseptic soaks

Pharmacological Management

C: mupirocin (topical) ointment 12hourly for 7days

OR

C: fusidic acid (topical) cream 12hourly for 7days

AND

C: betamethasone valerate (topical) 12hourly for 14 days

OR

S: tacrolimus ointment (topical) 12hourly for 14 days

ADD systemic therapies for severe disease

B: cefalexin (PO) 250 to 500mg; paediatric 25-50 mg/kg 6hourly for 7days

OR

B: amoxicillin + clavulanic acid 625mg (PO) 8hourly for 7days

OR

S: clindamycin (PO) 300mg 12hourly for 14 days

AND

D: itraconazole (PO) 200mg 24hourly for 14 days (for chronic diseases)

Note: Acute paronychia with abscess is treated with incision and drainage

13.2 Fungal Skin Infections

13.2.1 Tinea Corporis

Tinea corporis is a superficial fungal infection (dermatophytosis) of the skin of the trunk and extremities, excluding the hair, nails, palms, soles, and groin.

Clinical Presentation:

- Annular lesions with central clear
- Hair loss in areas of infection
- Associated with slight itching
- Fine scales may be present



Investigation
Skin scraping for KOH, Skin scraping for fungal culture.

Pharmacological Management
A: benzoic acid compound ointment (topical) 12hourly for 2-4 weeks.
OR
A: clotrimazole cream (topical) apply 12hourly for 2-4 weeks
OR
C: miconazole cream (topical) apply thinly 12hourly for 2-4 weeks
OR
C: terbinafine cream (topical) 12hourly for 2-4 weeks
OR
C: luliconazole cream (topical) 12hourly for 2-4 weeks

If extensive and refractory infections or for immunodeficient patient:
C: terbinafine (PO) 250mg; paediatric 62.5mg/ 10-20kg; 125mg/ 21-40 kg; 250mg/ above 40kg; 24hourly for 2-4 weeks
OR
D: itraconazole (PO) 200mg; paediatrics 3-5mg/kg 24hourly for 2-4 weeks

13.2.2 Tinea Capitis

It is a common superficial fungal infection (dermatophyte) of the scalp in children.

Clinical Presentation:
- Single or multiple patches with hair loss
- Fine scales may be present
- Associated with itching



Investigations:
Skin scraping for KOH, Skin scraping for fungal culture.

Pharmacological Management
A: griseofulvin (PO): Adult 500 mg; Paediatric 10-20mg/kg 24hourly for 4-6weeks
OR
C: terbinafine (PO): Adult 250mg; paediatric 62.5mg/ 10-20kg; 125mg/ 21-40kg; 250mg/ above 41kg 24hourly for 4-6 weeks

13.2.3 Tinea Pedis (Athlete's Foot), Tinea Manuum and Tinea Cruris

Tinea Pedis is a common fungal infection of the toes, while Tinea Manuum affects the palms and interdigital spaces. Both Tinea Pedis and Manuum are often the source of infection at other sites, especially the groin (Tinea Cruris).

Clinical Presentation

Tinea Pedis	Tinea Manuum	Tinea Cruris
• Pruritic erosions or scales between the toes or • Diffuse scale on the plantar surface and side of the foot or • Vesicles and bullae on the plantar or sides of the feet	• Hyperkeratotic eruption on the palm or annular plaques	• Erythematous or hyperpigmented patch on groin • Itching

Investigations:
Skin scraping for KOH, Skin scraping for fungal culture.

Non-Pharmacological Management
- Frequent change of socks/footwear or underwear.
- Use of cotton socks or underwear.
- Keep the spaces between toes as dry as possible after bathing, always

Pharmacological Management:
A: clotrimazole cream (topical) apply 12hourly for 2-4 weeks
OR
C: miconazole cream (topical) apply thinly 12hourly for 2-4 weeks
OR
C: terbinafine cream (topical) 12hourly for 2-4 weeks
OR
C: luliconazole cream (topical) 12hourly for 2-4 weeks

If extensive and refractory infections

For Adults
C: terbinafine (PO) 250mg 24hourly for 2-4weeks

For paediatrics
10-20kg 62.5mg 24hourly for 2-4weeks;
21-40 kg 125mg 24hourly for 2-4weeks;
40 kg and above 250mg 24hourly for 2-4weeks

OR

For Adults
D: itraconazole (PO) 200mg 24hourly for 2-4 weeks

For paediatrics
3-5mg/kg 24hourly for 2-4 weeks

13.2.4 Tinea Unguium (Onychomycosis)

It is a chronic fungal infection of the toenails or fingernails. It is more common in adults than in children. Patients with diabetes, advanced age, obesity, smoking, or peripheral neuropathy may be at a higher risk.

Clinical Presentation:
- White, yellow, or brown discoloration of the distal corner of the nail
- Subungual hyperkeratosis and onycholysis

Investigations:
KOH preparation, Fungal Culture and Sensitivity.

Non-Pharmacological Management
- Maintain foot hygiene
- Keep nails trimmed back
- Avoid occlusive shoes
- Wear flip flops/sandals in areas of high fungal density, e.g., communal showers

Pharmacological Management
A: fluconazole (PO) 150-300mg once weekly for 6–12 months
OR
C: terbinafine (PO) 250mg; paediatric 62.5mg/ 10-20kg; 125mg/ 21-40 kg; 250mg/ above 40kg; 24hourly for 6-12 weeks
OR
D: itraconazole (PO) 200mg, paediatrics 3-5mg/kg, 24hourly for 6-12 weeks

13.2.5 Pityriasis Versicolor

It is a common fungal infection caused by yeast of the genus *Malassezia*.

Clinical Presentation:
- Hypo/hyperpigmented macules and confluent patches with fine scales
- Commonly occurs on the chest, back, arms, and occasionally the neck and face

Investigation
Skin scraping for KOH

Pharmacological Management
A: clotrimazole cream (topical) 12hourly for 4 weeks
OR
C: miconazole nitrate cream (topical) 12hourly for 4 weeks
OR
C: ketoconazole shampoo (topical) 3 times per week for 4weeks
OR
C: luliconazole cream (topical) 12hourly for 4 weeks

If extensive and refractory or recurrent infections add:
A: fluconazole (PO) 300mg weekly for 2-4 weeks
OR
D: itraconazole (PO) 200mg, paediatrics 3-5mg/kg, 24hourly for 2-4 weeks

13.2.6 Intertrigo

It is a common inflammatory condition affecting skin folds. Usually triggered or aggravated by warm temperatures, friction, moisture, maceration, and poor ventilation. Intertrigo is often worsened by infection, most commonly with Candida.

Clinical Presentation:

- Moist, erythematous, dyspigmented, homogenous patch
- Most occur in the groin, axillary area, inframammary area and umbilicus
- Associated with burning, tenderness, pruritus, and/or a malodorous discharge



Investigation:
Skin scraping for KOH

Non-Pharmacological Management

- Daily cleansing of intertriginous skin, followed by drying the affected area.
- Use of absorbent material or clothing, such as cotton, to separate the skin in folds.
- Weight loss in persons who are overweight or obese.

Pharmacological Management
A: clotrimazole cream (topical) 12hourly for 2-4 weeks
OR
C: miconazole cream (topical) apply 12hourly for 2-4 weeks
OR
C: ketoconazole cream (topical) apply 12hourly for 2-4 weeks
AND
A: hydrocortisone cream/ointment (topical) 12hourly for 2-4 weeks

13.2.7 Mycetoma (Madura Foot)

Mycetoma is a chronic disease usually of the foot, but any part of the body can be affected. Infection is most probably acquired by traumatic inoculation of fungi (eumycetoma) or bacteria (actinomycetoma) into the subcutaneous tissue.

Clinical Presentation:

- Painless firm subcutaneous mass
- Discharge containing macroscopic or microscopic grains
- Sinus tracts
- The foot is the most common site of infection, followed by the hand, trunk, and scalp

Investigations:

- Skin biopsy for histology
- X-Ray OR/AND CT scan
- Grains or tissue for culture and sensitivity

13.2.7.1 Eumycetoma

Non-Pharmacological Management
Surgical Interventions

Pharmacological Management
D: itraconazole (PO) 200mg 12-hourly for 12 months

13.2.7.2 Actinomycetoma

Pharmacological Management
A: sulfamethoxazole + Trimethoprim (PO) 480mg–960mg 12hourly for 5weeks
AND
S: amikacin (IV) 7.5mg/kg 12hourly for 5 weeks
OR
A: sulfamethoxazole + Trimethoprim (PO) 480mg–960 mg 12hourly for 5 weeks
AND
S: dapsone (PO): adult 100mg 24hourly for 2–4months; Paediatric 25–50mg 24-hourly for 5 weeks

13.3 Parasitic Infestations

13.3.1 Scabies

Scabies is an intensely pruritic and highly contagious infestation of the skin caused by the mite *Sarcoptes scabies.*

Clinical Presentation:

- Erythematous papules and vesicles, burrows, and intense pruritus worse at night
- Common sites include fingers, wrists, periumbilical skin, waist, genitalia and buttocks

Investigation
Skin scraping for KOH

Non-Pharmacological Management

- Treat all members of the household at the same time to prevent reinfection
- Wash and dry bedding and clothing using hot water and drying in direct sunlight
- Avoidance of skin-to-skin contact with the patient until at least eight hours after treatment

Pharmacological Management
A: benzyl benzoate emulsion (BBE), (25% for adults, 6.25% or 12.5% for children), apply for 3 consecutive nights and repeat after 7 days
OR
A: sulfur ointment/cream (topical) applied as BBE above
OR
A: ivermectin (PO) 200mcg/kg stat then repeat after 1 or 2 week(s)
AND
C: betamethasone valerate cream (topical) 12 hourly for 2 weeks
AND
A: cetirizine (PO) 10mg 24hourly at night for 2 weeks
OR
C: loratadine (PO) 10mg 24hourly at night for 2weeks

13.4 Viral Infections

13.4.1 Herpes Simplex

It is an acute viral infection caused by Herpes simplex virus hominis (types HSV1, HSV2 acquired by close contact with an infected individual (**Management refer to the STI chapter)**

13.4.2 Chicken Pox

It is a highly infectious disease caused by the *Varicella zoster* virus (VZV). Most often benign and self-limiting, chickenpox is one of the most common childhood diseases.

Clinical Presentation

- Prodrome of fever, malaise, or pharyngitis
- Followed by lesions that begin as macules that become papules, followed by vesicles
- Intense pruritus
- Occasional regional lymphadenopathy

Pharmacological Management
B: acyclovir (PO) 800mg; paediatric 20mg/kg; 6hourly for 7 days
AND
A: paracetamol (PO)1g; paediatric 10mg/kg; 8hourly for 3 days
AND
A: calamine lotion (topical)l, apply over the whole body 12 hourly for 7 days

13.4.3 Herpes Zoster (Shingles)

It is due to the resurgence or reactivation of the Varicella zoster virus infection, which also causes chickenpox.

Clinical Presentation

- Grouped vesicles overlying erythematous skin following a dermatomal distribution; typically, lesions do not cross the midline
- Severe burning pain

Pharmacological Management
B: acyclovir (PO) 800mg, paediatric 20 mg/kg 6hourly for 7–10days

For Secondary infection (bacterial), apply
Refer to the management of impetigo or cellulitis.

Post-Herpetic Neuralgia:
A: amitriptyline (PO) 25mg at night, may be increased to 150mg at night for 4 weeks
OR
D: pregabalin (PO) 75-150mg 24 hourly or divided doses for 2-4weeks

13.4.4 Molluscum Contagiosum

Molluscum contagiosum (MC) is a benign infection caused by a member of the Poxviridae family, namely molluscum contagiosum virus (MCV). It infects only the skin and, rarely, the mucous membranes.

Clinical Presentation:

- Presents with normochromic or yellowish papule with central umbilication
- May be asymptomatic or accompanying with itching
- The most common areas include the trunk, axillae, antecubital and popliteal fossae, and crural folds.



Non-Pharmacological Management
Surgical procedures
C: Cryotherapy
OR
D: curettage

Pharmacological Management
A: benzoyl peroxide (topical) 10% 24hourly for 4-8 weeks
OR
S: tretinoin cream (topical) 0.5% at night for 4-8 week
OR
S: imiquimod cream (topical) 3 times per week for 8-16 weeks

13.4.5 Cutaneous Warts

Infections due to *Human Papilloma Virus* include: common warts, plane warts, plantar warts, and oral warts.

Clinical Presentation:

- Verrucous papules on the body, palms, soles, genital, and oral mucosa.
- Painful on applying pressure to warts on palms and soles.

Non-Pharmacological Management
C: cryotherapy
OR
D: curettage
OR
D: excision of large warts

Pharmacological Management
C: salicylic acid (topical) 20-40% at night for 4-8 weeks
OR
S: tretinoin cream (topical) 0.5% at night for 4-8 weeks
OR
C: silver nitrate pencil 3 times per week for 4 weeks for plantar, common warts.
OR
S: imiquimod cream (topical) 3 times per week for 8-16 weeks

13.5 Eczema (Dermatitis)

13.5.1 Atopic Eczema (Dermatitis)

It is a chronic, itchy, inflammatory skin condition that affects both children and adults. AD is often linked to a personal or family history of atopy, which includes eczema, asthma, and allergic rhinitis.

Clinical Presentation:

- Acute forms are weepy, chronic forms are lichenified, scaly
- Pruritus
- Eary age at onset
- Chronic or relapsing course
- Positive personal and/or family history of atopy
- Xerosis



Acute AD: Erythema on the cheek



Chronic AD: *Lichenification and scaling*

Investigations
Serum IgE Level, FBP, Patch test, Prick Test

Non-Pharmacological Management

- Education on the condition
- Maintaining skin hydration by reducing frequency of bathing
- Applying emollients or moisturizers immediately after bathing
- Removing the exacerbating factors such as irritants and allergens e.g., fragranced soaps, rough wool clothing, perfumes, detergents

Pharmacological Management

Mild Atopic Eczema

A: hydrocortisone cream/ointment (topical) 12 hourly (face/skin folds)

OR/AND

C: betamethasone valerate cream/ointment (topical) 12 hourly (other body parts)

OR

S: tacrolimus Ointment (face or skin folds) (topical) 12hourly

Moderate Atopic Eczema

A: cetirizine (PO) 10mg 24hourly for 2 weeks

OR

C: loratadine (PO) 10mg 24hourly for 2weeks

AND

A: hydrocortisone cream/ointment (topical) 12 hourly (face/skin folds)

AND

C: betamethasone valerate cream/ointment (topical) 12hourly (other body parts)

OR

C: betamethasone dipropionate cream/ointment (topical) 12hourly

OR

S: mometasone furoate cream/ointment (topical) 24hourly

Severe Atopic Eczema (e.g., erythroderma)

A: prednisolone (PO) 0.5 -1mg/ kg 24hourly for 1-2weeks (short course)

AND

S: methotrexate (PO) 7.5- 20mg, paediatric 0.2-0.5mg/kg weekly for >3 months

OR

S: cyclosporine 3-5mg/kg/day up to 3months

AND

A: cetirizine (PO) 10mg 24hourly for 2 weeks

OR

C: loratadine (PO) 10mg 24hourly for 2weeks

OR

S: desloratadine (PO) 5mg 24hourly for 2 weeks

AND

S: phototherapy

Note: Cyclosporine and methotrexate should be reserved for most severe cases in older children, adolescent and adults

Treatment of Infection in Atopic Eczema

Type of infection	Clinical Presentation	Treatment
Impetigo	• Polycyclic flaccid vesicles or bullae with clear yellow fluid	Refer to Treatment of Impetigo
Eczema Herpeticum	• Disseminated non-grouped vesicular eruptions and pustules on erythematous lesions	**B:** acyclovir cream (topical) applied 4hourly for 7–10days **OR** **B:** acyclovir (PO) 200mg 6hourly for 7–10days, (especially if severe)
Dermatophyte	• Depend on the type of Tinea	Refer to section on fungal infection

13.5.2 Contact Eczema (Dermatitis)

Contact dermatitis is a common inflammatory skin condition characterized by erythematous and pruritic skin lesions that occur after contact with a foreign substance. There are two forms of contact dermatitis: irritant and allergic. Common allergens and irritants include nickel, rubber, fragrances (Perfumes), topical antibiotics, water, soaps, cleansers, acids and alkalis.

Clinical Presentation:

- Well-demarcated, erythematous, vesicular and/or scaly patch or plaque
- Acute-blisters, weeping and oedema
- Chronic-lichenification, hyperkeratosis and fissuring
- Itching or painful, may be severe
- The distribution can be linear or localized



Nickel allergy

Investigations:
Patch testing

Non-Pharmacological Management

- Avoid contact with the allergen or irritant
- Using moisturizers multiple times per day
- Avoid water, soap, oil, overheating, sweat, dust, and friction irritation, from doing further damage to the skin barrier

Pharmacological Management
C: betamethasone valerate cream/ointment (topical) 12hourly for 4weeks
OR
S: tacrolimus Ointment (face or skin folds) (topical) 12hourly
OR
(For moderate cases)
S: mometasone furoate cream/ointment (topical) 24hourly for 4weeks
OR
(For severe cases)
D: clobetasol propionate cream/ointment (topical) 24hourly for 4weeks

Note: A single application with occlusion at night is often more effective than multiple daytime applications.

13.5.3 Seborrheic Eczema (Dermatitis)

It is a chronic, relapsing, and usually mild form of dermatitis confined to skin regions with high sebum production and the large body folds. It is associated with the commensal yeast Malassezia.

Clinical Presentation:

- Erythematous patches or plaques with greasy-looking
- Distributed on areas rich in sebaceous glands, such as the scalp, ear, face, chest, back and the intertriginous area

Pharmacological Management
A: clotrimazole cream (topical) 12 hourly for 4-6weeks
OR
C: miconazole cream (topical) 12 hourly for 4-6weeks
OR
C: ketoconazole shampoo (topical) 3 times per week for not less than 3 months
AND
A: hydrocortisone cream (topical) 12 hourly for 4-16weeks
OR
C: betamethasone valerate cream/ointment 12hourly for 4-6 weeks
OR
S: tacrolimus Ointment (topical) (face or skin folds) 12 hourly for 4-6 weeks

13.6 Anaphylaxis

It is an acute and often life-threatening immunologic reaction, frequently heralded by scalp pruritus, diffuse erythema, urticaria, or angioedema. Bronchospasm, laryngeal edema, hyperperistalsis, hypotension, and cardiac arrhythmia may occur. Antibiotics (especially penicillin), other drugs, and radiographic contrast agents are the most common causes of serious anaphylactic reactions.

Management: Refer to chapter on approach to patients with emergency conditions

13.7 Papulosquamous and Lichenoid Disorder

13.7.1 Psoriasis

Psoriasis is a common, chronic inflammatory skin condition that can present with various clinical forms. Types of psoriasis include chronic plaque psoriasis, guttate psoriasis, erythrodermic psoriasis, and pustular psoriasis.

Clinical Presentation:

- Thick, silvery-white, scaly plaques mainly affecting the scalp, sacral region, and extensor surfaces of the body.
- Usually symmetrically distributed, with a chronic relapsing course.
- Can involve joints (psoriatic arthritis)

Investigations:
Skin biopsy

Non-Pharmacological Management
Phototherapy

Pharmacological Management
C: betamethasone valerate ointment (topical) 12hourly for not less than 12weeks.
OR
C: betamethasone dipropionate and salicylic ointment (topical) 12hourly for not less than 4months
OR
D: clobetasol propionate ointment (topical) 24hourly for not less than 4months (severe disease)
OR
S: tacrolimus Ointment (topical) (face or skin folds) 12hourly for not less than 4 months
AND
C: coal tar (topical) 5-10% in Vaseline in the morning for not less than 3 months
AND
C: salicylic acid (topical) 5-10% in Vaseline to de-scale, apply at night for not less than 3 months

For severe or extensive disease:
ADD
S: methotrexate (PO) 7.5-20mg with folic acid supplementation weekly for not less than 6 months
OR
S: cyclosporine (PO) 3-5mg/kg/day up to 3months
OR
S: adalimumab (SC) 80mg stat, then 40mg weekly for 6 weeks

Note: Systemic steroids should not be used in psoriasis due to their rebound effect.

13.7.2 Pityriasis Rosea

Pityriasis rosea (PR) is an acute, self-limiting exanthematous disease that primarily affects children and young adults aged between 10 and 35 years. A large body of evidence supports the causal role of the endogenous systemic active human herpesvirus (HHV)-6 and HHV-7 infections in PR pathogenesis.

Clinical Presentation:

- Prodromal symptoms such as mild fever, sore throat, headache and loss of appetite
- Begins with a "herald" or "mother" patch, a single round or oval lesion on the chest, neck, or back
- Secondary eruption consisting of smaller papulosquamous lesions along the cleavage lines of the skin in a distribution that resembles a “Christmas tree’’
- Pruritus is usually mild or absent

Pharmacological Management
A: hydrocortisone cream (topical) 12hourly for 4-16weeks
OR
C: betamethasone valerate cream/ointment (topical) 12hourly for 4-6 weeks
OR/AND
A: prednisolone (PO) 0.5 -1mg/kg 24hourly for 1-2weeks (short course)
AND
B: acyclovir (PO) 400mg; pediatric 20mg/kg; 8hourly for 7 days

13.7.3 Lichen Planus

Lichen planus (LP) is a chronic lichenoid inflammatory disorder of the skin, mucosa, and appendages. Viruses, drugs, and contact allergens have been reported to be possibly associated with the development of LP.

Clinical Presentation:

- Pruritic, purple, polygonal, flat-topped papules or/and plaques
- Typical locations are the wrists, lower back, and ankles

Investigations:

- Skin biopsy
- Hepatitis C antibodies (patient with high risk)

Non-Pharmacological Management
S: Phototherapy

Pharmacological Management

C: betamethasone valerate ointment (topical) 12hrly for 2–4 weeks
OR
D: clobetasol propionate ointment (topical) 24hourly daily for 2–4weeks
AND
A: cetirizine (PO) 10mg 24hourly for 2 weeks
OR
C: loratadine (PO) 10mg 24hourly for 2weeks
OR
S: desloratadine (PO) 5mg 24hourly for 2 weeks

For extensive involvement:
A: prednisolone (PO) 0.5-1 mg/kg 24hourly for 3-4weeks then taper

For recalcitrant cases:
S: methotrexate (PO) 7.5-20mg weekly for not less than 6months with folic acid supplementation.

13.8 Acne

Acne is a multifactorial disorder of the pilosebaceous unit. It is common among adolescents and young adults, but is not restricted to these age groups. Acne variants include Post-Adolescent Acne, Acne Conglobata, Neonatal Acne, and Infantile Acne.

Clinical Presentation:

- Open and closed comedones
- Papules, pustules, nodules and cyst
- Commonly affects the face, neck, chest, upper back and upper arms

Investigations
Laboratory tests and radiologic imaging are limited to patients who exhibit signs of associated diseases (Hyperandrogenism and SAPHO syndrome) or acne fulminans.

Non-Pharmacological Management

- Avoid picking of acne lesions
- Avoid aggressive scrubbing of the skin
- Avoid underlying precipitating factors, e.g., stress, nuts, chocolate, overuse of ointments on skin, steroids, anticonvulsant drugs, etc.
- Use non-comedogenic moisturizers.
- Photodynamic therapy
- Laser therapy

Pharmacological Management

	Mild to Moderate Acne	Severe Acne
First Line	**A:** benzoyl peroxide (topical) 2.5-10% once AM for 2-3 months **AND** **S:** tretinoin cream (topical) 0.025/0.55% once nocte for 2-3 months **OR** **S:** adapalene gel (topical) 0.1% once nocte for 2-3 months	**A:** doxycycline (PO) 100mg 24hourly for 1–3 month **OR** **A:** erythromycin (PO) 250mg 6hourly for 1–3 month **AND** **A:** benzoyl peroxide (topical) 2.5-10% once AM for 2-3 months **AND** **S:** tretinoin cream (topical) 0.025/0.55% once nocte for 2-3 months **OR** **S:** adapalene gel (topical) 0.1% once nocte for 2-3 months

	Mild to Moderate Acne	Severe Acne
Second line	**A:** doxycycline (PO) 100mg 24hourly for 1–3 month **OR** **A:** erythromycin (PO) 250mg 6hourly for 1–3 month **AND** **A:** benzoyl peroxide (topical) 2.5-10% once AM for 2-3 months **OR** **S:** tretinoin cream (topical) 0.025/0.55% once nocte for 2-3 months **OR** **S:** adapalene gel (topical) 0.1% once nocte for 2-3 months	**S:** isotretinoin (PO) 0.025–0.5mg/kg 24hourly for at least 3–6 months **AND** **A:** prednisolone (PO) 0.5-1mg/kg for 2-4 weeks **Other alternatives:** **A:** ethinylestradiol 30mcg+Levonorgestrel 150mcg (PO) once for 3-6 cycles (in females) **OR** **C:** spironolactone (PO) 25-50mg once for 3-6 months (in females)

Note: Retinoids such as isotretinoin, tretinoin and adapalene are contraindicated in pregnant women or individuals who may become pregnant during or within one month after therapy.
COCs are contraindicated in pregnancy, smoking, history of venous thromboembolic disease and uncontrolled hypertension.

Management of Acne Complications:

Post-inflammatory hyperpigmentation	Scarring
B: sunscreen SPF 30+ or above, applied at least twice a day, AM and Noon **AND** **S:** tretinoin cream (topical) 0.025/0.55% once nocte for 2-3 months **OR** **S:** superficial chemical peels	**S:** laser therapy **OR** **S:** chemical peels **OR** **S**: injectable soft tissue fillers **OR** **S**: micro needling

13.9 Cutaneous Drug Reactions:

It is a response to a medicinal product that is noxious and unintended. Up to 80% of Adverse drug reactions are dose-dependent and predictable, while about 20% are independent of the administered dose and unpredictable.

Classification of adverse drug reactions:

Type A: Predictable adverse reactions	Type B: Unpredictable adverse reactions
• Over dosage (wrong dosage or defect in drug metabolism) • Side effects (sleepiness from antihistamines) • Indirect effects (antibiotics changing normal flora) • Drug interactions (altered metabolism of drugs; most commonly involving the cytochrome P-450 enzymes)	• Allergic reaction (drug allergy or hypersensitivity; immunologic reaction to drug; requires previous exposure or cross-reaction) • Pseudo allergic reaction (non-immunologic activation of mast cells). • Idiosyncratic reaction (unexplained reaction, not related to mechanism of action, without known or suspected immunologic mechanism).

Note:80% of allergic and pseudo allergic drug reactions are caused by Beta-lactam antibiotics, aspirin, NSAIDs and sulfonamides

Non-life-threatening cutaneous adverse drug reactions may include fixed drug eruption (FDE), urticaria, exanthematous drug eruptions, and lichenoid drug eruption, while life-threatening cutaneous adverse reactions include toxic epidermal necrolysis (TEN), Stevens-Johnson syndrome (SJS), acute generalized exanthematous pustulosis (AGEP), and drug reaction with eosinophilia and systemic symptoms (DRESS).

13.9.1 Fixed Drug Eruption (FDE)

It is a cutaneous drug reaction that recurs at the same site with repeated exposure to the agent.

Clinical Presentation

- Well-demarcated, round to oval, dusky red to brown/black macules that may develop into edematous plaques with or without vesiculation or blistering.
- Pruritus and a burning or stinging sensation are common.

Non-Pharmacological Management
Avoidance of a triggering drug

Pharmacological Management

A: hydrocortisone (IV) 200mg 12hourly for 24hours for 2-4 weeks

OR

C: betamethasone valerate cream (topical) 12hourly for 2-4 weeks

OR

D: clobetasol propionate cream/ointment (topical) 24hourly for 2- 4weeks

13.9.2 Stevens-Johnson Syndrome (SJS) and Toxic Epidermal Necrolysis (TEN)

They are rare and life-threatening mucocutaneous conditions caused by immune system activation, most commonly initiated by certain drugs and their metabolites or infections. In SJS, <10% of BSA is affected by skin detachment, 10–30% is an overlap area between SJS and TEN, and >30% is defined as TEN.

Clinical Presentation

- Prodromal symptoms with fever, malaise, sore throat, and arthralgia
- Early Lesions are ill-defined, erythematous, and coalescing macules
- Within days, blistering and detachment of the epidermis with light pressure (positive Nikolsky sign) occur
- All mucosal surfaces can be involved, including the buccal, oro/nasopharyngeal, and anogenital mucosa
- Eye involvement is common

Investigations

- Skin biopsy
- FBP
- Serum electrolyte
- Serum glucose
- Creatinine
- Total protein
- Serum albumin
- Serum BUN
- Skin or blood culture and sensitivity

Non-Pharmacological Management

- Multi-disciplinary approach involving dermatologist, ophthalmologist, gynecologist and physician
- Withdrawal all suspected drugs
- If SCORTEN is 0-1, admit into normal ward, if 2 or more admit to ICU
- Keep warm at 28-30^0 C
- Encourage high protein diet
- Avoid debridement and consider detached epidermis as natural biological dressing
- Fluid replacement with electrolyte solution 2ml/kg/%BSA in the 1st 24 hours

Pharmacological Management

A: paracetamol (PO) 1g; paediatric 15 mg/kg, 6hourly, for 3 days **(mild pain)**

OR

A: diclofenac (IM) 50-100mg stat **(moderate pain)**

OR

C: morphine (IV) 0.1mg/kg stat **(severe pain)**

AND

A: hydrocortisone (IV) 200mg 12hourly for 48hours

OR

A: prednisolone (PO) 1-2mg/kg 24hourly for 5-7 days

AND

S: cyclosporine (PO) 3-5mg/kg/day for 7-10 days

Note:

- Antibiotics should only be given if there are signs of infection and should be guided culture results
- Systemic therapies (corticosteroids and cyclosporine), if employed, should be used within 24 to 48 hours of symptom onset

13.10 Pellagra

It is a nutritional disorder caused by a deficiency of vitamin B3 (niacin) and/or tryptophan. It is characterized by four D's: photosensitive dermatitis, diarrhoea, dementia, and, if not treated, death.

Clinical Presentation:

- Casal necklace: hyperpigmented scaling affecting the neck area
- Hyperpigmented scaly lesions on sun-exposed areas

Non-Pharmacological Management

- Topical emollients at least four times per day
- Encourage a high-protein diet

Pharmacological Management:
B: sunscreen (topical) SPF 30+ or above, applied at least twice a day, AM and Noon
AND
A: hydrocortisone ointment (topical) 12-hourly (if mild disease, or on face) for 4 weeks
OR
C: betamethasone valerate cream/ointment (topical) 12-hourly for other parts of the body for 4 weeks
AND
C: nicotinamide (PO) 50-100mg; paediatric 5mg/kg in three divided doses, 24 hourly for 4 weeks

13.11 Pigmentary Disorders

13.11.1 Vitiligo

Vitiligo is an acquired disorder characterized by circumscribed depigmented macules and patches resulting from a progressive loss of functional melanocytes. It is associated with other autoimmune diseases, such as autoimmune thyroid disease, adult-onset insulin-dependent diabetes mellitus, and lupus erythematosus.

Clinical Presentation:

- Asymptomatic depigmented macules and patches
- Depigmented hairs are often present in lesional skin
- Affects more on the face and areas around the orifices, genitals, and hands



Investigations
Thyroid function test

Non-Pharmacological Management

- Avoiding Koebnerizing factors (friction, trauma)
- Moderate UV light exposure
- **S:** phototherapy (Disseminated Vitiligo)

Pharmacological Management

Stabilization of the disease:	**Regimentation:**
A: prednisolone (PO) 10-20mg; paediatric 5-10mg, 24hourly for 14 days **OR** **S:** phototherapy (PUVA or NBUVB) (Disseminated vitiligo)	**C:** betamethasone valerate ointment/cream 12hourly for 3-6 months **OR** **S:** mometasone furoate cream/ointment (topical) 24hourly for 3-6 months **OR** **S:** tacrolimus ointment (topical) 12hourly for 3-6 months (face, folds or mucous membrane) **OR** **D:** clobetasol cream/ointment (topical) 24hourly for 3-6 months **OR/AND**

13.11.2 Melasma

Melasma is a common and chronic acquired disorder characterized by symmetric, hyperpigmented patches that typically occur on the face. It is more common in females.

Clinical Presentation:

- Bilateral and symmetrical hyperpigmented macules or patches with an irregular border
- May affect the forehead, nose, cheeks, upper lip area, and chin



Non-Pharmacological Management

- Sun protection by wearing a wide-brimmed hat
- Camouflage if desired

Pharmacological Management

S: tretinoin cream (topical) 24hourly (at night) for 3-6 months **AND** **B:** sunscreen SPF 30+ or above, applied at least twice a day, AM and Noon	**Alternative Therapies:** **S:** laser therapy' **OR** **S:** chemical Peels

13.11.3 Oculocutaneous albinism

Oculocutaneous albinism (OCA) is a genetic disorder characterized by the complete or partial absence of melanin pigment in the skin, hair, and eyes. Reduced skin pigmentation leads to photosensitivity and increased skin cancer risk.

Clinical Presentation:

- Ocular findings: Photophobia, reduced visual acuity, strabismus, nystagmus, and lack of binocular vision.
- Complete or partial absence of pigmentation on the skin, hair and eyes

Non-Pharmacological Management

- Avoiding UV exposure during the pick hours (10AM-4PM)
- Use of protecting clothing such as wide-brimmed hats, shirts with a collar, long sleeves, long pants, and socks
- Skin examination at 6 months interval
- Wearing of sun-protective glasses
- Genetic counselling to individuals and family on the condition

Pharmacological Management
B: sunscreen SPF 30+ or above, applied at least twice a day, AM and Noon

Surgical Treatment:

- Cryotherapy of pre-malignant lesions (Actinic Keratosis)
- Wide excision of the malignant lesions

13.11.4 Xeroderma Pigmentosum

A rare autosomal recessive disease with hyper photosensitivity, photophobia, early onset of freckling, and cutaneous malignancies, associated with abnormal DNA repair.

Clinical Presentation

- Lentigens and freckles
- Multiple dry, scaly, mottled hyperpigmented and hypopigmented macules (Pigmentary changes)
- Extreme photophobia



Management
Refer to the management of oculocutaneous albinism.

13.12 Pruritic Papular Eruption (PPE)

A skin condition characterized by itchy papular eruptions on the extensor area of the upper and lower limbs, which is associated with HIV infection.

Clinical Presentation:

- Sever itchy papules more on the extensors
- Extensive excoriation with subsequent scarring
- Post-inflammatory hyperpigmentation is often the most visible manifestation

Pharmacological Management
C: betamethasone valerate cream (topical) 12hourly for 3–4weeks
OR
D: clobetasol propionate ointment (topical) 24hourly for 2–4weeks
AND
A: cetirizine (PO) 10mg 12hourly for not less than 4weeks
OR
C: loratadine (PO) 10mg 24hourly for not less than 4weeks

13.13 Urticaria and Angioedema

Urticaria is the sudden development of transient wheals (superficial dermal swellings) and angioedema (deep dermal swellings) or both. It can be acute or chronic, spontaneous or inducible. It can be induced by viral infections, bacterial infections, food allergies, drug allergies, colds, heat, or tight clothing, among other factors.

Clinical Presentation:

- Wheals that come and go rapidly within 24 hours
- Wheals may be small or large, as well as single or multiple
- Wheals can co-exist with angioedema

Investigations:

- FBP
- CRP or ESR
- TSH
- Prick and Patch test
- H. Pylori stool antigen
- Stool for OVA

Non-Pharmacological Management

- Avoid precipitating factors, e.g., NSAIDs, food, spices
- Treatment of the underlying disorder

Pharmacological Management:

Step One (monotherapy)	Step two
A: cetirizine (PO)10mg 24 hourly for 2-4 weeks **OR** **C**: loratadine (PO) 10mg 24 hourly for 2-4 weeks **OR** **S**: desloratadine (PO) 5mg 24 hourly for 2-4 weeks	If step 1 does not control the symptoms increase the dose of antihistamine 1 in step 1 up to 4 folds or **ADD** **D**: montelukast (PO) 10mg 24 hourly for 4-8 weeks

13.14 Connective Tissue Diseases

They are autoimmune diseases of unknown aetiology that affect the skin,, blood vessels and internal organs. These diseases include scleroderma, lupus erythematosus, and dermatomyositis or polymyositis.
For Clinical Presentation, investigation, and treatment, refer to the rheumatology chapter 26.

13.15 Autoimmune Blistering Diseases

They are a group of disorders characterized by the formation of blisters on the skin and/or mucous membranes due to an abnormal immune response that damages the skin's structural components. These include Pemphigus Vulgaris, Pemphigus Foliaceous, Bullous Pemphigoid, Dermatitis Herpetiformis, Linear IgA Dermatoses, and Cicatricial Pemphigoid.

Clinical Presentation

- Tense or flaccid vesicles and bullae on the skin and mucus membranes
- Lesions breaks and leaving erosions
- Some are associated with itching



Bullous Pemphigoid



Linear IgA dermatosis

Investigations

- Skin biopsy for histopathology
- Skin biopsy for direct immunofluorescence
- Indirect immunofluorescence assay

Pharmacological Management

C: betamethasone cream/ointment (topical) 12hourly for 4-8 weeks (limited diseases)
OR
D: clobetasol propionate cream/ointment (topical) 24hourly for 4-8 weeks (limited disease)
AND/OR
A: prednisolone (PO) 0.5-1mg/kg 24hourly for 2 months, then taper slowly to the lowest effective dose
AND
S: methotrexate (PO) 10 – 15 mg weekly for not less than 4months with folic acid supplementation
OR
S: mycophenolate mofetil (PO) 1g/day for not less than 4months
OR
S: rituximab (IV) 375 mg/m^2 weekly for 4 weeks

For Treatment of Dermatitis Herpetiformis
S: dapsone (PO)100mg 24hourly for not less than 2months

13.16 Keloids and hypertrophic scars

Excessive connective tissue proliferation following an injury or spontaneously.

Clinical Presentation
Skin colored nodules or plaques within or extending beyond the scar line, commonly on the earlobes, Associated with pain and itching.

Pharmacological Management
S: triamcinolone (intralesional) 2.5-5mg/ml monthly for 6-9 months
AND
D: clobetasol propionate ointment (topical) 24hourly for 6-9 months

Surgical and other treatment:
D: cryotherapy followed by Inj. Triamcinolone (intralesional) 2.5-5mg/ml monthly for 6-9 months
OR
D: total excision or debulking of keloids followed by injection of Triamcinolone 20mg intraoperatively and postoperatively for 3 months.
OR
S: radiotherapy (within 24 hours)
OR
S: laser therapy

13.17 Infantile Hemangioma

Benign vascular tumour which appears at birth as a mark and continues growing till 6-12 months, then starts involuting. May be part of PHACE(S) syndrome or LUMBAR syndrome.

Clinical Presentation
- A patch of telangiectasias with surrounding pallor at birth
- 80% of cases present as a single lesion only, 20% lesions are multiple
- Have a predilection for the head and neck, although they can occur anywhere in the skin, mucous membranes, or internal organs

Investigations
- FBG before initiating treatment and serially after
- ECG (ECHO)- Rule out cardiac insufficiency, cardiac or aortic anomaly
- Doppler USS- Evaluate the depth and size of infantile hemangioma

Pharmacological Management
A: propranolol (PO) 1mg/kg divided into 2 doses, given 12hourly for 6 months
OR
S: bleomycin (intralesional injection) 0.3-0.5mg/kg monthly for 4-6 months
OR
S: pulsed-dye laser therapy

13.18 Cutaneous Cyst

Cysts are common cutaneous lesions that may cause cosmetic or health problems that evoke deep concern in patients and their physicians. Common cutaneous cysts include milia and epidermoid cysts.

Treatment: Excision

13.19 Skin Cancer

The most common skin cancers may be categorized into 2 major groups: melanoma and nonmelanoma skin cancers. The latter group consists primarily of basal cell carcinomas and squamous cell carcinomas.
These tumors are rarely fatal, but are considered to be fast-growing tumors that, if neglected, may be locally and functionally destructive. They are common in person living with albinism and xeroderma pigmentosum.
For more details, refer to the malignancies chapter 22.

13.20 Skin Lightening Effects

Skin lightening (SL) is a practice where a person intentionally reduces the natural melanin pigmentation of their skin. The use of cosmetic, non-medical skin depigmentation is common among darker-skinned individuals globally.
Skin-lightening (or "skin-bleaching") agents are vital tools in managing disorders of hyperpigmentation such as melasma and post-inflammatory hyperpigmentation. However, some skin-lightening practices and ingredients can lead to various short- and long-term complications.

Skin Lightening Agents:

- Hydroquinone
- Corticosteroids
- Mercury salts
- Caustic agents

Complications of Skin Lightening Agents:

- Contact Dermatitis
- Exogenous Ochronosis
- Abnormal Skin Regimentation
- Hyperpigmentation of the finger joints or toes
- Nail discolorations
- Depression
- Anxiety
- Atrophy
- Striae
- Folliculitis
- Acne
- Tinea Corporis (Incognito)
- Hypertrichosis
- HPAA suppression
- Hyperglycemia

Patient Management

- Early recognition of the use of skin-lightening agents
- Confirming the use of skin-lightening agents
- Patient counselling on cessation of use and potential local and systemic side effects of excessive use of skin lightening agents
- Specific management of complications, such as antifungal treatment of tinea, laser therapy for Ochronosis

CHAPTER FOURTEEN

EYE DISEASES AND REFRACTIVE ERRORS

14.1 Major Blinding Eye Diseases

Eye diseases and refractive errors are conditions affecting the eye. Diseases of most important are those leading to blindness, visual impairment (VI) or presenting with pain. Blindness is defined as a presenting visual acuity (VA) of less than 3/60 or central visual field of less than 10º in the better eye. Visual impairment is categorized by WHO onto several categories depends on VA. The definition of blindness/VI in children and infants is the same as that in adults though there are different methods for testing vision in young children until when they are at preschool age when normal visual acuity chart can be used. The common causes of blindness and visual impairment among adults are cataract, glaucoma, corneal blindness, diabetic retinopathy, uncorrected refractive errors. There are other eye diseases that do not lead into blindness or visual impairment, these are also addressed in this section. Given the asymptomatic nature of most eye diseases, it is advised that patients presenting to eye clinic with whatever complaint must have basic eye examination of both eyes which entails (VA-Plain and PH, IOP, fundoscopy and pupil exam) as a minimum.

14.1.2 Cataract

Cataract is clouding of the lens which prevents clear vision and if not treated can lead to visual impairment and/or blindness. Most of the time its due to ageing process (Senile Cataract) but can also result from trauma, inflammatory eye diseases or systemic conditions. Children may be born with cataract (congenital) or develop cataract in the early ages of life (developmental cataract).

Clinical Presentation

- Various degrees of progressive painless vision impairment unilateral or bilateral
- History of trauma with a sharp/blunt object for traumatic cataract
- History of red eye for secondary cataract.
- Initially glare and haloes around light
- Cloudiness in the lens seen as a white mark behind the pupil and iris seen with slit lamp microscope (Leukocoria)
- Conjunctiva and cornea are clear and the whole iris can be seen clearly
- Obscured red reflex
- For Congenital Cataract, Squint and/or nystagmus can be seen

Note:

- Cataract may present in all age groups, blindness due to cataract is reversible but in children prognosis can be guarded depending on duration of the cataract.
- Currently, proven treatment is only by surgical removal of the cataractous lens and IOL Implantation
- IOL can range from Monofocal IOLs to premium IOLs such as Presbyopia-correcting IOL (Multifocal, EDOF and Accommodative IOLs) hence price of cataract surgery will vary depending on inserted IOL.
- Early treatment in children is mandatory
- White pupil in children may be a tumor in the eye, late referral may lead to permanent loss of vision, squint, loss of eye or loss of life
- No Cataract surgery should be done without Biometry for precise IOL power calculations

Investigations

- Visual acuity (Plain, PH and Corrected
- B Scan if no fundal view
- Pen torch eye exam for Cornea clarity and Pupil Exam-RAPD Check
- Biometry: Keratometer, A Scan and IOL power Calculations
- IOP Measurements
- For elderly, Anaesthesiologists review is advised
- Slit Lamp Biomicroscopy
- For some patients: ECG, Echo, BP, Blood sugars is recommended
- Refraction depending on the density of cataract
- S: Confocal microscopy, Corneal Tomography, Corneal Topography
- Dilated Fundoscopy

For congenital cataract, the following additional investigations may be ordered with Pediatrician consultation

- ECG
- Echocardiogram
- Hemoglobin
- Full blood picture
- Chest X Ray
- Blood grouping and Cross- matching
- TORCHES Profile
- VDRL/PRP

Surgical Treatment

The only treatment available for Cataract is surgery. There are different cataract surgical procedures depending on the causes of cataract, age of the patient and surgeons' skills and equipment availability.

Table 14.1 Patient Preparation for Cataract Surgery

Step	Pharmacological Management
I. Preoperative Care	**D:** amethocaine hydrochloride 1% Eye drops **OR** **C:** tetracaine 0.5% Eye drops **OR** **C:** proparacaine 1% eye drops **AND** **D:** tropicamide 1% + phenylephrine 2.5% Eye drops **Alternatively** **D:** cyclopentolate + phenylephrine eye drops **AND** **D:** povidone iodine 2.5 – 5% Eye Drops **AND** **A:** lidocaine hydrochloride + epinephrine (adrenaline) 2%, **AND** **D:** hyaluronidase 1500IU, 2-5 mL, retrobulbar or Subtenon injection stat, **OR** **A:** lidocaine hydrochloride (I.V) **OR** **D:** Lidocaine ointment topical application **AND** **D:** hyaluronidase 1500IU, 2-5mL, retrobulbar or subtenon injection stat,
II. Intraoperative Care	**A:** epinephrine (adrenaline) 0.5mL added in 500mL bottle of compound sodium lactate as infusion intracameral and for Corneal wetting during the surgery **AND** **C:** trypan blue 0.06% injection, 0.4mL intracameral, stat **AND** **S:** sodium hyaluronate 1% Intracameral and topical stat **AND** **S:** acetylcholine chloride 1% Injection, 0.5ml intracameral stat **AND** **B:** dexamethasone phosphate 1.25mg Subtenon injection stat **AND** **A:** gentamicin 1.25mg subtenon injection stat **AND** **B:** ceftriaxone 5mg intracameral injection, stat In addition to the above intraoperative medicines, in children and patients with preoperative ocular inflammatory conditions, use **S:** triamcinolone acetone 20mg injection, Sub tenon, stat **OR** **D:** methylprednisolone 20mg injection, Sub tenon, stat
III. Postoperative Care	**C:** dexamethasone + chloramphenicol 0.1 – 0.5%, 1 -2 Drops in the operated eye, 2hourly for 7days then 4hourly for next 7 days **OR** **C:** dexamethasone + gentamicin 0.1 - 0.3%, 1 – 2 Drops in the operated eye, 2hourly for 7days then 4hourly for next 7 days **OR** **C:** dexamethasone + neomycin 1-2 Drops in the operated eye 2hourly for 7days then 4hourly for next 7 days **AND/OR**

	D: cyclopentolate 1%, 1 – 2 Drops in the operated eye, 12hourly for 14days **OR** **B:** atropine 1%, 1- 2 Drops in the operate eye, 24hourly for 14days **AND** **D:** acetazolamide (PO) 500mg to 1g stat **AND** **A:** paracetamol (PO) 1 gm, 8hourly for 3days **OR** **A:** ibuprofen (PO) 400mg 8-12hourly for 3 days or as titrated **THEN:** **B:** ketorolac tromethamine eye drops 1-2 drops titrated for duration as per patient condition **OR** **D:** bromfenac Ophthalmic Solution 1-2 drops titrated for duration as per patient condition

Note:

- Atropine is given to patients where excessive inflammation is anticipated such as cataract surgeries in children, traumatic cataract and secondary cataract.
- Children may require longer term and more frequent topical steroids depending on their postoperative response

Referral: Refer all cases to eye surgeon for cataract surgery, available at Districts, Regional, Zonal and National Hospitals. Children should be referred immediately to a Health Facility with capacity to operate children's eyes safely.

14.1.3 Glaucoma

Glaucoma is a syndrome characterized by optic nerve damage and peripheral visual field loss which may be associated with raised intraocular pressure. The main classes of glaucoma are open angle glaucoma and angle closure glaucoma.

Note:

- Glaucoma may be congenital, primary or secondary to ocular or systemic conditions
- By Far POAG is the commonest type of Glaucoma in adults
- AACG is a different entity and should be managed as ocular emergency
- Congenital Glaucoma can present with simple symptoms and needs high clinical acumen for diagnosis and treatment. So, they should be referred to center with capacity to manage congenital Glaucoma

14.1.3.1 Primary Open Angle Glaucoma (POAG)

Clinical Presentation

- Painless loss of peripheral vision leading to absolute glaucoma as the end stage
- Affects mainly adults of 40 years of age and above
- Cornea and conjunctiva are clear
- Pupil in the affected eye does not react with direct light in advanced stage (RAPD +Ve)
- The optic nerve is always damaged, this can be seen through fundoscopy as enlarged CDR and NRR thinning
- One eye may be affected more than the other (Asymmetrical)
- First degree relatives of glaucoma patients are at 3x increased risk of developing Glaucoma and at younger age.

Note

- Primary Open Angle Glaucoma does not have symptoms in early stages, hence routine intraocular pressure checkup and fundus examinations should be done in all people of 40 years and above by some qualified eye care personnel on annual basis.
- All suspected cases of glaucoma should be referred to qualified eye care personnel for confirmation of diagnosis, Investigations, commencement of treatment and follow up plan
- Medical and/or Laser treatment (SLT, MP-TSCPC) should precede Surgical treatment
- Refilling of antiglaucoma may be prescribed by a middle cadre eye worker but Biannual monitoring should be done at a centre where there is an Ophthalmologist
- For advanced and complicated Glaucoma, patients should be referred to a health facility where there are Glaucoma Specialists

Investigations

- Visual Acuity
- Pupil Exam
- Slit Lamp Biomicroscopy
- Fundoscopy
- Tonometry
- Gonioscopy
- Refraction
- Visual Field Analysis
- Fundus Photography
- Pachymetry
- Optical Coherent Tomography

Pharmacological Management

This is initiated after a diagnosis is reached by an ophthalmologist, refill of some medicines can be done by Assistant Medical Officers in ophthalmology but with regular reviews at a health facility with eye specialist. Medical treatment should be lifelong unless there are conditions necessitating other interventions

D: timolol 0.25% or 0.5%, one drop in the affected eye, instill 12hourly.

OR

D: betaxolol 0.25% or 0.5%, one drop in the affected eye, instill 12hourly. Use lower strength in mild disease and those at risk of complications.

OR

D: latanoprost 0.005% one drop Nocte in the affected eye

In patients who comply to treatment and there is no good response

ADD

D: prostamide bimatoprost 0.03%, one drop, 24hourly in the affected eye.

OR

D: brimonidine tartrate 0.15–0.2%, one drop, 12hourly, in the affected eye.

OR

S: dorzolamide eye drop, one drop, 12hourly in the affected eye

OR

S: brinzolamide eye drop, one drop, 12hourly in the affected eye

Note:

- These may be used as first-line in patients with contraindication of beta-blockers.
- They can be used as a second/third-line drug in patients on beta-blockers if the target IOP reduction has not been reached either as two drops or as FDC drops in a single bottle

In patients who are intolerant to prostaglandin analogue or are not responding

give:

D: brimonidine tartrate 0.15–0.2%, one drop, 12hourly, in the affected eye.

OR

S: dorzolamide 20mg/mL, one drop, 8hourly in the affected eye

In special cases those with ACG give:

D: pilocarpine hydrochloride 2% or 4%, instill one drop in the affected eye 8 hourly.

Note: Pilocarpine causes long-standing pupil constriction so it should not be used unless a patient is been prepared for some types glaucoma surgery or as an alternative topical treatment for patients who are contraindicated for Timolol use. Consult a specialist before using it.

In severe cases or while waiting for surgery, use:

D: acetazolamide (PO) 250mg - 500mg 6hourly

Note:

- β-blockers are contraindicated to people who are known to have overt asthma as this group of medication may cause an acute asthmatic attack within a short time following instillation into the eye
- Brimonidine is contraindicated in children below 12years

Laser Treatment

- SLT may be indicated as initial treatment or in addition to or instead of eye drops or surgery to where it is available
- Laser trabeculoplasty (Argon Laser Trabeculoplasty, Selective Laser Trabeculoplasty) or limited cyclophotocoagulation or MP-TSCPC are different options among others

Surgical Treatment

It is done in all patients with poor compliance and when medical treatment is not useful. There are different surgical techniques depending on the age of the patients, patients' response to surgical treatment, surgeons' surgical skills and availability of equipment. It is recommended that all surgeries are done by Ophthalmologists after thorough assessment of the patients.

Angle Surgeries such as Goniotomy and MIGS should proceed Trab and/or tube surgeries. Adjuvant use of 5FU and MMC is highly encouraged to prolong lifespan of the surgery.

14.1.3.2 Acute Angle Closure Glaucoma (AACG)

This is also known as Congestive glaucoma and commonly affect people aged 40 years and above. It affects more females than males and majority are hyperopia

Clinical Presentation

- Acute sudden onset of painful red eye around the limbus
- Severe headache and cloudiness of the cornea with decreased VA
- Nausea/Vomiting
- Shallow anterior chamber
- Fixed and semi-dilated pupil
- Photophobia ++
- Blepharospasm
- Firm or hard globe on digital palpation due to Severe elevated intraocular pressure.
- It may be asymptomatic if IOP raises slowly (In Chronic/Subacute cases)

Investigations

- Visual Acuity
- Tonometry
- Slit Lamp Biomicroscopy
- Fundoscopy when cornea clear up
- Gonioscopy when cornea clear up
- Visual Field Analysis for chronic disease

Pharmacological Management

Institute therapy and then refer the patient to eye specialist at the Regional, Zonal or National Hospital for investigations and proper management.

Try to achieve immediate IOP reduction

First-Line

D: acetazolamide (PO), 500mg immediately as a single dose followed by 250mg 6hourly

AND

D: timolol 0.25–0.5% eye drops, instill one drop 12hourly in the affected eye

AND

D: pilocarpine hydrochloride 2% or 4%, instill one drop in the affected eye 8 hourly.

AND

A: ibuprofen 400mg (PO) 12hourly

OR

A: paracetamol (PO) 1g 8hourly

Use the above combined treatment until you have achieved your target IOP reduction, then continue with only Timolol eye drops for life unless patient has received surgical intervention and/or the trigger has been addressed and the IOP is reduced to normal level and no optic nerve damage progression

Second-Line

If the above measures fail, use as a short-term treatment, give systemic osmotic agents:

C: mannitol 15–20% (IV)1.5–2mg/kg body weight to run slowly over 30–60minutes

OR

D: paracentesis with a 30G needle for decreasing IOP

These medicines have diuretic effects, so they are only used as a single dose. They are also used in emergencies to prepare patients with high intraocular pressure for surgery as they lower intraocular pressure rapidly.

Surgical Treatment

This is done at a centre with Eye Specialists and necessary diagnostic and treatment equipment. Surgical or Later Peripheral Iridectomy will create a passage for the aqueous fluid from posterior chamber to the drainage angle.

Referral: Management of advanced angle closure glaucoma is done by eye specialist. All patients with Angle Closure Glaucoma should be referred to eye specialist for other management modalities and continuity of care.

Note:

- Acute Angle Closure Glaucoma is an Ophthalmological Emergency
- Immediately refer all patients with AACGto eye specialist after initial medical treatment to lower Intraocular pressure
- Patients who have had AACG should be monitored closely for relapse.
- Acetazolamide is a Sulfur containing medicine, do not use in patients allergic to Sulfur.
- Manage the associated pain and vomiting
- Look for any trigger and address it accordingly
- Educate patient and warn about relapse

14.1.3.3 Childhood and Juvenile Glaucoma

It is a syndrome whereby the intraocular pressure is raised and cause abnormality of the eyeball and visual disturbances including blindness if treatment is delayed. Presents from birth to 30 years.

Clinical Presentation

- Bigger than normal eye for age (buphthalmos)
- Photophobia
- Tearing
- Blepharospasms
- Cloudy cornea,
- Mild Red conjunctiva though occasionally
- Decrease in visual acuity

Investigations

For children, examination is done under General Anaesthesia (EUA)

- Tonometry
- Cornea Diameters (H&V)
- Slit lamp examination
- Fundoscopy
- Gonioscopy depending on corneal visibility
- Pachymetry

Surgical Treatment

Treatment for congenital glaucoma is usually surgery, which is done by either Pediatric Ophthalmologist or Glaucoma specialist.

Referral: Refer any child who has the above-mentioned signs to a specialist at the National Hospital or Zonal Referral Hospitals where there is Paediatric Eye team. Even when you're not sure of the diagnosis as it could be congenital glaucoma

Note:

- Prophylaxis Laser (PI) is usually advised to the fellow eye to prevent attack
- First Degree screening by Gonioscopy is advised so as to capture them early
- For Juvenile Glaucoma (Age 16-30years) a secondary cause should be sought and addressed accordingly as most of the time Juvenile glaucoma is an aggressive form of Glaucoma hence prompt and proper management is highly advised.

14.1.3.4 Secondary Glaucoma

This presents as a complication of other eye diseases such as uveitis, hypermature cataract, Pseudo exfoliation syndrome, ACA abnormalities, ocular trauma and retinal diseases. It may also be due to prolonged use of steroids**.**

Clinical Presentation

- Poor vision in the affected eye associated with
- High intraocular pressure
- Optic nerve damage
- New vessels on the iris if the cause is retinal diseases
- Shallow or normal depth Anterior Chamber

Investigations

- Visual Acuity
- Slit Lamp Biomicroscopy
- Fundoscopy
- Tonometry
- Gonioscopy
- Refraction
- Visual Field Analysis
- Fundus Photography
- Pachymetry test
- Optical Coherent Tomograph

Pharmacological Management

Management of these patients depends on the cause, but it includes medical, surgical and laser. Institute these treatment as you refer these patients: -

D: acetazolamide (PO) 500mg immediately stat followed by 250mg 6hourly

AND

D: timolol 0.25–0.5% eye drops, instill one drop 12hourly in the affected eye.

Treatment of the preexisting eye disease is highly recommended.

Referral: Refer all patients suspected to have secondary glaucoma to a qualified eye specialist available at the Regional, Zonal or National Hospital for proper assessment and definitive management.

14.1.4 Ocular Trachoma

It has five grades according to WHO which are grouped into two (Active Trachoma and Cicatricial Trachoma). Active trachoma usually happened in children below age of 9 years as is an acute conjunctivitis caused by infection with Chlamydia trachomatis (bacteria). The Cicatricial trachoma (TS, TT and CO) is one of the commonest causes of corneal blindness worldwide. There is an inward turning of the eye lashes which rub against the cornea and lead to corneal opacity which is the culprit for visual impairment and/or blindness.

Clinical Presentation

- Purulent whitish discharge in active disease
- Photophobia in early stages or re- infection
- More than 5 Follicles in the upper tarsal plate seen as round and white nodules in active disease.
- In cicatricial stages, in-turned eyelashes rub on the cornea leading to corneal ulcers and eventually opacity if left untreated
- Loss of vision due to corneal scarring and opacification.

Clinical Stages according to World Health Organization

Active Disease

- Trachomatous Inflammation Follicular (TF) - Presence of at least 5 follicles on the upper tarsal plate
- Trachomatous Inflammation Intense (TI) – There is intense inflammation, the conjunctival blood vessels cannot be seen.

Cicatricial Disease

- Trachomatous Scarring (TS) – Presence of white scars in the upper tarsal plate
- Trachomatous Trichiasis (TT) – Presence of some eye lashes rubbing against the cornea
- Corneal Opacity (CO) – Presence of corneal opacity (scar) affecting the central cornea

Investigations

- Visual acuity
- Refraction
- Slit lamp bimicroscopy
- Conjunctival swab for dipstick test and or PCR
- Lid eversion for follicles and tarsal conjunctiva scars

Non-Pharmacological Management

- Face washing and hygiene to prevent transmission of disease from one person to the other
- Environmental improvement/hygiene and sanitation
- Water availability and use of pit latrines

Pharmacological Management

A: oxytetracycline eye ointment 3% 24hourly for 6weeks

OR

B: azithromycin (PO) 20mg/kg (Max 2g) stat- for treatment, preventive chemotherapy and in mass treatment campaign

Note:

- Preventive chemotherapy in mass treatment campaign is conducted only once a year by NTD unit.
- Active disease in children should be treated aggressively to avoid later complications.
- TT should be managed by surgery timely before CO develops.

Surgery

For Trachomatous Trichiasis Surgical correction of entropion through BTRP. This procedure can be done at a Dispensary or Health Centre and community level by a trained health worker.

For Corneal Opacities, the recommend treatment modality is Corneal Transplant in any form hence we are advocating for Corneal banks establishment and tissue harvesting policies development to enable these patients to get appropriate care.

Referral: Refer all patients with recurrent TT or lower Eyelid TT to Oculoplastic Surgeon at Regional Referral or Zonal Referral Hospital for proper assessment and surgical management.

14.1.5 Diseases of the Retina and Posterior Segment

Main diseases of the retina that because blindness are Diabetic Retinopathy, Diabetic Macular Edema, Retinal Detachment, Vitreous Hemorrhages, retinal vessels occlusions and Age-related Macular Degeneration.

14.1.5.1 Diabetic Retinopathy

It is a chronic progressive sight-threatening disease of the retinal blood vessels associated with the prolonged hyperglycemia and other conditions linked to diabetic mellitus such as hypertension. Its is a complication of long-standing diabetes mellitus in the eyes

Clinical Presentation

- Initially asymptomatic
- Loss of vision in moderate and advanced stages, when there is severe NPDR or PDR presenting with vitreous/retinal haemorrhage, Tractional RD
- Diabetic cataract and anterior chamber new vessels in iris or angle

Note:

- Regular and scheduled screening at Diabetic or Eye Clinic is recommended for early diagnosis for all DM patients
- All DM patients should be advised to visit eye clinic for checkup and DR Screening

Diabetic retinopathy is mainly grouped into three stages/presentations:

- Non-Proliferative diabetic retinopathy (NPDR)
- Diabetic macular Edema (DME)
- Proliferative diabetic retinopathy (PDR)

Investigations

- Visual acuity with and without pinhole
- Tonometry
- Dilated fundoscopy (Direct or indirect ophthalmoscopy with or without biomicroscopy)
- Fundus photography
- Fluorescein Fundus Angiography (FFA)
- **S:** Indocyanine green Angiography (ICGA)
- Optical Coherence Tomography
- Gonioscopy
- Pupil Exam

Pharmacological Management

Dilate the pupils with combined

D: tropicamide 1% + phenylephrine 2.5% eye drops

OR

D: tropicamide 1% with

OR

D: cyclopentolate 1% eye drops to screen

Table14.2 below gives a summary of the Stages of Diabetic Retinopathy at Eye Clinic, treatment options and follow up schedule. Treatment is done in consultation with Diabetologist/endocrinologist and Physician to ensure a good glycaemic and blood pressure control

Grade	Treatment Options	Follow-up
No retinopathy	• Patient counseling • Strict control of blood sugar pressure and lipids	9 -12monthly
Mild or Moderate Non-Proliferative Diabetic Retinopathy (NPDR)	• No active treatment required • Patient counseling • Control of blood sugar, pressure and lipids	6-9monthly
Pre-proliferative DR		
Severe NPDR *	Close follow up for dilated fundoscopy	2-3monthly
Very severe NPDR *	Partial scatter PRP therapy (maximum LASER burns 800 spots)	3monthly
Mild Proliferative DR** (NVD/ NVE No pre-retinal or vitreous hemorrhage No Fibrovascular membrane <FVM>)	Full scatter PRP minimum 1200 shots in one sitting or/ and Anti-VEGF injection***	2monthly

Grade	Treatment Options	Follow-up
Moderate PDR ** (NVD/NVE, Moderate to severe Vitreous hemorrhage with visible fundus details for PRP, Pre-retinal Hemorrhage No FVM)	Full scatter PRP up to Ora-serrata sparing the macula and away from the FVM ***	1monthly
Severe PDR ** (NVD/NVE, Severe Vitreous hemorrhage obscuring fundus details/not visible for PRP, Extensive FVM, Tractional Retinal Detachment <TRD> Macular traction)	REFER To VR Surgeon	

Consider Argon LASER in patients with severe Non-Proliferative Diabetic Retinopathy (NPDR) under the following circumstances:

i. Older type 2 diabetics
ii. Difficult retinal view
iii. Prior to cataract surgery
iv. Only one eye situation where the first eye was lost due to PDR
v. Regular attendance to clinic for follow up is likely to be poor
vi. Difficult to examine patient due to other reasons.

**Intravitreal anti-VEGF therapy administered on a monthly basis is effective in the management of PDR. Treatment frequency should be individualized according to disease response, following a treat- and-extend protocol where appropriate
**Mild and moderate PDR should be treated with full scatter PRP (minimum 1200 shots in one sitting) or intravitreal anti-VEGF injection whichever is available, accessible and affordable.

If both are available and affordable then anti-VEGF injection is the treatment of choice provided the patient:

i. Is able to come for follow up at regular intervals- every month for 3 months and then every 2 months for next 3 months and then 3monthly
ii. Can afford the injections which may total up to 6 injections in the first year
iii. Has no contraindications to the injections

If any one of the above does not apply, then the patient should have PRP done.

Treatment options for Diabetic Macular Edema (DME)

Management of DME depends on the clinical stage of DME and treatment options available at the facility where the patient has been attended.

Primary tests are required to be performed in order to grade the DME. Macula OCT for all diabetic patients should be the baseline test to determine presence or absence of DME. Macular thickness of equal or more than 400 microns should be considered as DME. Those facilities without this tool, the clinical assessment will be the baseline test where the best corrected visual acuity will be the key point for grading which will be matched with the clinical findings. Therefore, VA of less than 6/12 should be considered as DME case. It is important to exclude other causes of visual impairment before concluding the presence of DME. Use of anti-VEGF has been found to be effective in the treatment of DME.

Table14.3: Treatment options for various grades of DME

Grade	Treatment option	Follow up period
No DME	Close observation	review after 6 to 12months
Non-Centre involving DME	Focal or Grid LASER	3-6months
Centre involving DME	3 intravitreal anti VEGF injections at monthly interval followed by 3 more injections at 6 weekly intervals. OCT should be done before offering another injection After 6 injections, refer patient to VR clinic if a. VA is not improving b. There is clinically persistent DME If anti VEGF injection is not available: i. Grid LASER should be given for diffuse, Exudative or edematous macular edema ii. Focal LASER to areas of focal Exudative edema	Every 1 month

Pharmacological Management
For glycemic control give antioxidant in non-proliferative diabetic retinopathy
D: multivitamin + carotenoids (PO) 24hourly to a maximum of 3months

For intravitreal anti Vascular Endothelial Growth Factor (VEGF) in Proliferative Disease
S: bevacizumab, 1.25mg per 0.05ml, intravitreal injection, stat.
OR
S: ranibizumab, 0.5mg per 0.05ml, intravitreal injection stat.
OR
S: aflibercept, 2mg per 0.05ml, intravitreal injection stat

Repeat after every month to a maximum of 3 months then 6 weekly to complete 6 injections. Re- assess on 3 monthly basis if there are signs of disease progression, restart treatment, with close follow up.
AND
S: triamcinolone acetonide, 0.05ml, intravitreal injection, stat. Repeat after 3months if necessary.

Surgical Treatment
- This is done in the Advanced proliferative stage
- It involves removal of vitreous and or blood, peeling of formed fibrovascular tissue and reattachment of retina if the retina is detached
- It is combined with retinal photocoagulation
- The vitreous cavity may be filled with tamponade liquid such as silicon oil or expansile gas like sulfur perfluoro propane or sulfur hexafluoride depending on the level of complication
- It may also be combined with Pharmacological Management (Anti VEGF) mentioned above

Laser Treatment
Laser photocoagulation: Extent and type of this treatment depending on the stage of the disease
- Focal Laser
- Grid Laser
- Pan Retinal Photocoagulation for advanced disease

Note:
- Ophthalmologists should work together with Physicians to holistically treat the diabetic patient.
- Poorly controlled diabetes mellitus and diabetic retinopathy can lead to blindness
- All patients with diabetes mellitus regardless of their eye conditions, should have a thorough eye examination by available eye care personnel or an eye specialist at least once a year.
- Dilated eye examination and direct viewing of the retina by an ophthalmologist or qualified eye care personnel is mandatory at initial diagnosis of Diabetes Mellitus and as per recommended schedule by the attending clinician.
- Urgent referral of all diabetic patients with sudden loss of vision to eye specialist is highly advised
- For detailed DR treatment refer to National DR Management guideline

14.1.5.2 Retinal Detachment

Retinal detachment is a sight threatening condition with an incidence of approximately 1 in 10000. Three known forms of Retinal detachment:
- **Rhegmatogenous retinal detachments** are often due to retinal tears associated with posterior vitreous detachment or trauma.
- **Tractional retinal detachments** can be seen in proliferative retinopathy due to diabetic disease, sickle cell and other disease processes leading to neovascularization of the retina.
- **Serous/Exudative detachments** are caused by a number of inflammatory, or exudative retinal disease processes such as sarcoidosis, medication toxicity, myeloma, or choroidal neoplasms.

Clinical Presentation
Sudden painless loss of vision with cuttens like complaints.

Investigations
- VA,
- B scan,
- Fundoscopy,
- OCT

Management
At Primary level once diagnosis of RD is suspected, referral should be done immediately to tertiary center with VRS for proper management. Treatment options vary depends on type of RD.

Medical management for Serous RD. Any inflammatory disease or underlying mass should be identified and treated if possible
Surgical management is indicated for rhegmatogenous and tractional detachments. Surgical options are:

- Laser retinopexy is typically reserved for small, localized detachments
- Pneumatic retinopexy involves the injection of an intraocular gas bubble along with retinopexy using cryotherapy or laser
- Scleral buckles are silicone bands permanently placed around the outside of the globe under the extraocular rectus muscles to relieve any traction and support retinal tears
- Pars plana vitrectomy with appropriate vitrectomy probe

14.1.5.3 Vitreous Hemorrhages

Vitreous Hemorrhage is a relatively common cause of acute vision loss, having an incidence of approximately 7 cases per 100,000.
The three most common causes include

- Proliferative diabetic retinopathy (PDR)
- Posterior vitreous detachment (PVD) with or without retinal tear
- Ocular trauma

Clinical Presentation
Sudden, painless visual loss or haze is a common presentation.

Investigations

- VA,
- Fundoscopy,
- B scan

Management
At Primary level if VH is suspected, refer urgently for proper management at tertiary level with information to minimize strenuous activity, as an increase in blood pressure may disrupt the newly formed clot and cause new active bleeding. If history of using of anticoagulation, advise to stop.
Intravitreal injection of anti-VEGF agents may be used to cause regression of neovascularization in proliferative retinopathies such as AMD but not in DR.

Surgery
Pars plana vitrectomy is indicated for vitreous hemorrhage accompanied by retinal detachment or break seen on B-scan, non-clearing vitreous hemorrhage

14.1.5.4 Acute Retinal Vascular Occlusions

Acute retinal vascular occlusions are common causes of visual impairment. Two forms exist retinal artery occlusions (RAOs) and retinal vein occlusions (RVOs). They are both associated with increased age and cardiovascular risk factors. These are synonyms to CVA of the eye. Acute management of RAOs involves a multidisciplinary approach including neurologists with stroke expertise, while RVO treatment is provided by ophthalmologists; optimization of systemic risk factors by patients' primary care providers is an important component of RAO and RVO management.

Clinical Presentation
Acute RAO results in acute monocular visual loss, with severity based on the size of the occluded vessel. attenuation of the retinal arteries, segmentation of the retinal arterial blood columns with sometimes visible retinal arterial emboli, and acute retinal ischemia, "cherry red spot".
Acute RVO presents with sudden loss of vision with tomato paste fundus.

Investigations

- VA,
- Refraction,
- IOP,
- Temporal artery palpation,
- B scan,
- Fundoscopy,
- OCT,
- FFA
- Systemic work up accordingly

Management
At primary level, if diagnosis is suspected. Decreasing of IOP should be considered through medical therapy.
Treatment at tertiary center with VRS can either be medical or surgical depending weather its ischaemic or hemorrhagic RVO. AntiVEGF can be used.

14.1.5.5 Papilloedema

Papilledema is a term that is exclusively used when a disc swelling is secondary to increased intracranial pressure (ICP). It must be distinguished from optic disc swelling owing to other causes, which is simply termed "optic disc edema.

Clinical Presentation
Sudden Loss of Vision in patient with Hypertensive crisis usually associated with headache and increased ICP.

Investigations

- BP,
- VA,
- Fundoscopy,
- Ultrasonography (B-scan),
- Fluorescein angiography,
- Fundus autofluorescence,
- Optical coherence tomography with enhanced depth imaging of the optic nerve head.
- CT Scan/MRI of the brain,

Pharmacological Management
Treat underlying cause by decreasing BP, Medication to lower ICP. Consult Physician for BP control Give
D: acetazolamide (PO) 500mg 12hourly for 5-7 days

If the patient is intolerant to acetazolamide, consider second line
A: furosemide (PO/IV) 20-40mg 24-12hourly

14.1.5.6 Retinopathy of Prematurity

Retinopathy of prematurity (ROP) is primarily due to unmonitored supplemental oxygen. Major risk factors are Low birthweight (<1500 grams), Gestational age of <30 weeks, High, unregulated oxygen at birth and/or fluctuations in oxygenation and Poor postnatal growth

Prevention
Screenings of infants at risk with appropriate timing of exams and follow up is essential to identify infants in need of treatment as per National RoP Guideline.

Diagnosis
Following pupillary dilation using eye drops, the retina is examined with an indirect ophthalmoscope. The peripheral portions of the retina are pushed into view using scleral depression. International Classification of Retinopathy of Prematurity (ICROP3) developed a diagnostic classification of ROP. These diagnostic classifications define ROP by location (zone), severity (stage) and vascular characteristics in the posterior pole (normal, pre-plus, or plus disease).
Non-Pharmacological Management
Follow up interval and treatment will depend on classification of the disease as mentioned in the National RoP Guideline.
Treatment is mainly surgical:

- Cryotherapy to the avascular retina. This is mainly given to eyes with threshold RoP which is defined as defined as 5 contiguous or 8 cumulative clock hours of stage 3 ROP in zone I or zone II with plus disease
- Argon and diode lasers to treat the avascular retina of threshold ROP.

Pharmacological Management
Anti-VEGF treatment for stage 3 ROP with plus disease in zone I (not zone II). Given as

S: bevacizumab intravitreal injection 0.2 mg monthly
OR
S: ranibizumab intravitreal injection 0.2 mg monthly
OR
S: aflibercept intravitreal injection 0.2mg monthly Follow up after treatment is crucial in these kids.

14.1.5.7 Age Related Macular Degeneration (AMD)

It is a disease condition characterized by progressive macular changes that are associated with increase in age. There are two types of AMD i.e., Wet AMD and Dry AMD.

Clinical Presentation

- Drusens around macula area (yellowish excrescence in the retina)
- Affects elderly over 60 years
- Poor central vision, characterized with scotomas and later can lead to blindness

Investigations

- Visual Acuity
- Refraction
- Tonometry
- Optical Coherence Tomography
- Fundoscopy through a well-dilated pupil,
- Fundus photography
- Fluorescein Fundus angiography

Non-Pharmacological Management

S: Photodynamic therapy (PDT)

Pharmacological Management

This depends on types of AMD. Intravitreal injection is recommended for Wet AMD

S: bevacizumab 1.25mg per 0.05ml stat

OR

S: ranibizumab 0.5mg per 0.05ml stat.

OR

S: aflibercept, 2mg per 0.05ml, intravitreal injection stat

Give Antioxidant in Dry AMD

D: multivitamin + carotenoids, 1 tablet 24 hourly to a maximum of 3 months

Surgical Treatment

Type of surgery depends on the presentation/ stage of the disease.

Referral: Refer patients with Age Related Macular Degeneration to Vitreo-retinal Surgeons for proper management

14.1.5.8 Other Retina Conditions

Several other Retinal Conditions of importance exist such as Macular Hole and Inherited Conditions like Retinitis Pigmentosa (RP)

- Macula Hole presents with acute loss of vision usually with positive Watzke-Allen test
- Retinitis Pigmentosa, usually present with night blindness and decreased peripheral vision at young age with characteristics bone spicule pigmentation on the retina.

Investigations

- VA,
- Refraction,
- Fundoscopy
- B scan, Fundus photo
- OCT
- Electroretinogram (ERG)
- Electrooculogram (EOG)

Management

- Macular Hole Surgery
- For RP, no proven treatment so far but treatments and strategies can help manage symptoms and improve quality of life. These include low vision aids, genetic counseling, and potential gene therapies for specific genetic mutate

14.1.6 Refractive Errors and Optical surface disorders

These are eye conditions which presents with poor vision either at near or distance at any age. There are mainly 4 types of refractive errors:

- Presbyopia,
- Myopia,
- Astigmatism
- Hyperopia.

Note:

- Refractive errors are usually corrected by lenses and/or refractive surgery (Spectacles, contact lenses)
- A patient may have more than one type of refractive error.

14.1.6.1 Presbyopia

This is a disorder of accommodation commonly occurring in older people commonly from age of 40 years

Clinical Presentation

- It usually starts after the age of 40 years
- The main complaint is difficulty in reading/writing or doing near works
- Inability to read in dim light
- Diagnosis is only through refraction.
- Attendance to heath facility is also a good opportunity for screening of glaucoma and diabetic retinopathy which are initially asymptomatic

Investigations

- Near Visual acuity
- Colour vision test
- Autorefraction
- Tonometry
- Near and distant Objective refraction
- Fundoscopy
- Near and distant Subjective refraction
- In Children Wet/Cycloplegic Refraction should be done
- Stereopsis test
- Duochrome test

Non-Pharmacological Management

- Convex lens (Plus lenses) spectacles for near vision.
- Contact Lenses can be used as well
- Refractive Surgery such as LASIK and SMILE

14.1.6.2 Myopia (Short sightedness)

This is a condition whereby patient has difficulty seeing far objects.

Clinical Presentation

- It is common in young age between 5–25 years
- The condition persists throughout life, though changes can happen
- If not treated early, it may progress rapidly and lead to retinal complications
- Blurry vision at distant
- Frequently headaches especially at evening
- It is diagnosed through refraction.

Investigations

- Distant Visual acuity
- Autorefraction
- Near and distant Objective refraction
- Near and distant Subjective refraction
- In Children Wet/Cycloplegic Refraction should be done
- Fundoscopy
- Stereopsis test
- Colour test
- Strabismus assessment in all children

Non-Pharmacological Management

- Spectacles with Concave lens (Minus)for constant wear.
- Contact Lenses can be used as well
- Refractive Surgery such as LASIK and SMILE can be used

Pharmacological Management

To prevent progression of myopia low dose topical atropine 0.1mg/ml can be used for children aged 3–14 years with myopia between – 0.50 DS and – 6.00 DS and a progression rate of 0.50 DS or more per year.

Note:

- Secondary causes of Myopia should be ruled out and addressed accordingly
- For Children outdoors should be encouraged
- Low dose atropine can be used to control myopia progression as well

14.1.6.3 Hypermetropia (Long sightedness)

This is a condition where patients have difficulty in seeing near objects. It is less manifested in children as they have a high accommodative power.

Clinical Presentation

- Ocular strain
- Diagnosis in children should be reached after refraction through a dilated pupil (Cycloplegic refraction using cyclopentolate eye drop)

Investigations

- Distant Visual acuity
- Autorefraction
- Near and distant Objective refraction
- Near and distant Subjective refraction
- In Children Wet/Cycloplegic Refraction should be done
- Fundoscopy
- Stereopsis test
- Duochrome test
- Colour
- Strabismus assessment in all children

Non-Pharmacological Management

- Spectacles with Convex lens (Plus) spectacles for constant wear
- Contact Lenses can be used as well
- Refractive Surgery such as LASIK and SMILE can be used

Note:
Spectacles should be given to: -

- Children who have only significant hypermetropia (more than +3.00 Diopter of Sphere both eyes), all children who present with squint and have significant hypermetropia and children with anisometropia
- Elderly who presents with signs of ocular strain

14.1.6.4 Astigmatism

This is a condition where the cornea and sometimes the lens have different radius of curvature in all meridians (different focus in different planes). Some myopic and hyperopic patients may have astigmatism.

Clinical Presentation

- Poor vision at distance
- Photophobia
- Headache (sometimes) at the evening.
- Diagnosis is reached through refraction

Clinical Presentation

- Visual acuity
- Autorefraction
- Near and distant Objective refraction
- Near and distant Subjective refraction
- In Children Wet/Cycloplegic Refraction should be done
- Fundoscopy
- Stereopsis test
- Duochrome test
- Colour
- Strabismus assessment in all children

Non-Pharmacological Management

- Cylindrical lenses spectacles for constant wear. These can be plus or minus depends on refractive findings.
- Contact Lenses can be used as well
- Refractive Surgery such as LASIK and SMILE can be used
- Surgery (Limbal relaxation incisions) can be done

Note:

- Reassessment for all types of refractive errors is done annually and change of lenses if there are significant differences and improvement with new correction.
- All children with rapid progression of refractive errors need to be seen by Paediatric Optometrist and Paediatric Ophthalmologist for further assessment

14.1.7 Low Vision and Blindness

Low vision is a permanent visual impairment that cannot be corrected by medication, surgery, or standard spectacles and interferes with daily activities. It is defined as visual acuity less than 6/18 but equal to or better than 3/60, or a visual field less than 20 degrees in the better eye with the best possible correction.

Blindness defined as a presenting visual acuity of less than 3/60 in the better eye, or a visual field of less than 10 degrees from the central fixation, even with the best possible spectacle correction.

Clinical Presentation

Inability to

- Recognize people in the streets,
- Read black boards,
- Write at the same speed as peers
- Play with friends.

Investigations

- Visual acuity
- Refraction
- Tonometry
- Slit Lamp Biomicroscopy
- Fundoscopy
- Low vision assessment
- Orthoptic Assessment

Non-Pharmacological Management

Mainly Rehabilitation

- Assessment of the patients' visual function
- Accurate refraction and provision of spectacles if indicated
- Low vision devices such as optical devices (magnifiers, telescopes) or non-optical devices (reading stands and or reading slits) and white canes as per assessment results.
- Surgical intervention is indicated e.g., if a patient has cataract

Referral: All children with low vision should be referred to high level health facility for proper assessment and management by a paediatric Eye Team

14.1.7.1 Optical surface disorders

These are disorders affecting the cornea and lens to impact vision.

Keratoconus

This is bulging of the cornea due to thinning. It Causes Myopia and visual impairment. It is commonly in childhood especially during puberty. Its cause is usually allergic conjunctivitis eye rubbing.

Clinical Presentation

- Bulging of the cornea,
- Munson's sign,
- Rizzuti's sign,
- Photophobia,
- Vogt striae,
- Charleaux sign on refraction,
- Decreased Vision,
- History of VKC,
- Corneal topography,
- Keratometry

Non-Pharmacological Management

After thorough investigations to rule out and address risk factors,

- Corneal collagen cross-linking with riboflavin sensitizer, Corneal rings, Refractive laser surgery if all fail, Corneal transplantation can be considered.
- Specialty contact lenses can be used as indicated

14.2 Painful Red Eyes

The eye conditions shown on Table 14.4 presents with an acute onset of red eyes: Ocular trauma, Corneal ulcer, Uveitis, Conjunctivitis

Table 14.4: Summary on diagnosis of Red Eyes

Disease Condition	Visual Acuity	Affected Eye	Cornea	Pupil	Pain	Discharge
Allergic/ viral Conjunctivitis	Good	Both	Clear	Normal	No	Watery/mucoid
Bacterial Conjunctivitis	Good	Both	Clear	Normal	No	Purulent
Ophthalmia neonatorum	Poor +/-	One/both	Cloudy +/-	Normal +/-	Yes	Copious Purulent
Cornea ulcer	Poor	One/ both	Gray spot	Normal	Yes	Watery/purulent
Uveitis	Poor	One/ both	Clear or cloudy	Small & Irregular	Yes	Watery
Acute glaucoma	Poor	One	Cloudy	Mid dilated	Yes	Watery

14.2.1 Ocular Trauma

These are eye injuries that result from blunt or sharp objects or from chemical substances injuring the eye. The management of these injuries is guided by history from the patient and ocular findings by the clinicians. Classes of ocular trauma are as follows: -

14.2.1.1 Blunt Trauma/Non-Perforating Eye Injury/Foreign Body

Establish the cause to determine the type of injury and whether there is penetration.

Clinical Presentation

- Corneal abrasion/laceration with or without an imbedded foreign body.
- Eye lids may also be involved.
- Conjunctiva may be involved as well

Investigations

This is done after the first aid measures

- Examine the injured eye with slit lamp or magnifier and pen torch
- Fluorescein staining to reveal foreign body or corneal laceration
- Fundoscopy in blunt injury or embedded foreign body
- B scan in embedded foreign body
- CT Scan in suspected metal foreign body

Non-Pharmacological Management

- Provide first aid measures to the patients as per presentation
- If no penetration, irrigate the eye with clean water or Ringers Lactate to reduce chemical substance in the eye
- Remove foreign body if visible with a cotton bud or surgical blade if shallow after topical application of an anaesthetic drop

Pharmacological Management

At the primary care:

Corneal Abrasion:

A: chloramphenicol eye ointment 1%, 8hourly to the injured eye until no fluorescein staining

AND

S: Soft Contact Lenses is indicated for pain relief and quick recovery

Steps Guiding Management of Complicated Blunt Trauma

Complicated blunt trauma is a trauma where the vision is poor, patient's experiences pain and there is hyphaema. It is best managed by eye specialist as surgery may be required in the management.

Table 14.5: Steps guiding management of complicated blunt trauma

Findings	Action to be taken
No hyphaema, normal vision	Observe
Hyphaema, no pain	Refer
No hyphaema, normal vision, pain	Paracetamol, observe for 2 days, refer if pain persist
Poor vision and pain	Paracetamol, refer urgently
Hyphaema, pain, poor vision	Paracetamol, refer urgently

14.2.1.2 Deep Corneal or Scleral Injuries (Penetrating)

These are corneal or scleral injuries caused by sharp objects.

Clinical Presentation

- History of injury with a sharp object such as knife or wire
- Swollen eye
- Eye discharge

Investigations

- Examine the injured eye with slit lamp or magnifier
- Fluorescein staining to reveal foreign body or corneal laceration
- Fundoscopy

Non-Pharmacological Management

Apply an eye shield or pad with no pressure and refer immediately while waiting for referral, use the following in the affected eye.

Pharmacological Management

A: chloramphenicol 1% eye drop, 2 drops stat

OR

A: chloramphenicol 1% ointment, stat

OR

A: oxytetracycline eye ointment, stat

AND

B: atropine 1%, 1–2 drops stat

AND

A: tetanus vaccine (IM) 0.5ml stat as prophylaxis

AND

A: paracetamol (PO)1gm 6-8 hourly to a maximum of 4 doses in 24hours, for 3days in adults, the dosage in children is 10–15mg/kg 6-8hourly for 3days.

Referral indicated if

- Intraocular foreign body is suspected
- There is globe or intraocular penetration evidenced by:
  - Poor vision,
  - Distorted pupil
  - Ocular contents of foreign body is seen
  - Circumferential subconjunctival hemorrhage
  - Hyphaema with or without raised intraocular pressure
- Conjunctival laceration requiring suturing (>1 cm)
- Laceration/perforation or diffuse damage to the cornea and sclera
- Chemical and thermal injuries
- Damage to ocular adnexa including eyelids
- Limited ocular movements

Surgical Treatment

This is done by a well-trained eye specialist at the District, Regional, Zonal and National hospitals. It should be done within 48 hours of injury. Post-operative care should be monitored regularly for any signs of endophthalmitis.

Note:

- Eye ointment should be applied very gently and in the lower fornix (behind the lower eyelid).
- Do not apply pressure on the eye in perforating injuries of the eyeball
- Delay in surgical management of the injury may cause irreversible blindness or may necessitate removal of an eye

Referral: Immediately refer the patient to a health facility with eye surgeon at the District, Regional, Zonal or National hospital depending on the staff availability.

14.2.1.3 Traumatic Optic neuropathy

Traumatic optic neuropathy (TON) is a condition in which acute injury to the optic nerve from direct or indirect trauma results in vision loss. The most common cause of TON is indirect injury to the optic nerve, which is thought to be the result of transmitted shock from an orbital impact to the intracanalicular portion of optic nerve.

Clinical Presentation

Patients with TON may have decreased visual acuity, decreased color vision, an afferent pupillary defect, and/or visual field deficits.

Investigations

- CT scan of the brain and orbits.
- VA, Refraction,
- IOP,
- EOM tests,
- Pupils' exam

Management

Aside from observation, the two treatment options that can be considered include high-dose corticosteroids or surgical decompression.

Erythropoietin (EPO) has shown promise as a potential treatment for TON.

Note: Intervention within 48 hours or three days of injury may yield better outcomes Surgical decompression can be considered in cases of TON with evidence of optic nerve compression

14.2.1.4 Chemical Injuries/Burn

This is an Ophthalmological emergency. It occurs when chemicals such as acid or alkali (e.g., household detergents, bleaching agents), snake spit, insect bite, traditional eye medicine, cement or lime cause a damage to the eye.

Clinical Presentation

- Diagnosis relies mostly with patients' history
- Patients may present with photophobia
- Inability to open eyes
- Excessive tearing/watery eyes
- Cloudiness of cornea with blurred vision
- Loss of conjunctival blood vessels
- Traces of chemical substance such as cement or herbs and blisters or loss of eyelid skin in open flame injuries

Investigations

- Visual acuity
- Slit lamp biomicroscopy
- Fluorescein staining

Non-Pharmacological Management

If a patient gives you history of being in contact with the items mentioned above, the following should be done:

- Irrigate the eye with clean water or Ringer's lactate continually for a minimum of 20–30 minutes to reduce chemical substances. Irrigate longer for severe alkali burn.
- Test the patients' vision and examine the patient's eye

Pharmacological Management

C: tetracaine 0.5% eye drops, instill 2 drops in the affected eye. Repeat irrigation if possible. Evert the eye lids and remove the debris

AND

A: chloramphenicol 1% eye ointment, apply 6hourly to prevent infection for 3days.

OR

A: oxytetracycline eye ointment, apply 6hourly to prevent infection for 3 days.

AND

A: paracetamol (PO)1gm 4–6hourly to a maximum of 4 doses in 24hours, for 3days in adults, the dosage in children is 10–14mg/kg 4–6hourly for 3days

Referral: Refer all cases within 12hours to eye specialist at high level health facilities for more care

14.2.2 Corneal Ulcer

This is a painful red eye condition resulting from a raw discontinuity to the corneal epithelium. It may be caused by infection (bacterial, viral e.g., Herpes simplex virus and measles, fungal, trauma (physical or chemical) and nutritional (Vitamin A deficiency). Systemic conditions can contribute to corneal ulcers as well.

Clinical Presentation

- Painful and red eye of acute onset
- Excessive tearing
- Severe photophobia
- Poor vision
- Gray/white spot on the cornea staining with fluorescein
- Hypopyon (Pus or white cells in anterior chamber)

Investigations

- Visual acuity
- Slit Lamp biomicroscope
- Corneal scrapping for Gram Stain and
- Corneal scrapping for Potassium Hydroxide staining
- Fluorescein sodium drops or a drop of local anesthetic on a fluorescein strip to assess the pattern of the ulcer and measure the size of corneal defect.

Pharmacological Management

While waiting for laboratory results,
give:

C: ciprofloxacin 0.3%, ophthalmic drops, instill 1–2drops 1–2hourly for 3days then reduce to 3–4hourly.

OR

D: ofloxacin 0.3%, ophthalmic drops, instill 1 drop 1–2hourly for 3days then reduce to 3– 4hourly

OR

S: moxifloxacin ophthalmic drops, instill 1 drop 1–2hourly for 3days then reduce to 3– 4hourly

Give antifungal, if fungal infection is suspected or confirmed

S: natamycin 5%, ophthalmic drops, instill 1 drop 1–2hourly for 3–4days (specialist use only). Then reduce to 1 drop 3-4hourly. Continue for 14–21days until resolution of infection

OR

S: econazole 2%, ophthalmic drops, instill 1 drop 1–2hourly for 3–4days (specialist use only). Then reduce to 1 drop 3–4hourly. Continue for 14–21days until resolution of infection

OR

S: chlorhexidine 0.2%, ophthalmic drops, instill 1 drop 1–2hourly for 3–4days (specialist use only). Then reduce to 1 drop 3–4hourly. Continue for 14–21days until resolution of infection

Give antiviral if viral causes are suspected after the examination of the eye

C: acyclovir 3% eye ointment 5hourly a day until there is no corneal stain, then continue with treatment 8hourly a day for a maximum of 10–14days

Note: Treatment may be changed depending on corneal scrapping results

Referral: Refer to the next level of care where there is an eye specialist when there is hypopyon (white cells in anterior chamber)

14.2.2.1 Herpes Simplex Keratitis

It is an inflammatory condition of the cornea caused by Herpes Simplex Virus. Usually present as dendric ulceration

Clinical Presentation

- Acute painful eye (usually unilateral)
- Blurring of vision
- Reduced corneal sensation
- Dendritic corneal ulcer seen on staining with fluorescein

Investigations

- Visual acuity
- Slit lamp biomicroscopy
- Fluorescein staining
- Corneal sensitivity test

Pharmacological Management

C: acyclovir 3%, ophthalmic ointment applied in the lower conjunctival sac, 4hourly. Continue for 3 days after ulcer has been healed.

AND

B: acyclovir, (PO), 400mg 8–4hourly a day for 7–10days depending on initial response as well as the extent of the ulcer.

Note:

- Topical corticosteroids are contraindicated when corneal ulcer is suspected
- Use of contact Lenses should be avoided until complete healing
- Corneal Opacity as a sequela of corneal ulcer can result and leading to blurry vision

14.2.2.2 Herpes Zoster Ophthalmicus

Occurs when Varicella Zoster Virus reactivates in the trigeminal ganglion and passes down the ophthalmic division of the trigeminal nerve

Clinical Presentation

- Presents with painful vesicular rash in the trigeminal V1 area–vesicles on the tip of the nose indicate nasociliary branch involvement and increases the risk of ocular involvement
- Some patients develop conjunctivitis, keratitis, uveitis, retinitis and cranial nerve involvement (oculomotor and optic nerves)
- Later, chronic ocular inflammation, loss of vision, post herpetic neuralgia
- All patients should be offered HIV testing

Investigations

- Visual acuity
- Slit lamp bimicroscopy
- Corneal sensation test
- Fluorescein staining
- HIV Testing

Pharmacological Management

B: acyclovir (PO) 800mg 4hourly for 7–10days

AND

A: amitriptyline (PO) 25mg at night for 3months.

Note:

- Treatment should be initiated within 3 days of the onset of symptoms, except in HIV infected patients who should be treated if there are active skin lesions
- Management of Herpes Zoster is Multidisciplinary so consult physician for proper management of the patient.

Referral: Refer to eye specialist in case of: -

- Vesicles on the tip of the nose
- Fluorescein staining of the cornea shows corneal ulceration
- Decreased vision
- Red eye (uveitis or keratitis)
- Cranial nerve palsies

14.2.3 Uveitis

This is Inflammation of the uveal tissue (Iris, choroid and ciliary body) and its adjacent structures. Majority of the cases are idiopathic whereby other cases are due to autoimmune diseases e.g. Rheumatoid Arthritis, Sarcoidosis, SLE ocular or systemic infections e.g. Viral, Tuberculosis, Leprosy, and Syphilis.

Clinical Presentation

It has three main Clinical Presentations namely acute, chronic and acute on chronic. The commonest form is anterior uveitis. In acute type, patients present with: -

- Painful red eye
- Excessive tearing
- Severe photophobia
- Loss of vision
- Cells and flare in anterior chamber
- Irregular pupil with synechiae

Investigations

- Visual acuity
- Slit lamp biomicroscopic examination anterior chamber
- Tonometry
- B scan
- Chest X-Rays if Tuberculosis and Sarcoidosis are suspected.
- Urinalysis
- FBC
- ESR
- Antinuclear Antibody
- VDRL
- HIV Testing

Pharmacological Management

Treatment for uveitis is mainly steroids and specific treatment according to the cause. This should be initiated in a facility where workup and close monitoring can be done.

Steroidal Anti-inflammatory medicines

D: dexamethasone 1% eye drops, 1–3hourly in the affected eye for 4-6weeks

OR

D: prednisolone 0.5% or 1 % eye drops, 1–3hourly in the affected eye for 6weeks

OR

D: betamethasone 1% eye drops, 1–3hourly in the affected eye for 4-6weeks

AND

A: prednisolone (PO) 1mg/kg body weight, given in a tapering manner to maximum of 4–6 weeks

OR

D: dexamethasone (PO) in tapering dosage for 2-4 weeks

In Cases which doesn't resolve with above regime, addition of the following is recommended

S: triamcinolone (subtenon) 20mg stat, it can be repeated after 4 weeks if need arise.

OR

S: methotrexate 20mg weekly (PO) in collaboration with an ocular oncologist

AND

Pupil dilating eye drops

B: atropine eye drops or ointment 1% 12hourly in the affected eye

OR

D: cyclopentolate 1 % eye drops, 1–2drops 8hourly in the affected eye.

Treatment for uveitis is to be continued for at least 4-6weeks

Note

- Treatment of uveitis must involve various specialists such as oncologist, immunologist, physician
- Acute uveitis is a serious problem and the patient should be referred urgently for specialist treatment
- Recurrences may occur or acute disease may end up becoming a chronic uveitis
- If Uveitis is not managed appropriate blinding sequalae can result

14.2.4 Conjunctivitis

This is an inflammation of the conjunctivae and one of the most common causes of red eyes. The cause of conjunctivitis may be allergy, viral, or bacterial. Clinical features and treatment guideline depend on the type and cause of conjunctivitis.

Note:

- If conjunctivitis is due to an infection, counsel on the importance of frequent hand washing, use separate linen, towels and wash towels and avoid direct contact with infected materials or individuals
- Contacts lenses should not be worn in patients with conjunctivitis until the condition has resolved

14.2.4.1 Allergic Conjunctivitis Clinical Presentation

Different types of allergic conjunctivitis (AC) exist such as simple AC, Seasonal AC, Vernal Keratoconjunctivitis (VKC-common in tropics), Atopic keratoconjunctivitis (AKC)

Clinical Presentation

- Itching of eyes,
- sand sensation,
- photophobia,
- brownish of the eye,
- eyelids hyperpigmentation
- sometimes mucoid discharge
- the eyes may be normal or slightly red,
- Conjunctival swelling in severe cases,
- Limbal hyperpigmentation and papillae of the upper tarsal conjunctiva.
- Normal iris, pupil and visual acuity.
- Corneal complications in very advanced stages

Investigations

- Visual acuity
- Slit lamp biomicroscopy
- Full blood picture
- Skin Allergic test
- Ocular allergic test

Non-Pharmacological Management

Treatment of allergic conjunctivitis depends on the severity of the condition and age of the patient. In mild acute cases, Avoid allergens, Cold water compresses for 10 minutes four times a day

Pharmacological Management

D: olopatadine eye drops 0.1/0.2% eye drops bid/od respectively for 2-4 weeks and titrate against presentation

OR

C: cetirizine eye drops nocte 1-2 weeks

OR

C: sodium cromoglycate 2% eye drops, instill 6hourly per day for at least a month. Use may be seasonal (1–3 months) or long-term use.

Oral drugs can be added as needed such as

A: chlorpheniramine (PO) 0.1 mg/kg/dose 6–8hourly

OR

A: cetirizine PO nocte 3-5 days in acute phase

Note: Do not give antihistamine to children under 2 years of age as its effectiveness at this age group has not been proven.

Referral: Refer to eye specialist for further specialized care in case of the following:

- Moderate to severe allergic conjunctivitis
- No response after initial treatment
- Persons wearing contact lenses
- Children <2 years of age

At the specialized center, the following treatment may be added depending on the patient's presentation especially in VKC.
Short term steroid eye drops (in severe cases with involvement of the cornea, apart from mast cell stabilizers, give

D: dexamethasone eye drops 0.1%, 6hourly for a maximum of 14days.

OR

D: prednisolone 0.5% eye drops, 6hourly for a maximum of 14days.

OR

D: betamethasone eye drops 8hourly for a maximum of 14 days

In very severe form of allergic conjunctivitis such as VKC, give steroid injection

S: triamcinolone acetonide (subtenon) 20mg stat

OR

D: methylprednisolone sodium acetate (subtenon) 20mg stat

14.2.4.2 Viral Keratoconjunctivitis

The commonest causative organism is adenovirus. It may be unilateral but usually bilateral and involves the cornea and conjunctiva as well. It is the commonest cause of red eye epidemics and is one of the notifiable national diseases.

Clinical Presentation

- It may be associated with upper respiratory tract infection
- Presents with morning crusting and watery eye discharge
- A burning, sandy or gritty feeling in the eyes
- Diffuse pink or red conjunctiva due to subconjunctival hemorrhages
- Photophobia if the cornea is involved
- Normal visual acuity but may be blurry in cornea involvement
- Preauricular lymphadenopathy
- It appears in epidemics so there will be history of contact with patients with similar eye condition
- It is usually self-limiting, but the irritation and discharge get worse on 3 – 5 days before getting better and symptoms can persist for 2–3 weeks.

Non-Pharmacological Management

- Advise on correct cleansing or rinsing of eyes with clean water
- Cold compresses for symptomatic relief
- Sunglass in severe photophobia

Pharmacological Management

Children > 6 years and adults

C: acyclovir eye drops, instill 1–2drops 6hourly for a maximum of 7days.

AND

A: paracetamol (PO) Adult; 1g. Pediatric 10–15 mg/kg/dose 6hourly when required.

Note:

- Viral conjunctivitis is very contagious so patients and members of the family should be alerted
- Assess for superimposed bacterial infection and treat accordingly
- Outbreaks usually happen in schools and other congregations

Referral: Refer all patients to a centre with eye specialist if there is

- No response after 5 days
- Unilateral red eye for more than one day
- Suspected herpes conjunctivitis
- Loss of vision
- Irregular pupil
- Haziness of cornea
- Persistent painful eye

14.2.4.3 Bacterial Conjunctivitis

Purulent conjunctival inflammation caused by bacterial infection. Common bacteria are chlamydia trachomatis, gonorrhea (can break intact cornea)

Clinical Presentation

- Mucopurulent discharge from one or both eyes
- Sore, gritty or scratch eyes and swollen lids
- Conjunctiva redness more at the fornices
- Eyelids may be swollen
- Matting of eye lashes in the morning with eyelids stuck shut

Non-Pharmacological Management

- Educate patient on personal hygiene to prevent spread
- Educate patient correct application of ophthalmic ointment
  - To wash hands thoroughly before applying ophthalmic ointment
  - Not to share the ophthalmic ointment and drops
- Eye swabs for Gram stain and for culture and sensitivity may be needed to tailor down treatment.

Pharmacological Management

A: chloramphenicol 1%, ophthalmic ointment, applied 8hourly for 5days.

OR

C: ciprofloxacin 0.3%, ophthalmic drops, instill 1drop, 4hourly for 2days. Then reduce frequency to 1 drop 6hourly for 5days

OR

D: ofloxacin 0.3%, ophthalmic drops, instill 1 drop 4hourly for 2days. Then reduce the frequency to 1drop 6hourly for 5days

OR

S: moxifloxacin ophthalmic drops, instill 1 drop 4hourly for 2days. Then reduce the frequency to 1drop 6hourly for 5days

AND

A: paracetamol (PO) Adult 1g. Children 10–15 mg/kg/dose 6hourly when required.

Referral: Refer to eye specialist if no improvement after 5days of treatment if VA is still stable.

14.2.4.4 Ophthalmia Neonatorum/Neonatal Conjunctivitis

This is acute bacterial infection of the eyes that affect newborn baby during the first 28days of life. The infection is acquired from mother's birth canal secretions. It is characterized by inflammation of the conjunctivae, sticky eyes to abundant purulent discharge and eyelids oedema. Causative organisms are Neisseria Gonorrhea, Chlamydia spp and Staphylococcus spp.

Clinical Presentation

- Ranges from mild (small amount of sticky exudates) to severe form (profuse pus and swollen eye lids) depending on the causative organism
- There can be rapid ulceration and perforation of corneal which eventually leads to blindness if treatment is delayed especially in gonorrhea cases.
- It usually presents 3–4days of life
- Late and mild presentation is due to Staphylococcus or undefined

Investigations

- Pus swab for Gram Stain
- Pus for Culture and sensitivity
- Vaginal swab for Gram stain and culture and sensitivity
- Maternal VDRL/RPR test should be done, if positive treat as per STI guideline.

Non-Pharmacological Management

Cleanse or wipe eyes of all newborn babies with a clean cloth, cotton wool or swab, taking care not to touch or injure the eye

Pharmacological Management

Screen women in the antenatal clinics and treat both parents for Sexually Transmitted Diseases. In Ophthalmia neonatorum, prevention is better than cure

.

A: chloramphenicol 1% eye ointment, apply both eyes, to all newborn babies as soon as possible after birth.

OR

D: povidone iodine 2.5 % Eye Drops, both eyes

Sticky eye(s) without purulent discharge:

A: chloramphenicol 1% eye ointment, apply 6hourly for 7days

Purulent discharge

Mild discharge without swollen eyelids and no corneal haziness:

Referral: To high level health facilities for proper management.

A: sodium lactate compound (ringer's lactate)eye wash, immediately then 2–3hourly until discharge clears

AND

B: ceftriaxone (IM/IV) 50mg/kg immediately stat

Abundant purulent discharge and/or swollen eyelids and /or corneal haziness:

A: sodium lactate compound (ringer's lactate)eye wash, immediately then hourly until referral

AND

B: ceftriaxone (IM/IV) 50mg/kg immediately stat

Note:

- Ceftriaxone should not be used in neonates that are seriously ill or are jaundiced
- Ceftriaxone should not be administered if calcium containing intravenous infusion e.g., Sodium lactate compound (ringer's lactate)is given or is expected to be given
- Treat parents of a neonate with purulent discharge appropriately
- For more details on prevention and treatment see the "Neonatal Conjunctivitis (NC) **Flow chart number 12.7** under the **Sexual Transmitted disease chapter 12**
- Urgently refer neonates with abundant purulent discharge, swollen eyelids, corneal haziness, or no improvement within 2 days of treatment.

14.3 Structural Abnormalities of the Eye

These includes:

- **Squint:** eyes are aligned; one eye appears to be turned in or out, in children or in adult. Refer urgently all children who present with squint to Paediatric Eye Tertiary Centre
- **Ocular swellings disease**: The most common ocular swellings are Chalazion, Stye, Pre- septal/Orbital Cellulitis, pterygium and Squamous cell carcinoma of the conjunctiva.
- **Eyelids abnormalities**: eyelashes rubbing on cornea (trichiasis), in-turned eyelids (entropion), eyelids bent out too much (ectropion), drooping eyelids (ptosis), inability to close the eyes (lagophthalmos)

Note: Abnormal tissues excised from eye patients should be subjected to pathology examination for proper diagnosis

14.3.1 Squint/Strabismus

This is ocular misalignment. Usually, a common problem in children before 2 years of age but tends to resolve after that age. If significant ocular misalignment is present, it definitely needs work up.

Clinical Presentation

- Esotropia,
- Exotropia,
- wide nasal bridge

Investigations

- Corneal light reflex,
- Cover-uncover test,
- Double Maddox rod,
- Refraction,
- VA

Management

Correct refractive errors if present with spectacles, Occlusion therapy either mechanical or pharmacological, If persist referral to orthoptist and/or Paediatric ophthalmologist should be considered for squint surgery on EOM
after assessment. 37

14.3.2 External Eye and Eye Lid diseases

Commonest Chalazion, Stye, Pterygium, Orbital/ Preseptal cellulitis, dacryocystitis and OSSN.

Clinical Presentation

- Depends on the condition but can be lid swelling (Chalazion, Stye, Pre septal), conjunctival swellings (Pterygium/OSSN), Proptosis in orbital cellulitis.
- Pre-septal and orbital cellulitis are associated with systemic symptoms as well and hence needs appropriate management.

Investigations

Usually, its clinical diagnosis

Management

Depends on the pathology
For Chalazion is usually incision and curettage, for Stye give antibiotics and analgesics for pain. Pre-septal and orbital cellulitis usually strong antibiotics and analgesics.

14.4 Orbital and Pre-Septal Cellulitis

Orbital cellulitis is an infection of the soft tissues of the orbit posterior to the orbital septum. It may be a continuum of preseptal cellulitis, which is an infection of the soft tissue of the eyelids and periocular region anterior to the orbital septum. Orbital cellulitis may result from an extension of an infection from the paranasal sinuses or other periorbital structures such as the face, globe, or lacrimal sac, direct inoculation of the orbit from trauma or surgery or as a hematogenous spread from bacteremia

Clinical Presentation

- Fever, malaise, and a history of recent sinusitis or upper respiratory tract infection
- Proptosis and ophthalmoplegia are the cardinal signs of orbital cellulitis.
- Conjunctival chemosis, dyschromatopsia, and relative afferent pupillary defect
- Decreased vision
- Elevated intraocular pressure

- Pain on eye movement
- Orbital pain and tenderness are present early
- Swollen eyelids, chemosis, hyperemia of the conjunctiva, and resistance to retropulsion of the globe may be present
- Purulent nasal discharge may be present
- For very ill children, vision may difficult to evaluate in very ill children with marked edema

Investigations

- Visual acuity
- Slit lamp biomicroscopy
- Tonometry
- Fundoscopy
- Full Blood Count and ESR
- Blood culture
- Assessment of purulent nasal discharge or from the abscess (Swab for Gram Stain)
- CT Scan of the orbits and paranasal sinuses with Contrast and
- MRI will help differentiating it with other diseases but also identifying the source or extension of the disease

Non-Pharmacological Management

- Patients must be hospitalized
- Adequate hydration
- Lower the temperature
- Daily evaluation and monitor the vital signs
- Management of orbital cellulitis is done with consultation from other medical team (Neurosurgical (if brain extension is seen), ENT (for involvement of sinuses), Paediatrician (for paediatric patients) and Physicians

Pharmacological Management

The antibiotic will be tailored when the laboratory results are out Adults,

B: ampicillin + cloxacillin (FDC) (IV) 1g stat then 500mg 6hourly for 2weeks

AND

A: gentamicin (IV) 160mg 24hourly for 7days

OR

S: vancomycin (IV) 15–20 mg/kg 8–12hourly

AND

B: metronidazole (IV) 500mg 8hourly for 7days

Children more than one-month old give:

B: ampicillin + cloxacillin (FDC) (IV) 50 mg /kg 8hourly for 7–14days

AND

A: gentamicin (IV) 7.5mg/kg, 24hourly for 5 -7days

OR

S: vancomycin (IV) 10mg/kg 6hourly for 7–10day

AND

B: metronidazole (IV) 7.5–15mg/kg 6hourly for 7–10days

Children less or equal to one-month old give:

B: ampicillin + cloxacillin (FDC) (IV) 25–50mg/kg 8hourly for 7–14days

AND

A: gentamicin (IV) 5mg/kg 24hourly for 5–7days

Steroidal anti – inflammatory medicines

To be given after 48 hours of antibiotic therapy.

A: prednisolone (PO) 1–2mg/kg 24hourly to be tapered slowly.

AND

Adults:

A: ibuprofen (PO) 400–800mg 6–8hourly; not to exceed 3.2 g 24hourly

OR

A: paracetamol (PO) 1g 4–6hourly to a maximum of 4 doses 24hourly, for 3days

Children:

A: ibuprofen (PO) 30–40mg/kg per day in 3–4doses

OR

A: paracetamol 10–14 mg/kg for 3days

Note: Do not use ibuprofen in patients with bleeding disorders or peptic ulcers

Surgical Treatment

Surgical drainage is only indicated when there is:

- A decrease in vision
- Development of an afferent pupillary defect
- Progression of Proptosis despite appropriate antibiotic therapy
- The size of the abscess does not reduce on CT scan within 48–72hours after appropriate antibiotics have been administered
- If brain abscesses develop and do not respond to antibiotic therapy, then craniotomy is indicated
- Presence of a drainable fluid collection is evident on CT scan in patients older than 16years

14.4.1 Eyelids abnormalities

Refers to Eyelashes rubbing on cornea (trichiasis), in-turned eyelids (entropion), eyelids bent out too much (ectropion), drooping eyelids (ptosis), inability to close the eyes (lagophthalmos)

Rule out secondary causes and address appropriate, referral to secondary or tertiary center for appropriate management.

Pharmacological Management
C: oxymetazoline 0.1% drops 8hourly for 4-6 weeks.
Can be used for Ptosis management due to myasthenia gravis.

Surgical Treatment
Depending on the cause for Ptosis different surgeries can be performed such as Muller muscle–conjunctival resection, Levator advancement or resection, Frontalis suspension

14.5 Dacryocystitis

Dacryocystitis is inflammation of the lacrimal sac which typically occurs secondarily to obstruction within the nasolacrimal duct and the resultant backup and stagnation of tears within the lacrimal sac. Three clinical forms for the disease exist: Congenital-NLDO, Acute dacryocystitis usually requires systemic antibiotic therapy prior to intervention for the NLDO. Chronic dacryocystitis typically presents with fewer inflammatory signs and requires surgical therapy for the underlying cause

Clinical Presentation
In acute dacryocystitis, the symptoms may occur over several hours to several days and include

- pain, erythema, and edema over the medial canthus and the area overlying the lacrimal sac at the inferomedial portion of the orbit. The redness can extend to involve the bridge of the nose. Purulent material can sometimes be expressed from the puncta and tearing may be present.

In chronic dacryocystitis,

- excessive tearing and mucus reflux (mucocele) are the most common symptoms. Changes in visual acuity may be present due to altered tear film dynamics.

Investigations
The diagnosis of dacryocystitis is generally made based on the patient's history and physical exam. Crigler maneuver, or tear duct massage, can be performed to express material for culture and gram stain. The fluorescein dye disappearance test (DDT),

Pharmacological Management
For congenital NLDO has up to a 90% chance of resolution by 1 year of age, so treatment is delayed until 2 years of age meanwhile Crigler massages is advised.
Acute dacryocystitis should be treated with oral empirical antibiotics with gram-positive coverage

A: amoxicillin (PO) 500mg 8hourly for 7 days
AND
A: ciprofloxacin (PO) 500mg 12hourly for 7 days
OR
B: azithromycin (PO) 500mg 24hourly for 5 days

If No response within 48 hours give referral for further care. Once the acute inflammation/infection is controlled, the underlying cause can then be addressed

For Chronic dacryocystitis. Patients who fail conservative treatment often undergo lacrimal probing, which is successful in 70% of cases. If the dacryocystitis still persists, additional surgical interventions may be needed, such as stenting, balloon dacryoplasty, and either external or endonasal DCR (Dacryocystorhinostomy Surgery)

14.6 Ocular Oncology

14.6.1 Retinoblastoma

It is the commonest childhood malignant tumor of the eyes. It is diagnosed between the first 1– 3 years of life. It has a lower survival rate after diagnosis hence, monthly screening of all under-five children is important for timely referral and management through RCH clinics.

Clinical Presentation

- White pupil reflex (leukocoria)
- Squint
- Rarely vitreous hemorrhage
- Hyphema/Hypopyon
- Ocular/periocular inflammation
- Secondary glaucoma
- In late stages proptosis and whole eye structure protrusion

Investigations

- Visual acuity
- Tonometry
- Fundoscopy
- B Scan
- CT Scan of the head and orbits
- Examination under anaesthesia
- Histology of an enucleated eye in advanced disease
- Cerebral Spinal Fluid analysis in advanced disease

Non-Pharmacological Management

Staging and treatment is done in specialized centres in consultation with Pediatrician and Oncologist. The following are treatment modalities:

- Enucleation of the affected eye and histology
- External beam radiotherapy
- Plaque radiotherapy
- Cryotherapy and laser photoablation

Table 14.6 Classification of Retinoblastoma and recommended treatment options according the international classification of Retinoblastoma (ICRB)

Group	Clinical features	Recommended Treatment options
A	All small tumors (3 mm or less) that are only in the retina and are not near important structures such as the optic disc or the foveolar i.e., Not less than 3 mm from the foveolar and 1.5mmfrom the optic disc.	• Focal therapy (cryotherapy or Transpupillary thermotherapy (TTT). • TTT is indicated for posterior located tumors. TTT use Diode Laser (810nm) or 1064nm or 532nm. Tumor is heated until it turns slightly gray. Complete tumor regression can be achieved by using 3- 4sessions • Do not exceed 5 minutes per session to avoid complication such as Cataract. • Cryotherapy is done to a small tumor at equatorial and peripheral retina. Under GA place the probe precisely on the sclera, directly behind the intraocular focus of the tumor. apply triple freeze/thaw at 3week intervals until complete tumor regression. **Note:** Administer cryotherapy or TTT 3-6 hours prior to chemotherapy if systemic treatment is indicated. Focal therapy synergistically increases drug penetration to the tumor
B	Tumor of > 3mm, close to the optic disc or foveola No subretinal fluid	• 6cycles of standard dose chemotherapy are indicated to allow adequate tumor reduction. **Note:** Standard dose is a combination of Carboplatin, Vincristine and Etoposide (VEC). Do not perform focal therapy if tumors are located in the macular and juxtapupillary areas. • If focal therapy is indicated chemotherapy should be given within 6hr of focal therapy to increase drug penetration to the eye and tumor
C	Well-defined tumors with small amounts of subretinal or vitreous seeding (tumor cells floating within the vitreous cavity) NOTE: Vitreous seeding is one of the most challenging situations for eye-preservation therapy and is the primary reason for treatment failure following conservative management of retinoblastoma.	• 6cycle of standard dose Chemotherapy is indicated. • Chemotherapy should be given within 6 hours of focal therapy (cryotherapy or TTT or Subtenon Carboplatin) depending on site and response to treatment. • Chemotherapy cycles are given at 3 weeks intervals, every cycle is preceded by EUA and focal therapy. **Note:** Do not perform focal therapy if tumors are located in the macular and juxtapupillary areas • vitreous seeding can be managed by plaque radiotherapy (need license), External beam Radiotherapy, Enucleation or intravitreal chemotherapy (Melphalan). Melphalan salvage about 60% of eyeball with vitreous seeding (8-10µg is safe dose)

Group	Clinical features	Recommended Treatment options
D	Large or poorly defined tumors occupying up to 50% of the globe with widespread vitreous or subretinal seeding. There is retinal detachment up to 50% of the globe	• If unilateral Enucleate. • If bilateral Start 3 cycles of chemotherapy • If no response and no visual potential enucleate the worse eye. • If there is response complete 6cycles of systemic chemotherapy. • Local radiation for persistent vitreous seeds may be indicated (plaque therapy or Intravitreal Melphalan) **Note:** Focal therapy should be given prior to chemotherapy for every cycle. • Chemotherapy should be given within 6 hours of focal therapy to increase drug penetration to the eye and tumor
E	The tumor is very large with one or more of the following features: • No visual potential • Tumor in the anterior segment • Tumor in or on the ciliary body • Neovascular glaucoma • When there is no direct visualization of an active tumor (Vitreous hemorrhage, cataract or hyphema) • Phthisical or pre-phthisical eye • Orbital cellulitis-like presentation Total RD of more than 50%	Enucleation with minimal manipulation is indicated for - All group E with no visual potential, If all known effective treatment has failed **Note:** Optic nerve length should not be less than 17mm to minimize the chances of leaving tumor at surgical site. Also, when performing enucleation: - • Take care not to perforate the globe • Use primary orbital implant to achieve excellent cosmetic appearance • If histopathology results are positive for high risk factors, 6cycles of Chemotherapy is indicated as for Group D above. Histopathological features in retinoblastoma are considered high-risk factors (HRF) for tumor progression and metastasis, thus their presence becomes an indication for adjuvant chemotherapy (HRF) includes: i) Scleral extension ii) Post-laminar optic nerve invasion iii) Disease at the cut margin of optic nerve iv) Massive choroidal invasion of more than 3mm v) Anterior chamber extension • If no HRF no need of chemotherapy. Prosthesis and protective glasses are indicated for all children who have been enucleated
EOE	Orbital RB	• 3–6 cycles of high dose chemotherapy- followed by enucleation if tumor regressed significantly • External Beam Radiotherapy and adjuvant chemotherapy for a total of up to 12 cycles **Note:** Exenteration is not encouraged at this stage since aim of treatment is for palliation.
Distance metastasis	CNS involvement RB- where Ct/MRI proved CNS extension or cerebral-spinal fluid is positive for RB cells	Palliative care according to the National Palliative Care Guideline
	Metastatic RB where bone marrow biopsy is positive	Palliative care according to the National Palliative Care Guideline

Pharmacological Management

Systemic and/or intravitreal chemotherapy is instituted by Oncologists and/or or Paediatrician. Ophthalmologist if need be.

Referral: Refer to Oncology Section in this document for details of Chemotherapy in Retinoblastoma treatment.

Note:
Close follow up is very important due to the following: -

- There is a chance of developing retinoblastoma in the fellow eye
- The risk is diminished with increase in age
- Also watch for secondary tumors like osteosarcoma
- Screening of all children during RCH attendance is highly encouraged

Referral: Refer all children presenting with a white pupillary reflex, squint or acute painful red eye to some qualified eye care personnel/ophthalmologist.

14.6.2 Squamous Cell Carcinoma of Conjunctiva

Invasive squamous cell carcinoma of conjunctiva is the major and most common ocular malignancy of the eye in adults. The tumor typically occurs on the bulbar conjunctiva, originating at the limbus, and often spreads onto the cornea, globe, orbit and nasolacrimal system. The cancer is a slow growing tumor of middle-aged to elderly people. It is common in immunocompromised individuals

Clinical Presentation

- It manifests usually as a fleshy vascularized mass at the limbus. (Temporal or nasally)
- In advanced stage, it may intrude the eyeball and extend to other ocular adnexa structures
- Definitive diagnosis is by histopathological assessment of excised tissue

Investigations

- Visual acuity
- Slit lamp Biomicroscopy
- Tonometry
- Fundoscopy
- Histology
- PITC
- DM Screening

Non-Pharmacological Management

- Check for HIV status of the patient as recurrences occurs most frequently in HIV positive patients
- Close follow up of patients for at least the first 12 months postoperatively to look for residual or recurrent tumors

Pharmacological Management

S: 5-fluorouracil (5FU) 50mg/mL, on a sponge, for about 2.5minutes then wash off with sodium lactate compound (ringer's lactate)solution.

OR

S: mitomycin C 0.2mg/mL, on a sponge, for about 2.5minutes then wash off with sodium lactate compound (ringer's lactate)solution.

AND

C: dexamethasone + chloramphenicol eye drops, 0.1%–0.5 %, 6hourly, for 3–4weeks

OR

C: dexamethasone + gentamicin eye drops, 0.1–0.3%, 6hourly, for 3–4 weeks (These are post operatively until the wound is healed)

THEN

S: 5-fluorouracil (5FU) 1% eye drops, 4times daily for 2–3weeks

OR

S: cyclosporine 0.05% eye drops bid for 2-3 weeks

Note:

- 5-fluorouracil (5FU) is used after the excision wound has healed
- 5FU eye drops may cause watery eye, discomfort or eye inflammation, manage accordingly

Surgical Treatment

- It depends on the tumor size, location, focality, and invasiveness
- Surgical excision of the mass with clear margin of 4 mm without touching the tumor is recommended, followed with topical adjunctive cryotherapy and or chemotherapy to the residual conjunctival and scleral bed
  - Double - four freeze-thaw cycles of cryotherapy to the remaining conjunctival margins, bed and limbus.
  - For tumors that are adherent to the sclera, perform a superficial sclerectomy and use cryotherapy to the base.
- A large or multicentric squamous conjunctival mass should be managed by a surgeon experienced in treating such lesions
- Removal of the eyeball and adnexa may be indicated for advanced stage
- Radiotherapy if required, for palliation after removal of the eye.

Referral:

- All suspicious cases of Squamous Cell Carcinoma of Conjunctiva must be referred to eye specialist for proper evaluation and management.
- Refer all patients with advanced Squamous Cell Carcinoma of the conjunctiva to Oncologist

14.7 Dry Eye Syndrome/Keratoconjunctivitis Sicca

It occurs when there is inadequate tear volume, poor quality tears or functional disorders of tear drainage.

Clinical Presentation

- Feelings of dryness, grittiness, burning and foreign body sensation, usually worse during the day
- Stringy discharge, redness and transient blurring of vision are also common. Exclude allergic conjunctivitis

Investigations

- Visual acuity
- Refraction
- Fundoscopy
- Schirmer tear Test
- Tear break up time
- Slit lamp biomicroscopy
- Tear meniscus height (meniscometry)

Non-Pharmacological Management

- Control symptoms and look for secondary causes for treatment such as MGDs.
- Educate patients to avoid unprescribed eye medications which may worsen the dryness and control their environmental factors by e.g., blinking frequently during visual attentive tasks and the use of 20-20-20 rule avoid air conditioners directly on the face.
- Use humidifier in areas with low humidity
- Punctal plugins to decrease tear drainage
- Tear conserving interventions such as punctal plugs or nighttime masks/goggles
- Bandage Contact Lenses can be used as well
- Specialty contact lenses such as scleral lenses

Pharmacological Management

C: hydroxypropyl methylcellulose 0.7%, ophthalmic drops, 1drop, 6hourly.

OR

C: carboxymethylcellulose-0.5%w/v + glycerin-0.5%w/v eye drops 12hourly for 3months

OR

S: cyclosporine 0.05%/0.09% eye drops 12hourly for 1-2months -increase tear production)

OR

S: lifitegrast 5% ophthalmic solution 12hourly 1-2 months have shown to alleviate symptoms

OR

S: autologous serum tears 12hourly for 1-2 months

Note:

- Dry eye syndromes are a multifactorial disease and should be managed wholistically
- Rule out risk factors and address them accordingly such as MGDs, Blepharitis
- Menopause women are prone to dry eyes so advise them accordingly

14.8 Endophthalmitis

It is an infection of the ocular cavity. It is an ophthalmic emergency that can cause blindness that may occur secondary to bacteraemia (endogenous infection) or following penetrating eye injury or after intraocular surgery

Clinical Presentation

- Loss of vision, associated with pain in the affected eye
- Injected painful eye
- Hypopyon
- Corneal oedema
- Blood culture should be done to identify the source and how it can be treated (for bacteraemia)
- In post injury or surgery, culture of specimens of aqueous or vitreous humour should be done

Investigations

- Visual acuity
- Slit lamp biomicroscopy
- Tonometry
- Refraction
- B Scan
- Vitreous Tap for Gram stain, Culture and sensitivity

Pharmacological Management

Start Topical antibiotics and oral antibiotics as well and refer immediately to an ophthalmologist for treatment

C: ciprofloxacin eye drops hourly

OR

B: chloramphenicol eye drops hourly

OR

D: moxifloxacin eye drops hourly

OR

D: gentamicin Subconjunctival. 24hourly

AND/OR

S: at this level tap for vitreous sampling should be done and immediately Intravitreal Vancomycin 1.0 mg/0.1 mL and Amikacin 400 µg/0.1 mL for Penicillin (PCN) allergic patients 24hourly for 5 days and assess accordingly as there is room for extension

AND

B: ceftriaxone (IV) 2g 24hourly for 7days

OR

D: ceftazidime (IVI) 2.25 mg/0.1 mL 24hourly

AND

C: chloramphenicol (PO) 500mg 12hourly for 5-7 days

OR

A: ciprofloxacin (PO) 750mg bid for 5-7 days

If fungal is suspected:

S: Amphotericin B deoxycholate Intravitreal 5-10 µg/0.1 mL should be given

Note:

- Vitrectomy (PPV) can be considered as early as possible for endophthalmitis and when available should be offered asap.
- Adjust antibiotics accordingly to culture and sensitivity
- 4th generation fluoroquinolones have better ocular penetration.
- Systemic ceftazidime, cefazolin, ciprofloxacin, gatifloxacin and moxifloxacin have been shown to penetrate the blood ocular barrier efficiently and can be used as adjunctive oral antibiotics.

14.9 Visual Problems

Visual problems may be due to refractive errors, damage to the eye or optic nerve. This may be an indication of underlying diseases such as diabetes or hypertension.

Investigations

- Assess ocular alignment
- Determine visual acuity accurately in both eyes by Snellen chart
- If vision is diminished, (less than 6/12), perform the following: -
- **Pin hole test**
  - Make a hole of about 1mm wide in a piece of dark/black paper – you can push a hole in a paper or card with a pen tip
  - Ask the patient to look through this hole at the Snellen chart
  - If vision improves, this means that the patient has a refractive error
- **Red Reflex Test**

  The patient looks past the examiners head focusing on a distant target.
  - With the ophthalmoscope at 0 (zero) the examiner keeps close to his eye and then focuses the beam of light so that it falls on the pupillary area of the cornea
  - The examiner stands about 60cm away from the patient.
  - In normal individuals, the examiner should be able to see a red or pink colour (reflex) through the pupil which comes from the retina.

Significance of absent red reflex

If there is history of trauma or diabetes, the absence of a red reflex is probably due to:

- Retinal detachment
- A vitreous hemorrhage
- Mature cataract

If there are cataracts, one usually sees:

- Black shadows against the red reflex in immature cataract, or
- Absence of red reflex in mature cataracts

In a >50years of age with no history of trauma, diabetes or previous eye disease, an absent red reflex is often due to cataract formation, especially with decreased visual acuity.

Note: Associated diabetes or hypertension should be adequately managed with referral, as surgery can only be considered with appropriately managed systemic disease

Table 14.7: Referral Criteria for Eye Conditions

Category	Clinical Features / Indications for Referral
Urgent (within 12–24 hours)	• Sudden loss of vision in one or both eyes • Pain or redness in one eye, especially with visual and pupillary abnormalities • Recent proptosis of one or both eyes or enlargement of the eye (buphthalmos) in children • Hazy cornea in children • Unilateral watery eye
Within Days	• Squint of recent onset • Suspected or previously diagnosed glaucoma • Double vision following recent injury (may indicate orbital fracture) • Leukocoria (white pupillary reflex), especially in children • Squint at any age if not previously evaluated by an ophthalmologist • Visual loss in patients with systemic diseases such as diabetes
Non-Urgent Referral	• Cataracts in adults • Refractive errors in teenagers and adults • Long-standing blindness (first presentation to a health facility)

14.10 Onchocerciasis (River Blindness)

Onchocerciasis is a tissue parasitic infestation caused by a filarial worm, Onchocerca volvulus. The microfilariae invade lymphatic system, subcutaneous and deep tissues producing acute inflammation and chronic inflammation at a later stage

Clinical Presentation

- Skin inflammation with papules
- Subcutaneous nodules
- Atypical skin lesions (scarred, saggy, hanging areas of skin, leopard skin)
- Skin nodules under the bony prominent areas
- Microfilaria in anterior chamber
- Scleritis and Keratitis leading to Impaired vision as well as blindness

Investigations

- Visual acuity
- Rapid diagnostic test (OV-16 - Onchocerciasis IgG)
- Skin snip for microscopic examination
- Slit lamp eye examination.
- B Scan

Pharmacological Management

Treatment is done in consultation with dermatologists and infectious disease specialists.
Apart from WHO recommended mass treatment campaign to community at risk with annual preventive chemotherapy which polarize/paralyze the worm, treatment depends on individual patient presentation.

A: ivermectin (PO) 0.15mg/kg once every 12months for 12–15years

Note:

- Patients with heavy ocular infestation require retreatment every 3 to 6 months.
- Treatment will only arrest progression of the clinical features but not reverse them.

Table 14.8 Ivermectin Dosage guidelines based on body weight

Weight	Dosage
15-25kg	3mg
26-44 kg	6mg
45 -64 kg	9mg
65- 84 kg	12mg
85kg or more	0.15mg/kg

CHAPTER FIFTEEN

EAR, NOSE AND THROAT/HEAD AND NECK DISEASES

Ear, Nose and Throat (ENT) is a specialty in medicine that deals with medical and surgical management of disorders affecting the ear, nose, throat, head and the neck. Symptoms and diseases affecting this area are common and commonly lead to patients seeking medical care.

15.1 Ear Conditions

15.1.1 Circumscript otitis Externa (Furunculosis)

This is a localized infection of the hair follicle on the outer one-third of the external auditory canal. It is caused by Staphylococcus aureus.

Clinical Presentation

- Ear pain that is severe and disproportional to the visible lesion
- Reduced hearing
- Localized swelling on the external auditory canal
- There may be a purulent discharge if the swelling ruptures

Non-Pharmacological Management

- Aural toilet if there is otorrhea (ear suctioning under direct vision).
- Aural toilet using a clean dry cotton cloth while at home.
- Instruct the patient to keep the ear dry and avoiding scratching

Pharmacological Management

Antibiotics are reserved for cases with systemic symptoms (e.g., fever, cellulitis) or microbiologically confirmed resistant infections. Routine use is discouraged to prevent antimicrobial resistance

Indication	Medicine	Population	Dose	Frequency	Duration
Bacterial Infection	**B:** amoxicillin + clavulanic acid (FDC) (PO)	Adults	625 mg – 1 g	12 hourly	7–10 days
		Children ≤ 3 months	30 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
		Children > 3 months	25 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
Pain/Fever Control (as needed)	**A:** paracetamol (PO)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed

Surgical management

Incision and drainage

15.1.2 Diffuse Otitis Externa (Swimmer's ear)

This is an inflammation of the entire external auditory canal. It can be caused by bacteria, fungus or both.

Clinical Presentation

- Itchy, dry and scaly ear canal and painful ear
- There may be a water or purulent discharge, debris and reduced hearing
- Pain may become extreme when the ear canal becomes completely occluded with edematous skin and debris.

Non-Pharmacological Management

- Aural toilet at least once a week (ear suctioning under direct vision using microscope or endoscope).
- Instruct the patient to keep the ear dry and avoiding scratching.

Pharmacological Management

Topical Antibiotics: Preferred over systemic antibiotics to reduce resistance risk. Systemic antibiotics are not recommended unless there is evidence of cellulitis or systemic infection

Indication	Medicine	Population	Dose	Frequency	Duration
Topical Therapy	**C:** ciprofloxacin ear drops	Adults & Children	2–4 drops in each ear	6–8 hourly	14 days
	OR				
	C: Topical cream (combination: Gentamicin or Neomycin + corticosteroid [Clobetasol/Betamethasone/Beclometasone] + antifungal [Miconazole/Clotrimazole])	Adults & Children	Apply pea-sized amount in external auditory canal	Once weekly	4–6 weeks
	OR				
	D: chloramphenicol + beclometasone dipropionate + clotrimazole + lidocaine ear drops (FDC)	Adults & Children	2–3 drops in each ear	6–8 hourly	14 days
Pain/Fever Control (as needed)	**A:** paracetamol (PO)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed

15.1.3 Necrotizing (Malignant) Otitis Externa

This is a life-threatening invasive infection that affects the external auditory canal leading to skull base osteomyelitis. It is common to elderly diabetic patients and other immunosuppressive conditions. Most common causative organism is *Pseudomonas aeruginosa* followed by Aspergillus. Controlling the underlying cause of immunosuppression is of paramount importance.

Clinical Presentation

- Nocturnal exquisite ear pain, discharge, fullness and hearing impairment.
- May present with facial nerve paralysis or other cranial nerves palsy.
- Oedema of the external auditory canal with or without presence of granulation tissues at the junction between the bony and cartilaginous parts of the inferior portion of external auditory canal
- Necrosis of external auditory canal

Non-Pharmacological Management

- Aural toilet at least three sessions per week (ear suctioning under direct vision using microscope or endoscope) until disease is controlled.
- Placement of an aural wick
- Instruct the patient to keep the ear dry and avoiding scratching

Investigations

- Culture and sensitivity of discharge and tissue.
- Erythrocyte Sedimentation rate
- C – reactive protein
- Full blood picture
- Glycosylated hemoglobin HbA1c / Fasting blood glucose
- HR CT Scan Temporal bone

Pharmacological Management

Antibiotics: Systemic antibiotics are essential due to the severity and osteomyelitis risk. Treatment should be guided by culture and sensitivity result.

Indication	Medicine	Population	Dose	Frequency	Duration
Severe Infection	**D:** ceftazidime (IV)	Adults	2 g	8 hourly	4 weeks, then de-escalate according to M/C/S
		Children	50 mg/kg (max 6 g/day)	8 hourly	4 weeks, then de-escalate according to M/C/S
	OR				
	C: ciprofloxacin (IV → PO)	Adults	500 mg (IV)	12 hourly	5–7 days, then switch to oral
			500 mg (PO)	12 hourly	Continue up to 6 weeks
		Children > 1 year	20 mg/kg	12 hourly	4–6 weeks
	OR				
	S: meropenem (IV) (culture and sensitivity required)	Children ≥ 3 months	20–40 mg/kg	8 hourly	7–14 days
Pain/Fever Control (as needed)	**A:** paracetamol (PO/IV)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed

Note: Necrotizing otitis externa is an emergency therefore treatment should be vigorous including the treatment of underlaying immunodeficiency. Consider referral to tertiary facility for specialized care.

15.1.4 Herpes Zoster Atticus (Ramsay Hunt syndrome)

This is a viral infection of external, middle and inner ear caused by reactivation of Varicella Zoster virus in the geniculate ganglion.

Clinical Presentation

- Vesicular rash of the ear
- Facial nerve paralysis
- Ear discharge
- Ear pain

Non-Pharmacological Management

Instruct the patient to keep the ear dry and avoiding scratching

Pharmacological Management

Indication	Medicine	Population	Dose	Frequency	Duration
Antiviral Therapy (early initiation recommended)	**A:** prednisolone (PO)	Adults	60 mg	24 hourly	5 days, then taper to 50 mg 24 hourly for next 5 days
		Children	1 mg/kg	24 hourly	5 days, then taper by half for next 5 days
	AND				
	B: acyclovir (PO)	Adults	800 mg	4–8 hourly (optimal 5 times/day)	7–14 days
	OR				
	D: acyclovir (IV)	Children birth to 12 years	10–20 mg/kg	8 hourly	7–14 days
	OR				
	B: acyclovir (PO)	Children > 12 years	40–80 mg/kg	6 hourly	7–14 days
	AND				
	B: acyclovir 5% cream (topical)	Adults & Children	Apply to lesions	12 hourly	7 days

Indication	Medicine	Population	Dose	Frequency	Duration
Pain/Fever Control (as needed)	**A:** paracetamol (PO/IV)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed
	OR				
	C: diclofenac (PO / IV / IM)	Adults	50 mg (PO)	8 hourly	As needed
			75 mg (IV/IM)	12 hourly	As needed

Note: If there is involvement of the eyelid or eye refer to an ophthalmologist for review.

15.1.5 Pre-auricular Sinus Tract Infection

This is an infection of the pre-auricular sinus tract. May present with pre-auricular abscesses. Most common causative organism is Staphylococcus aureus.

Clinical Presentation

Ear pain, sinus discharge, Pre-auricular Swelling, Fever, headache.

Pharmacological Management.

Antibiotics: Antibiotics are indicated only for active infection with abscess or cellulitis. Prophylactic antibiotics are not recommended

Indication	Medicine	Population	Dose	Frequency	Duration
Bacterial Infection	**B:** amoxicillin + clavulanic Acid (FDC) (PO)	Adults	625 mg – 1 g	12 hourly	7–10 days
		Children ≤ 3 months	30 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
		Children > 3 months	25 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
Pain/Fever Control (as needed)	**A:** paracetamol (PO)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed

Surgical management

- Incision and drainage of the abscess
- Excision of the sinus tract two to three weeks after incision and drainage i.e., when the sinus tract is dry.

15.2 Trauma of the Pinna

15.2.1 Hematoma of the Pinna

Clinical Presentation

- History of trauma,
- Fluctuant,
- Tender pinna swelling

Pharmacological Management

Antibiotics: Prophylactic antibiotics are not routinely recommended unless there is evidence of infection or high risk of postoperative infection

Indication	Medicine	Population	Dose	Frequency	Duration
Bacterial Infection	**B:** amoxicillin + clavulanic Acid (FDC) (PO)	Adults	625 mg – 1 g	12 hourly	7–10 days
		Children ≤ 3 months	30 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
		Children > 3 months	25 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
Pain/Fever Control (as needed)	**A:** paracetamol (PO)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed

Surgical management

- Incision and evacuation of hematoma
- Tight wound dressing to prevent re-accumulation of hematoma

15.2.2 Laceration of the Pinna

Lacerative trauma of the pinna with tear of skin and cartilage through and through.

Non-Pharmacological Management

Skin to skin stitching of the wound, do not suture the cartilage.

Pharmacological Management

Antibiotics: Prophylactic antibiotics are indicated only for contaminated wounds or high-risk patients

Indication	Medicine	Population	Dose	Frequency	Duration
Bacterial Infection	**B:** amoxicillin + clavulanic Acid (FDC) (PO)	Adults	625 mg – 1 g	12 hourly	7–10 days
		Children ≤ 3 months	30 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
		Children > 3 months	25 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
Pain/Fever Control (as needed)	**A:** paracetamol (PO)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed

15.2.3 Ear Keloid

This is abnormal proliferation of scar tissue that forms at the site of cutaneous injury and grows beyond the original margins of the scar. Most common causes are ear piercing, trauma or surgical incisions.

Clinical Presentation

Swelling of the involved area of the ear, most commonly ear lobe

Non-Pharmacological Management

Use of pressure therapy e.g., pressure clips

Pharmacological Management
Intra-lesional steroid injection
S: triamcinolone acetonide (Intra-lesional) 40mg depending on the size of the lesion weekly for 4weeks before excision and 4weeks after excision

Surgical management
Total keloidectomy +/- Steroid injection. (should be done by expertise, involve dermatologist/plastics for best decision)

15.2.4 Cerumen Impaction

Usually occurs following the use of cotton buds which hinder the natural movement of cerumen outwards

Clinical Presentation

- Reduced hearing
- Ear pain
- Ear fullness
- Itching
- Tinnitus

Pharmacological Management
A: hydrogen peroxide 3% ear drops2-4drops each ear 6-8hourly for 7days.

Non-Pharmacological Management
Remove using cerumen hook or suctioning under direct vision

15.2.5 Foreign Body in the Ear

Usually happens in children. Common foreign bodies include beads, stones and seeds (bean, maize, orange). In adult's foreign bodies include cotton bud and insect

Non-Pharmacological Management

- Should be removed under direct visualization e.g., headlight, Otomicroscopy or endoscopy.
- An insect should be killed (by soaking the ear canal with normal saline or spirit) before removal

Note: Do not attempt to remove ear foreign body if you don't have proper instruments and expertise.

15.2.6 Traumatic Tympanic Membrane/ Ear Drum Perforation.

Clinical Presentation

- History of trauma direct or indirect
- Ear bleeding +/-discharge
- Ear pain/otalgia

Non-Pharmacological Management

- For indirect trauma avoid ear drops and water in the ear
- For direct trauma aural toilet can be done then ear drops instilled

Note: Patient should be educated on cleansing mechanism of the ear and not to use cotton bud.

Pharmacological Management
Post traumatic infection

Indication	Medicine	Population	Dose	Frequency	Duration
Topical Therapy	**A:** ciprofloxacin ear drops	Adults & Children	2–4 drops in each ear	6–8 hourly	14 days
Pain/Fever Control (as needed)	**A:** paracetamol (PO)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed

15.2.7 Otitis Media (Acute or Chronic)

It is an inflammation of the middle ear cavity. It is considered acute when the inflammation is of less than 2 weeks' duration, and chronic when the inflammation is of more than 2 weeks' duration with tympanic membrane perforation.

Clinical Presentation

- Examine the pinna
- Using an otoscope carefully examine the external auditory canal and the tympanic membrane

15.2.7.1 Acute Otitis Media

Clinical Presentation

- Previous upper respiratory tract infection
- Fever
- Hearing often reduced
- Inflamed, bulged tympanic membrane
- Painful ear
- Restlessness

Non-Pharmacological Management

Acute otitis media should be treated with analgesics, antibiotics and/or Myringotomy to reduce pain and to obtain pus for culture and sensitivity)

Pharmacological Management

Antibiotics should be avoided in mild cases to reduce resistance AND only indicated for severe cases (e.g., high fever, severe pain, bilateral disease) or in children <2 years.

Amoxicillin is first-line;

Indication	Medicine	Population	Dose	Frequency	Duration
Bacterial Infection	**A:** amoxicillin (PO)	Adults	500 mg	8 hourly	5–7 days
	OR				
	B: azithromycin (PO)	Adults	500 mg	24 hourly	5 days
	A: amoxicillin dispersible tablet (PO)	Children	80–90 mg/kg/day (in 2 divided doses)	12 hourly	10 days
Pain/Fever Control (as needed)	**A:** paracetamol (PO)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed

Referral

- Children with high fever, severe ear pain, headache, altered state of consciousness
- A chronically discharging ear that persists in spite of proper treatment.
- Foul smelling ear discharge
- Mastoiditis
- Otitis in the normal (or better hearing) ear combined with permanent hearing loss in the other ear

15.2.7.2 Chronic Suppurative Otitis Media

This is a perforated tympanic membrane with persistent drainage from the middle ear for more than 2-6 weeks. Most common causative organisms are Pseudomonas aeruginosa, Staphylococcus aureus, Proteus species, Klebsiella pneumonia, and diphtheroid.

Clinical Presentation

- Discharge of pus from the ear
- Perforated tympanic membrane
- Reduced hearing

Non-Pharmacological Management

- Keep ear dry/avoid water into the ear
- Aural toilet – ear suctioning under direct vision (Otomicroscopy/endoscopy), removal of debris
- Ear wicking regularly, with a dry cotton wick at home

Pharmacological Management

Prefer topical over systemic antibiotics to reduce resistance. Systemic antibiotics are reserved for complications (e.g., mastoiditis)

C: ciprofloxacin ear drops, three drops 12 hourly for 14days

OR

A: hydrogen peroxide 3%, 2–4 drops, 6–8-hourly for 14 days (adults and children)

OR

D: ofloxacin ear drops: 2 to 4 drops each ear 6-8hourly for 14days

AND

(If systemic complication)

A: ciprofloxacin (PO) 500mg 12hourly for 10days

For Children:

A: ciprofloxacin (PO) 10–20mg/kg 12hourly for 10days

Investigations

- Pure Tone Audiometry
- HR CT SCAN-Temporal Bone

Surgical treatment

S: Tympanoplasty +/-Mastoidectomy (Tympano-mastoidectomy)

S: Ossiculoplasty (Autologous or Prothesis)

Note:

- Treatment of shorter than 10 days will result into treatment failure
- Avoid ototoxic drugs (gentamicin or neomycin)

15.2.7.3 Mastoiditis with Sub-Periosteal Abscess

It is due to infection of the mastoid air cells in the middle ear, a complication of chronic suppurative otitis media. It presents as a fluctuant painful swelling on the post auricular area. The overlying skin is also inflamed.

Non-Pharmacological Management

Aspirate the swelling before incision and drainage, and then refer for mastoidectomy at a zonal/national hospital

Pharmacological Management

C: ciprofloxacin ear drops, 3drops, 12hourly for 14days

AND

Intravenous antibiotics are required due to the severity and risk of intracranial complications

B: ceftriaxone (IV) 1–2 g, 12-hourly for 7–14 days

For Children

B: ceftriaxone (IV) 50–100 mg/kg, 24-hourly for 7–14 days (children)

Investigations

- Culture &sensitivity
- CT SCAN-Temporal Bone

Surgical treatment

- Incision and drainage
- Mastoidectomy/Drainage mastoidectomy
- Tympano-mastoidectomy
- Ossiculoplasty

Note: Treatment shorter than 10days will result into treatment failure

15.2.7.4 Otitis Media with Effusion (Glue Ear)

The presence of middle ear fluid without signs of acute infection. OME often occurs after acute otitis media (AOM) episodes, but it also may occur as a result of Eustachian tube dysfunction in young children in the absence of a preceding AOM.

Clinical Presentation

It is often discovered by chance with: -

Little or no ear pain, Gradual loss of hearing, No ear discharge and Aural fullness.

Investigations
Tympanometry, Audiometry.

Non-Pharmacological Management
- Close follow-up
- Valsalva maneuver
- Encourage chewing

Pharmacological Management
B: ephedrine (0.5% and 1%) nasal drop, Adults and children above 12years: Instill 1 to 2 drops in each nostril, not more than 4 times a day for 3 to 5 days

AND

D: fluticasone propionate (50mcg/spray) nasal spray. Adults and adolescents more than 12years:
2sprays in each nostril 24hourly as needed. Children 4 months-1years: 1spray in each nostril 24hourly as needed.

OR

S: mometasone (nasal spray) Adults and adolescents from 12years: 2 sprays in each nostril 24hourly as needed.
Children 6-11years: 1spray in each nostril 24hourly as needed

Note: Otitis media with effusion with hearing loss that does not improve after 3months should be referred to a specialist for myringotomy and grommets insertion.

Surgical treatment
Myringotomy + grommet insertion (microscopic/endoscopic)
+/- Adeno (tonsillectomy)

15.3 Hearing Loss

A child with hearing loss should be detected and intervention started immediately after delivery. New born hearing screening is done using an otoacoustic emission machine. Any child suspected of hearing loss (usually presenting with delayed speech development) should be referred to a zonal/national hospital immediately since early intervention has a better outcome.

15.3.1 Sensorineural Hearing Loss (SNHL)

Loss of hearing that results from defective function of cochlea or auditory pathway. It may be congenital or acquired.

Clinical Presentation
Hearing impairment as confirmed by hearing assessment tests.

Investigations
- Distraction Test/Free Field Test – for children
- Tympanometry
- Pure Tone Audiometry
- Otoacoustic emission (OAE)
- Auditory Brainstem Response (ABR)
- CT-Scan/MRI for bone cochlea and auditory nerve assessment for pre cochlea implantation

Non-Pharmacological Management
(Rehabilitation)
- Avoiding exposure to noises
- Avoiding unnecessary use of ototoxic drugs
- Digital programmable hearing aid- for mild to moderate SNHL
- Super power digital programmable hearing aid- for severe and profound SNHL
- Bone-anchored hearing Aid (BAHA)
- Cochlea Implantation (C.I), with interval programming/troubleshooting –for severe and profound SNHL.
- Speech therapy
- Sign language/ lip reading

Pharmacological Management
C: calcium + vitamins 1 tablets 24hourly for not less than 3months

Surgical treatment
Cochlear implantation

15.3.2 Sudden Sensorineural Hearing Loss

Clinical Presentation
- Hearing loss that is sensorineural in nature
- Hearing loss of at least 30 decibels (dB) over at least three consecutive test frequencies
- Hearing loss that occurs within a 72-hour period

Investigations

- Tuning Fork Test
- Tympanometry
- Pure Tone Audiometry

Pharmacological Management

Treat underlying cause if known

A: prednisolone (PO) 60mg 24hourly for 5days then taper down to 50mg 24hourly for next 5days.

For Children:

A: prednisolone (PO) 1mg/kg 24hourly for 5days then taper down by half for the next 5days.

AND

C: calcium + vitamins 1tablet 24hourly for not less than 3months

15.3.3 Otosclerosis

Otosclerosis is a bony overgrowth that involves the footplate of the stapes. As the overgrowth develops, the stapes can no longer function as a piston, it becomes fixated. Conduction gradually becomes worse until a maximal conductive hearing loss of 60 dB is reached.

Clinical Presentation

Hearing loss, Dizziness, Tinnitus.

Investigations

- Tympanometry
- Pure tone Audiometry (PTA)
- CT- Scan -of temporal bone

Non-Pharmacological Management

- Hearing aids (H/A)-Digital Programmable Hearing Aids
- Cochlea implantation

Surgical treatment

- Stapedectomy
- Cochlea Implantation
- Middle ear implant

15.3.4 Peripheral Vertigo (Meniere's disease and Benign Paroxysmal Positional Vertigo (BPPV)

Clinical Presentation

Meniere's disease	Benign Paroxysmal Positional Vertigo(PPPV)
Vertigo	Vertigo
Nausea	Nausea
Vomiting	Vomiting
Tinnitus	Directional specificity
Aural Fullness	
Reduced Hearing	
Reduced Hearing	

Investigations

- Audiometry
- Vestibular test
- Video nystagmogram (vNG)
- Video head impulse test (vHIT)
- HINTS Examination
- MRI Brain-to rule out cerebellopontine angle (CPA) tumours

Non-Pharmacological Management (FOR BPPV)

- Epley maneuver
- Berbecure maneuver
- Vestiulr rehabilitation therapy
- Stabilometer

Pharmacological Management (FOR MENIERES)

B: intratympanic dexamethasone (IV) 4mg

AND

D: betahistine (PO) 24-48mg 8 hourly for 14days. Maintenance dose 24mg 24hourly for 14 days

15.3.5 Vestibular Neuritis /Vestibular Neuronitis and Labyrinthitis

Clinical Presentation

- Rapid onset severe vertigo, nausea, vomiting
- Spontaneous vestibular nystagmus 325
- Gait instability

Pharmacological Management

Symptomatic approach

A: promethazine (PO/IV) 12.5-25mg 8hourly

AND

B: metoclopramide (PO/IV) 5 – 10mg 8hourly

AND

C: diazepam (PO) 1- 5 mg 8-12hourly

OR

D: betahistine (PO) 16-24mg 12hourly

15.3.6 Vestibular Migraine

Clinical Presentation

- Dizziness/Vertigo
- Moderate to severe temporal headache
- Sensory amplification e.g., hyperaccusis

Investigations

- Audiometry
- Vestibular test
- Video nystagmogram (vNG)
- Video head impulse test (vHIT)
- MRI Brain-to rule out cerebellopontine angle (CPA) tumours

Pharmacological Management

A: propranolol (PO) 40mg 12hourly for 14days

OR

B: amlodipine (PO) 10mg 24hourly for 14days

15.3.7 Tinnitus

Clinical Presentation

Perception of sound in proximity to the head in the absence of an external source

Non-Pharmacological Management

Tinnitus masking

Pharmacological Management

D: betahistine (PO) 48mg daily (16-24mg regime) preferably after meals for 2 months

For Children 5-12 years:

D: acetazolamide (PO) 250mg 24hourly 14days

15.3.8 Glomus Tumours

Paragangliomas are rare neuroendocrine tumors that arise from the extra-adrenal autonomic paraganglia, small organs consisting mainly of neuroendocrine cells that are derived from the embryonic neural crest and have the ability to secrete catecholamines.

Clinical Presentation

Neck mass (at angle of mandible), Rising sun signs**,** Pulsatile tinnitus**,** Hearing loss(conductive).

Investigations

- Audiometry
- CT-angiogram
- MRI-Head & neck HRCT
- Scan-head & neck

Surgical treatment

Glomus Tumour excision, Embolization (MDT with Interventional radiologist and neurosurgeon)

15.3.9 Vestibular Schwannomas

Also known as acoustic neuromas, acoustic schwannomas, acoustic neurinomas, or vestibular neurilemomas) are Schwann cell-derived tumors that commonly arise from the vestibular portion of the eighth cranial nerve.

Clinical Presentation

Hearing loss, Tinnitus.

Investigations

- Audiometry
- MRI-brain (with gadolinium as contrast)
- Auditory Brainstem Response (ABR)
- Videonystagmography (VNG)
- Video Head Impulse Testing (vHIT)
- Acoustic Reflex Testing (ARTs)

Non-Pharmacological Management

- Observation/watchful waiting
- Radiotherapy

Surgical treatment

Tumour (schwanoma) excision

15.3.10 Hereditary/Congenital Hearing loss

Refers to hearing impairment present at birth, while hereditary hearing loss is caused by genetic mutations that may present at birth or later in childhood. Both may be sensorineural, conductive, or mixed in type.

Classification

Type	Description
Indication	Hearing loss occurs with other physical or systemic abnormalities (e.g., Waardenburg, Pendred, Usher syndromes)
	Hearing loss is isolated with no other clinical features (accounts for ~70% of genetic cases)
	Autosomal recessive (most common), autosomal dominant, X-linked, or mitochondrial

Causes

- Genetic mutations
- Syndromes affecting ear development or inner ear structures
- Intrauterine insults (e.g., CMV, rubella) may mimic congenital/genetic loss
- Anomalies of the external/middle/inner ear seen in syndromic disorders

Clinical Presentation

- Failure to respond to sound or startle reflex
- Speech and language delay
- Lack of appropriate auditory milestones by age
- Family history of hearing loss

Investigations

- Newborn Hearing Screening (OAE/ABR testing ideally within the first month)
- Confirmatory Audiologic Testing: Behavioral Audiometry, ABR, or ASSR
- Imaging (CT/MRI): Evaluate anatomical abnormalities if needed
- Genetic Testing: Especially in bilateral, symmetric sensorineural hearing loss
- Thyroid, renal, or ophthalmic evaluations if syndromic features suspected

Non-Pharmacological Management

- Early identification and intervention (before 6 months of age is ideal)
- Amplification
- Hearing aids for mild to moderate hearing loss
- Cochlear implants for severe to profound bilateral sensorineural loss
- Speech and language therapy
- Educational support and sign language if appropriate
- Family counseling and genetic referral when indicated

Referral Criteria

- Any infant who fails newborn hearing screening or exhibits:
- No startle to sound by 1 month
- No babbling by 6 months
- Delayed speech by 12–18 months
- Children with family history of early-onset hearing loss
- Suspected syndromic features falling Newborn Hearing Screening

15.4 Nose/Paranasal Sinuses Conditions

15.4.1 Acute Rhinitis

It is a viral inflammatory condition in the nasal mucous membrane, usually part of a more wide- spread infection of the upper respiratory tract.

Non-Pharmacological Management
Bed rest& warm drinks

Pharmacological Management
B: ephedrine nasal drops (1% for adults and 0.5% for children) 1–2drops into each nostril 6hourly for not more than 5days

15.4.2 Acute Non-Allergic Rhinitis

Clinical Presentation

- Nasal blockage
- Post nasal drip
- Erythematous turbinate

Pharmacological Management
A: prednisolone (PO), Adults: 60mg 24hourly for 5days then taper down to 50mg 24hourly for next 5days.
Children: 1mg/kg 24hourly for 5days then taper down by half for the next 5days.

AND

B: ephedrine (0.5% and 1%) nasal drop, Adults and children above 12years: Instill 1- 2drops in each nostril, not more than 4times a day for 3-5days

OR

C: oxymetazoline (0.05%) nasal drops/spray Dosage for adults and children above 6years: Instill 2 -3drops or sprays in each nostril 12hourly for 3-5days

AND

D: fluticasone propionate (50mcg/spray) nasal spray, Adults and adolescents more than 12years: 2sprays in each nostril 24 hourly as needed. children 4-11years: 1 spray in each nostril 24hourly as needed

OR

S: mometasone nasal spray, Adults and adolescents from 12years: 1sprays in each nostril 24hourly as needed,
children 6-11 years: 1spray in each nostril 24hourly as needed

Note: Oral drugs to reduce swelling of the mucous membrane, antihistamines and antibiotics are not indicated

15.4.3 Allergic Rhinitis

It is an irritation of the nasal mucosa by an allergen in a previously sensitized individual. Common allergens include house dust mites (mite's feaces), pollens, cockroach antigen, animal dander, molds (in- door), birds feathers

Clinical Presentation

- Itchy nostrils, throat, eyes
- Watery nasal discharge
- Nasal congestion
- Sneezing
- Post nasal drip
- Cough

Investigations

- Anterior rhinoscopy (rigid or fibreoptic nasolaryngoscopy) – watery nasal discharge, Turbinates congestion
- Total or specific IgE
- Skin prick Allergy test

Non-Pharmacological Management

- Patient Health Education, the main treatment of allergic rhinitis is the Avoidance of the triggers (Both irritants and Allergens).
- Allergy Testing
- Steaming
- Immunotherapy

Pharmacological Management

Note: Do Not Prescribe Oral Antihistamine When Offering This Option

B: ephedrine (0.5% and 1%) nasal drop, Adults and children above 12years: Instill 1 to 2drops in each nostril, not more than 4 times a day for 3-5days

OR

C: oxymetazoline (0.5%) nasal drops/spray, Adults and children above 6 years: Instill 2- 3 drops or sprays in each nostril every after 12 hours for 3-5days

AND

D: fluticasone propionate (50mcg/spray) nasal spray, Adults and adolescents more than 12years: 2sprays in each nostril 24 hourly as needed. children 4-11years: 1spray in each nostril 24hourly as needed

OR

S: mometasone nasal spray, Adults and adolescents from 12years: 1 spray in each nostril 24 hourly as needed. children 6 to 11 years: 1 spray in each nostril 24 hourly as needed.

OR

S: mometasone furoate + olopatadine hydrochloride nasal spray Adults and adolescents from 12years: 2 sprays in each nostril 24 hourly as needed. children 6 to 11 years: 1 spray in each nostril 24 hourly as needed.

Alternatively

C: loratadine (PO), Adults: 10mg 24hourly for 30days. Children 2-6years: 5mg 24hourly for 14days. Children above 6 years: 10mg 24 hourly for 14 days

OR

S: desloratadine (PO)Adults: 5mg 24hourly for 30days. Children 2-5 years: 1.25mg 24hourly for 14days. Children 6 to 12 years: 2.5mg 24hourly for 30days

OR

D: bilastine (PO), Adults and children above 12 years, 20mg 24hourly Nocte daily for 30days

AND

A: prednisolone (PO): 60mg 24hourly for 5days then taper down to 50mg 24 hourly for next 5days. Children: 1mg/kg 24hourly for 5days then taper down by half for the next 5days.

AND

D: montelukast, Adults: 10mg 24hourly for 30days.Children 1-5 years 4mg/24hourly and children above 5 years: 5mg 24hourly for 30days. For known Asthmatic patients

15.5 Granulomatous Diseases of the Nose

15.5.1 Rhinoscleroma

Clinical Presentation

- Rhinitis, Fetid rhinorrhea
- Crusting, Nasal bleeds
- Intranasal rubbery nodules
- Dysphonia
- Fibrosis, Nasal deformity

Non-Pharmacological Management

Nasal douching with saline solution

Pharmacological Management

Prolonged antibiotic therapy is required, guided by culture and sensitivity

Indication	Medicine	Population	Dose	Frequency	Duration
Chronic / Prolonged Bacterial Infection	**A:** ciprofloxacin (PO)	Adults & Children > 12 years	500 mg	12 hourly	4–12 weeks (continue at least 2 days after resolution of signs and symptoms)
	OR				
	S: cefixime (PO)	Adults	400 mg	24 hourly	4–12 weeks
		Children ≥ 6 months to 12 years (<45 kg)	8 mg/kg	24 hourly	4–12 weeks
	AND				
Adjunct Therapy (anti-inflammatory)	**A:** prednisolone (PO)	Adults	60 mg	24 hourly	5 days, then taper to 50 mg 24 hourly for next 5 days
		Children	1 mg/kg	24 hourly	5 days, then taper by half for next 5 days

Surgical treatment

- Excision biopsy
- Rhinoplasty

15.5.2 Rhinosporiodiosis

Chronic, granulomatous disease caused by *Rhinosporidium seeberi*, an aquatic protistan parasite. It primarily affects the nasal mucosa and nasopharynx, but can also involve other mucous membranes and, rarely, the skin and internal organs.

Clinical Presentation

- Unilateral nasal obstruction
- Epistaxis
- Local Pruritus
- Rhinorrhea
- Pink or deep red polyp, strawberry like appearance, Bleeds easily on manipulation

Pharmacological Management
S: dapsone (PO), Adults: 100mg 24hourly for 6months. Children1-2mg/kg 24hourly, not to exceed 100mg 24hourly

Surgical treatment
Wide excision with wide area electro-coagulation of the lesion base

15.5.3 Rhino-orbital-cerebral mucormycosis

A potentially lethal invasive fungal infection which commonly affects the immunocompromised and diabetic patients and is most commonly caused by genera Mucorales and include Rhizopus, Mucor and Rhizomucor.

Clinical Presentation

- Fever, Headache
- Nasal congestion, Purulent nasal discharge
- Facial numbness
- Eshar of nasal mucosa
- Proptosis, Blindness

Pharmacological Management
S: amphotericin B deoxycholate (IV)

Adults: Test dose of 1mg IV infused over 20-30 minutes.
Loading dose of 0.25-0.5mg/kg infused over 2-6hours.
Maintenance dose of 0.25-1mg/kg IV 24hourly for 3-6weeks.

Children: Test dose of 0.1mg/kg not to exceed 1mg: infused over 20-60minutes.
Loading dose of 0.25mg/kg infused over 2-6hours.
Maintenance dose of 0.25/kg 24hourly to ensure a total dose of 30-40mg/kg is given over 3-6weeks

Control underlying risk factors

Surgical treatment
Endoscopic debridement (FESS) of the necrotic tissue and Biopsy

Note: High index of suspicion in patient with DKA and nasal symptoms above

15.6 Other Conditions of the Nose

15.6.1 Nasal septal Abscess and Hematoma

Clinical Presentation

- Nasal pain
- Fever
- History of trauma for septal hematoma
- Nasal swelling
- Bilateral nasal blockage with boggy septal mass
- Aspiration will confirm the diagnosis

Pharmacological Management

Indication	Medicine	Population	Dose	Frequency	Duration
Bacterial Infection	**B:** amoxicillin + clavulanic Acid (FDC) (PO)	Adults	625 mg – 1 g	12 hourly	7–10 days
		Children ≤ 3 months	30 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
		Children > 3 months	25 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
Pain/Fever Control (as needed)	**A:** paracetamol (PO)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed

Surgical treatment

- Intranasal Incision and drainage
- Tight bilateral nasal packing or suturing of mucoperichondrial to prevent re-accumulation

15.6.2 Congenital Choanal Atresia

A congenital blockage (bony, membranous, or mixed) of the posterior nasal opening, causing nasal obstruction. It may be unilateral or bilateral. Neonates are obligate nasal breathers; therefore, complete bilateral choanal atresia is a medical emergency requiring immediate oral airway support until surgical creation of a patent nasal airway. Early recognition and referral are critical in bilateral cases. Always assess for associated anomalies (e.g., CHARGE syndrome).

Clinical Presentation

- Bilateral: Neonatal respiratory distress relieved by crying, difficulty feeding, cyanosis.
- Unilateral: Persistent unilateral nasal obstruction or discharge.
- Thick nasal discharge on the defective nostril
- Failure to pass nasogastric tube

Investigation

- Primary level: Failure to pass a nasogastric tube through the nostril.
- Secondary level: Clinical assessment; refer.
- Tertiary level: Nasal endoscopy and CT scan Paranasal sinuses (PNS) for confirmation and surgical planning.

Non-Pharmacological Management

- Primary level: Maintain airway (oral airway or prone/lateral positioning), oxygen (oral) if needed, urgent referral.
- Secondary level: Supportive care (suction, feeding via orogastric tube), refer to tertiary immediately.
- Tertiary level: if suspected at tertiary facility, urgently follow the above approach and consult ENT on call immediately or refer.

Surgical treatment

(At a center with ENT surgeon)

Surgical correction preferably via endoscopic trans nasal approach (endoscopic stentless Cho anoplasty)

Postoperative care includes the following;

S: esomeprazole 1mg/kg once 4 weeks

AND

A: sodium chloride saline drop (irrigation) 8 hourly for 4 weeks

AND

C: oxymetazoline 0.05%/ephedrine nasal drops 8hly 5 days),

AND

D: dexamethasone + ciprofloxacin nasal drops (0.1%+0.3%), 3 drops/nostril 12 hourly)

Monthly follow-up nasoendoscopy for 3 months

Note: Delaying unilateral choanal atresia repair until after 6 months of age may reduce the need for revision surgery as the child grows.

15.6.3 Nasal Turbinate Hypertrophy

Turbinate hypertrophy is a complication of allergic rhinitis

Clinical Presentation

- Snoring
- Nasal obstruction
- Nasal irritation
- Enlarged inferior or middle turbinate on rhinoscopy

Pharmacological Management
As for Allergic Rhinitis

Surgical treatment
Partial submucosal Turbinectomy/Turbinoplasty – (open or endoscopic)

15.6.4 Nasal Bone Fracture

Clinical Presentation

- History of nasal trauma
- Deviation of nose or septum
- Nasal bleeding
- Nasal obstruction

Pharmacological Management
Antibiotics & Analgesics) as for nasal septal abscess and hematoma

Surgical treatment
Closed reduction and alignment of nasal structures under LA or GA this should be done 1-2weeks if there is edema. Can be done using nasal speculum or endoscopically.

Nasal Septal Deviation (Non-Traumatic)

Clinical Presentation
Nasal obstruction, Nasal dryness, +/_Epistaxis.

Surgical treatment
Septoplasty –open or Endoscopic

15.6.5 Adenoid Hypertrophy

It is hypertrophy of the lymphoid tissues in the nasopharynx; presenting with stertor, mouth breathing, snoring sleep apnea and sometimes otitis media with effusion. It is reported mainly in children although it can affect adults mainly with chronic nasal allergies and immunosuppression.

Investigations

- Nasopharynx lateral view X-ray.
- Fiberoptic nasolaryngoscopy (gold standard)

Pharmacological Management
A: cetirizine (PO) 10mg 24 hourly for 4weeks. Children: 5mg 24 hourly for 4weeks
AND
A: sodium chloride 0.9% nasal spray/drops 4hourly for 2weeks
AND
C: oxymetazoline 0.05%
OR
B: ephedrine 0.5% Nasal drops (as per table below)

Age Group	C: oxymetazoline 0.05%	B: ephedrine 0.5% Nasal Drops	Maximum Duration
< 2 years	Not routinely recommended	Not recommended	Only to be prescribed by ENT supervision. Risk of systemic toxicity.
2–5 years	1 drop per nostril, 12 hourly	2 drops per nostril, 3 times/day	5 days
6–11 years	2 drops or sprays per nostril, 12 hourly	2 drops per nostril, 3 times/day	5 days
≥ 12 years & Adults	3 drops or sprays per nostril, 12 hourly	3 drops per nostril, 4 times/day	7 days

Surgical treatment
Adenoidectomy/Adenotomy

Note: An adult with snoring upper aerodigestive tumours and Obstructive Sleep Apnea (OSA)should be considered.

15.6.6 Acute Rhinosinusitis

It is the inflammation of the mucosal lining of the nose and paranasal sinuses of not more than 12 weeks' duration. In sinusitis of dental origin, anaerobic bacteria are often found.

Acute Purulent Rhinosinusitis: Bacterial infection with pus accumulation in one or more of the paranasal sinuses

Clinical Presentation

- Nasal discharge (watery
- or purulent)
- Nasal congestion
- Post nasal dripping
- Headache worsening on bending forward and more in the morning
- Fever
- Facial pain
- Ear pain and blockage
- Anterior rhinoscopy – watery/purulent nasal discharge occasionally foul smelling
- Nasal congestion
- Plain paranasal sinuses X ray (Water's, Caldwell views)
- Mucosal thickening; air fluid level

Pharmacological Management

Antibiotics are indicated for severe or complicated cases (e.g., high fever, severe facial pain, or orbital complications). Amoxicillin or amoxicillin + clavulanic acid is first-line.

Indication	Medicine	Population	Dose	Frequency	Duration
Bacterial Infection (First-line)	**A:** amoxicillin (PO)	Adults	500 mg	8 hourly	7 days
	A: amoxicillin Dispersible tablets (PO)	Children	40 mg/kg	8 hourly	7–10 days
	OR				
	B: amoxicillin + clavulanic Acid (FDC) (PO)	Adults	625 mg – 1 g	12 hourly	7–10 days
		Children ≤ 3 months	30 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
		Children > 3 months	25 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
	OR				
	C: clarithromycin (PO) (In case of Penicillin allergy)	Adults	500 mg	12 hourly	7–10 days
		Children ≥ 6 months	15 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
	AND				
Nasal Decongestants	**B:** ephedrine (0.5% or 1%) nasal drops	Adults & Children > 12 years	1–2 drops in each nostril	Up to 4 times daily	3–5 days
	OR				
	S: xylometazoline (0.05% or 0.1%) nasal drops/spray	Adults & Children > 6 years	2–3 drops/sprays in each nostril	8 hourly	3–5 days
	AND				
Nasal Steroids	**D:** fluticasone propionate (nasal spray)	Adults & Adolescents > 12 years	2 sprays in each nostril	24 hourly	As needed
		Children 4–11 years	1 spray in each nostril	24 hourly	As needed
	OR				
	S: mometasone (nasal spray)	Adults, Children 6–11 years & Adolescents ≥ 12 years	1 spray in each nostril	24 hourly	As needed
	AND				
Antifungal (Fungal rhinosinusitis)	**D:** itraconazole (PO)	Adults	200 mg	24 hourly	30 days
		Children	5 mg/kg	24 hourly	30 days
	AND				
Pain/Fever Control (as needed)	**A:** paracetamol (PO/IV)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed

Non-Pharmacological Management

- Saline nasal wash
- Steaming with or without Vicks

Note: Treatment periods shorter than ten days increase the risk of treatment failure

Referral: To ENT Specialists

- Children with ethmoiditis presenting as an acute periorbital inflammation or orbital cellulitis must be hospitalized immediately (ophthalmology consultation should be sought)
- Adults with pronounced symptoms despite treatment
- If sinusitis of dental origin is suspected
- Recurrent sinusitis (>3 attacks in a year) or chronic sinusitis (duration of illness of >12 weeks)

Surgical treatment

Surgery if associated with complications e.g., obital/periobital abscess, pottys puffy tumour, Brain abscess and nasal polyposis

- Frontal Trephination
- Open ethmoidectomy
- Functional Endoscopic Sinus Surgery (FESS)

15.6.7 Chronic Rhinosinusitis

Can be caused by Bacterial or Fungal

Clinical Presentation

- Anterior and/or posterior nasal mucopurulent drainage
- Nasal obstruction/nasal blockage/congestion
- Facial pain, pressure and/or fullness
- Hyposmia or Anosmia
- Halitosis

Investigations

CT scan of paranasal sinuses (PNS)-gold standard-should be done after adequate medical treatment with persistent symptoms.

Non-Pharmacological Management

- Saline nasal wash
- Steaming with or without camphor, eucalyptus and menthol topical.

Pharmacological Management

as for acute sinusitis BUT should be for 4-6 weeks

Surgical treatment

Surgery if associated with complications e.g., obital/periobital abscess, pottys puffy tumour, Brain abscess and nasal polyposis and Failure of disease resolution after adequate medical treatment.
Frontal Trephination OR Caldwell Luc operation OR Open ethmoidectomy OR Functional Endoscopic Sinus Surgery (FESS)

15.6.8 Nasal Polyposis

This is mucosal change due to chronic mucosal inflammation. Ethmoidal polyp- This is a complication of allergic rhinitis or chronic rhinosinusitis. Antrochoanal polyp benign tumor of the maxillary sinus that prolapse to the nasal cavity.

Clinical Presentation

- History of allergy or asthma
- Nasal congestion/blockage
- Nasal discharge
- Snoring and mouth breathing
- Post nasal drip

Investigations

- Direct nasal Endoscopy (DNE) or Fiber optic nasopharyngoscopy
- Serum Total/specific IgE
- CT-Scan of paranasal sinuses (CT-PNS)

Pharmacological Management
As for allergic rhinitis/acute rhinosinusitis

Surgical treatment
- Intranasal polypectomy
- Partial/Medial maxillectomy
- Functional Endoscopic Sinus surgery (FESS)

15.6.9 Nose Bleeding (Epistaxis)
Nose bleeding is a condition which is common in adults. It may be due to a local cause in the nasal cavity (e.g., trauma, tumor, foreign body, septal varices, or septal deviation); or a systemic cause (e.g., blood disorders, vascular disorders, renal failure, hepatic failure, or use of anticoagulants (warfarin, heparin). Most cases of epistaxis are minor; do not require hospitalization. Patients with significant nose bleeding do require hospitalization.

Non-Pharmacological Management
- Stabilize the patient: put an open intravenous line, do blood grouping and cross matching
- Put the patient in a sitting position and advise the patient to pinch the soft part of the nose gently for 5minutes
- Put on a gown, glasses, head light and sterile gloves and evacuate clots. Do a thorough head and neck examination
- Cauterize septal varisces (if any) using a silver nitrate pencil
- Do an anterior nasal packing by introducing into the nasal cavity as far posterior as possible sterile Vaseline gauzes (or iodine-soaked gauzes if not available) or special merocele pack, using a dissecting forceps (if bayonet forceps is not available)
- Put rolled dry gauze on the columella and plaster it

If the patient is still bleeding
- Perform a Flexible nasoendoscopy
- Do a posterior nasal packing using a Foley's catheter introduced through the nasal cavity into the oropharynx, balloon it with normal saline up to 10–15cc while pulling it outward to impinge on the posterior nasal choana, then do anterior nasal packing as above.
- Place a posterior nasal pack under general anaesthesia (GA)
- Put dry gauze on the nose to prevent necrosis of the columella and fix the catheter on the nose with an umbilical clamp
- Almost all of the nasal bleedings will be controlled by this way

Note: Remove the packs after 72 hours

Pharmacological Management
To prevent rhinosinusitis
Prophylactic antibiotics are not routinely recommended unless there is evidence of infection or high risk of rhinosinusitis

Indication	Medicine	Population	Dose	Frequency	Duration
Bacterial Infection	**B:** amoxicillin + clavulanic Acid (FDC) (PO)	Adults	625 mg – 1 g	12 hourly	7–14 days
		Children ≤ 3 months	30 mg/kg/day (in 2 divided doses)	12 hourly	7–14 days
		Children > 3 months	25 mg/kg/day (in 2 divided doses)	12 hourly	7–14 days
	AND				
Pain/Fever Control (as needed)	**A:** paracetamol (PO/IV)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND				
Nasal Decongestants	**B:** ephedrine (0.5% or 1%) nasal drops	Adults & Children > 12 years	1–2 drops in each nostril	Up to 4 times daily	3–5 days
	OR				
	S: xylometazoline (0.05% or 0.1%) nasal drops/spray	Adults & Children > 6 years	2–3 drops or 1–2 sprays in each nostril	8 hourly	3–5 days
	AND				
Control of Bleeding	**C:** tranexamic acid (PO/IM)	Adults	500 mg	8 hourly	5–8 days
	AND	Children	25 mg/kg	6–8 hourly	5–8 days
	C: silver nitrate stick (topical)	Adults & Children	Apply to identified bleeding point	Single application	Once

Note: Putting an ice cube on the forehead, extending the neck or placing a cotton bud soaked with epinephrine (adrenaline) in the vestibule will not help

Referral: refer the patient to the next facility with adequate expertise and facilities if:
- The patient is still bleeding repack and refer immediately
- Failure to manage the underlying cause, refer the patient

Surgical treatment

- Endoscopic electrical cauterization of the lesion for posterior nasal bleeding
- Ligation/Clipping/cauterization of bleeding vessel (open or endoscopic)

Note: Rule out systemic causes of epistaxis e.g., renal, blood dyscrasias and liver failure.

15.6.10 Foreign Bodies in the Nose

This situation usually occurs mostly in children.

Non-Pharmacological Management

Restrain the child before removal using a cerumen hook, if the child cannot be restrained sedation is advised

Note: A unilateral foul-smelling nasal discharge in a child is due to a foreign body until proven otherwise

15.7 Throat Conditions

15.7.1 Obstructive Sleep Apnea Syndrome (OSAS)

Disorder characterized by recurrent episodes of upper airway obstruction during sleep, resulting in interrupted ventilation, intermittent hypoxia, and sleep fragmentation. The obstruction typically occurs at the level of the pharynx, often due to collapse or anatomical narrowing involving ENT structures such as the adenoids, tonsils, nasal passages, soft palate, and base of tongue.

In both children and adults, ENT-related anatomical factors contribute significantly to the pathophysiology of OSAS, and their recognition is critical for effective treatment planning.

This section addresses only non-central sleep apnea. Central sleep apnea and non-Surgical treatment are discussed in the Respiratory and CNS chapters. ENT specialists play a key role in the multidisciplinary management of OSAS.

Etiology and Risk Factors

In Children

- Adenoid and/or tonsillar hypertrophy (most common cause)
- Nasal obstruction (e.g., allergic rhinitis, inferior turbinate hypertrophy, deviated nasal septum)
- Pharyngo- Laryngomalacia
- Craniofacial anomalies (e.g., midface hypoplasia, Pierre Robin sequence)
- Neuromuscular disorders
- Obesity (as a contributing factor)

In Adults

- Obesity (primary risk factor)
- Nasal obstruction (polyps, septal deviation, turbinate hypertrophy)
- Redundant soft palate and uvula
- Tonsillar hypertrophy (less common)
- Macroglossia or retrognathia
- Alcohol or sedative use before bedtime

Clinical Presentation

While symptoms vary with age, a high index of suspicion should be maintained for

- Loud habitual snoring
- Witnessed apneas or gasping episodes during sleep (this can be reported by bedpartner or parent/caretaker)
- Daytime somnolence or hyperactivity (children)
- Mouth breathing and nasal speech
- Learning or behavioral difficulties (children)
- Poor concentration, irritability, or morning headaches
- Nocturnal enuresis in children
- Decreased quality of life and sexual dysfunction (adults)

Clinical assessment

- Detailed sleep history (snoring, witnessed apneas, sleep position, restlessness, daytime function)
- Examination of nasal patency, tonsillar size (Brodsky scale), adenoid facies, craniofacial features
- Screening tools: STOP-BANG (adults), Pediatric Sleep Questionnaire (children)

Investigations

- Polysomnography (gold standard)
- Pulse oximetry (overnight) as a basic alternative where polysomnography is not available
- Flexible nasopharyngoscopy: to assess upper airway dynamics and obstruction
- Lateral neck X-ray or soft tissue nasopharynx imaging to evaluate adenoidal size in children
- Drug-Induced Sleep Endoscopy (DISE): to evaluate the site and severity of upper airway obstruction. In case where the above are inconclusive

Non-Pharmacological Management

- Address modifiable risk factors (e.g., obesity, allergens, sedatives)
- Multidisciplinary involvement may be required in complex or residual cases

Pharmacological Management

Considered in, Mild OSAS, Awaiting surgical intervention, non-surgical candidates

Medication	Pediatric Dose	Adult Dose	Remarks
C: oxymetazoline 0.05%	2 drops/sprays 12hourly (≥6 yrs); dilute if <6 yrs	2–3 sprays BID	Max 5–7 days use to avoid rebound congestion
B: ephedrine 0.5% nasal drops	2 drops 2–3x/day (≥2 yrs)	3 drops 3–4x/day	Max 5 days; monitor for systemic side effects
Intranasal corticosteroids	1 spray per nostril OD (e.g., mometasone)	2 sprays per nostril OD	Long-term if allergic rhinitis is present

Surgical treatment

Surgical intervention is the definitive treatment in cases of identifiable and correctable airway obstruction.

Children

- Adenoidectomy and/or tonsillectomy – first-line for OSAS with adenotonsillar hypertrophy
- Supraglottoplasty or pharyngoplasty in cases of laryngomalacia and pharyngolaryngomalacia
- Nasal surgery (e.g., turbinate reduction (bone sparing technique), septoplasty, Functional endoscopic sinus surgery in CRSwNP) when significant nasal obstruction exists

Adults

- Uvulopalatopharyngoplasty (UPPP) – for soft palate redundancy
- Septoplasty, turbinate reduction, or nasal polypectomy for nasal obstruction
- Tonsillectomy – in patients with hypertrophic tonsils contributing to airway narrowing
- Tongue base reduction – in selected cases of macroglossia (specialist centers)
- Nasal surgery (e.g., turbinate reduction, septoplasty, rhinoseptoplasty Functional endoscopic sinus surgery in CRSwNP) when significant nasal obstruction exists.

Non-Surgical Treatment (Primarily in Adults)

- Continuous Positive Airway Pressure (CPAP) – first-line in moderate to severe OSAS or when surgery is not indicated
- Mandibular advancement devices – for mild-moderate OSAS or in CPAP-intolerant patients

Complications of Untreated OSAS

- Cardiovascular: systemic hypertension, pulmonary hypertension, arrhythmias
- Neurocognitive: poor school performance, memory impairment
- Growth failure in children

Referral: Refer to ENT specialist if

- OSAS is moderate-to-severe or affecting quality of life
- There is failed response to medical therapy
- Surgery is indicated based on anatomical findings
- Polysomnography reveals severe desaturation or apnea–hypopnea index (AHI) ≥10 in children, ≥15 in adults
- Presence of craniofacial abnormalities or comorbidities (e.g., neuromuscular disease, severe obesity)
- Depression and reduced quality of life in adults

15.7.2 Pharyngotonsillitis

Acute inflammation of the pharynx and/or tonsils, commonly viral; bacterial cases often due to Group A Streptococcus (GAS). It is a frequent cause of outpatient visits in children aged 3–15 years.

Clinical Presentation

- Fever, Sore throat or pain on swallowing, red/swollen tonsils, with or without exudate, Enlarged, tender anterior cervical lymph nodes.
- Headache, abdominal pain, vomiting (in GAS)
- Consider EBV if generalized lymphadenopathy, fatigue, hepatosplenomegaly

Investigations

Diagnosis is purely based on clinical assessment, for suspected GAS, Modified Centor Criteria may be used, the score helps to estimate the probability of GAS infection and guide treatment decisions. Throat swab is not recommended unless atypical Clinical Presentation.

Pharmacological Management
Supportive (all cases) Fluids and rest

Indication	Medicine	Population	Dose	Frequency	Duration
Pain/Fever Control	**A:** paracetamol (PO)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	As needed
		Children > 10 kg	15 mg/kg	4–8 hourly	As needed
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg	6–8 hourly	As needed
Bacterial Pharyngotonsillitis (GAS) suspected/confirmed	**A:** amoxicillin (PO)	Adults	500 mg	8 hourly	10 days
	A: amoxicillin Dispersible Tablets (PO)	Children	25 mg/kg	8 hourly	10 days
	OR				
	B: azithromycin (PO) (If allergic to penicillin)	Adults	500 mg	24 hourly	3 days
Recurrent cases or confirmed GAS	**B:** amoxicillin + Clavulanic acid (PO)	Children	10 mg/kg	24 hourly	3 days
		Adults	625 mg	8 hourly	10 days
	OR				
	S: cefixime (PO)	Adults	400 mg	24 hourly	7–14 days
		Children ≥ 6 months to 12 years (<45 kg)	8 mg/kg	24 hourly	7–14 days

Ensure completion of antibiotic course to prevent rheumatic fever.

Referral Criteria
- Peritonsillar abscess or airway symptoms
- Persistent fever >72 hours on treatment
- Dehydration or inability to swallow

Indications for Surgical treatment

Category	Indication	Key Features
Absolute (Immediate)	Severe OSA / airway obstruction	Tonsillar hypertrophy causing breathing disturbance, cardiopulmonary complications, or failure to thrive
	Suspected malignancy	Tonsillar asymmetry or rapid enlargement; concern for lymphoma/carcinoma
	Peritonsillar abscess	Refractory to antibiotics or I&D; recurrent quinsy
	Tonsillitis with febrile convulsions	Recurrent infections associated with seizures
Relative	Recurrent tonsillitis (Paradise criteria)	≥7 episodes in 1 year; ≥5/year for 2 years; ≥3/year for 3 years
	Chronic tonsillitis	Persistent sore throat, halitosis, cervical lymphadenopathy despite treatment
	Streptococcal carrier state	Persistent, non-responsive infection
	Dysphagia / speech impairment	Swallowing difficulty or voice change due to tonsillar hypertrophy

Surgical treatment
(Adeno)Tonsillectomy

15.7.3 Laryngitis

Inflammatory condition of the larynx can be infectious or non-infectious, acute (3–7 days) or chronic (>3 weeks). Diagnosis is often made by case history alone and treatment often targets symptoms.
- Acute viral laryngitis is commonest and self-limiting, often linked to upper respiratory infections.
- Bacterial laryngitis is less common but can be more severe.
- Clinical Presentation may differ between children and adults.
- Signs of infectious laryngitis include odynophagia, cough, fever, and respiratory distress.

15.7.3.1 Acute Laryngitis

(Please refer Respiratory chapter for more specific details)
- Children are more prone to airway compromise with bacterial laryngitis—prompt recognition is critical.
- In adults, reflux and occupational overuse are more common contributors to chronic or recurrent acute laryngitis.
- Most cases (especially viral or traumatic) are self-limiting, requiring only supportive care.

Etiological Types Acute Laryngitis in Children and Adults

Etiology	Population Affected	Etiology/Trigger	Key Features	Management
Viral Laryngitis	Children & Adults	URTI viruses (e.g., Rhino Virus, Influenza)	Hoarseness, dry cough, sore throat, often afebrile	Supportive: voice rest, fluids, analgesics
Bacterial Laryngitis	Children > Adults	Secondary to URTI; Strep, Staph aureus	Fever, worsening voice, purulent secretions; may progress to airway distress in children	Antibiotics + airway monitoring (if severe)
Traumatic (Phonotrauma)	Children & Adults	Vocal overuse (shouting, singing, crying)	Hoarseness after vocal strain, no fever	Voice rest, hydration, behavior modification
Allergic Laryngitis	Children & Adults	Environmental allergens, smoke, dust	Intermittent hoarseness, throat clearing, itchy throat	Allergen avoidance, antihistamines ± intranasal steroids
Reflux-related (LPR)	Mostly Adults	Gastric acid irritation	Morning hoarseness, chronic throat clearing, globus	Treat GERD (PPIs), diet modification
Post-infectious Laryngitis	Children & Adults	Lingering inflammation after URTI	Persistent hoarseness despite resolution of other URTI symptoms	Supportive care; resolves over 1–2 weeks
Occupational Laryngitis	Adults	Chronic voice use (teachers, singers)	Progressive hoarseness, vocal fatigue	ENT referral, voice therapy, workplace modification

Pharmacological Management
A: epinephrine (adrenaline) inhalation/nebulization effectively reduces symptoms
1mg (1ml) of epinephrine (adrenaline) of 3mls 0.9% Saline nebulized over 05 minutes
AND
A: cough suppressants such as dextromethorphan can help reduce nighttime coughing, which often worsens with laryngitis. Dosage for adults: as instructed by a physician or pharmacist.

Hospitalization
If severe symptoms persist or worsen after epinephrine inhalation, hospitalization is indicated.

15.7.3.2 Chronic Laryngitis

Chronic hoarseness >3–4 weeks requires ENT evaluation to rule out malignancy. Early intervention prevents irreversible vocal damage or missed serious disease.

Etiological Types of Chronic Laryngitis in Children and Adults

Etiological Types	Population	Etiology / Trigger	Key Features	Management
Chronic Non-Specific (Irritative)	Children & Adults	Smoke exposure, dust, air pollution	Hoarseness, dry throat, frequent throat clearing	Remove irritants, voice rest, hydration
Reflux Laryngitis (LPR)	More common in adults; also, in Children (esp. infants)	Gastric acid reflux irritating the larynx	Hoarseness, throat clearing, globus sensation, chronic cough	Dietary modification, PPI therapy, elevate head during sleep
Allergic Laryngitis	Children & Adults	Allergens (dust, pollen, food) + postnasal drip	Hoarseness, itchy throat, nasal congestion	Antihistamines, nasal steroids, allergen avoidance
Infectious (Chronic TB, fungal, syphilitic)	Mostly Adults	TB, Syphilis, fugal (e.g., in HIV patients)	Persistent hoarseness, cough, systemic symptoms	Treat underlying infection, refer for biopsy if needed
Autoimmune / Inflammatory	Mostly Adults	Rheumatoid arthritis, sarcoidosis, SLE	Hoarseness with multisystem signs	Treat underlying disease, ENT referral
Phonotrauma-related (Functional)	Children & Adults	Vocal misuse (shouting, singing, crying in children)	Hoarseness, vocal fatigue, possible nodules or polyps	Voice therapy, speech-language pathologist input
Neoplastic / Pre-neoplastic	Mostly Adults	Tobacco, alcohol, HPV-related lesions	Progressive hoarseness, weight loss, hemoptysis	Urgent ENT referral, laryngoscopy, biopsy

Etiological Types	Population	Etiology / Trigger	Key Features	Management
Papillomatous Laryngitis (Recurrent Respiratory Papillomatosis - RRP)	Predominantly Children	HPV (types 6 & 11), perinatal exposure	Progressive hoarseness, stridor, airway obstruction	Surgical debulking, ENT follow-up, HPV vaccination

15.7.4 Laryngopharyngeal reflux disease (LPR) with/without Vocal cord nodules or Laryngeal polyp)

- Occurs when gastric contents reach the larynx, affecting the glottis and vocal cords.
- It commonly presents with hoarseness, globus sensation, chronic throat clearing, and sometimes heartburn or regurgitation.
- Unlike gastroesophageal reflux disease (GERD), which involves the lower esophageal sphincter, LPR is linked to dysfunction of the upper esophageal sphincter.
- Proper evaluation and management require a coordinated interprofessional approach.

Investigations
Fiberoptic Nasolaryngoscopy
Non-Pharmacological Management

- Voice rest
- Lifestyle Modifications – First-Line
  - Weight loss (if overweight or obese), eat smaller, more frequent meals, avoid lying down within 3 hours after eating
  - Reduce or eliminate: Fatty, spicy, or acidic foods, Caffeinated and carbonated beverages, stop tobacco use and limit or avoid alcohol

Surgical Therapy – For Refractory Cases

- Consider in patients with confirmed reflux unresponsive to optimal medical and lifestyle therapy
- Requires gastroenterology and surgical consultation

Pharmacological Management
Acid suppression

Indication	Medicine	Population	Dose	Frequency	Duration
Acid Suppression Therapy	**C:** pantoprazole (PO)	Adults	40 mg	24 hourly	8–12 weeks
		Children ≥ 5 years	20 mg		
		Children < 40 kg	20 mg		
		Children ≥ 40 kg	40 mg		
	OR				
	C: lansoprazole (PO)	Adults	30 mg	24 hourly	8–12 weeks
		Children 1–12 years (<30 kg)	15 mg		
		Children ≥ 12 years (>30 kg)	30 mg		
	OR				
	S: esomeprazole (PO)	Adults	40 mg	24 hourly	8–12 weeks
		Children 1–12 years	10–20 mg		
		Children > 12 years	20–40 mg		
Symptomatic Relief	**C:** antacid liquid/mixture (PO)	Adults & Children	10–15 mL	12 hourly	10–14 days
Anti-inflammatory Therapy	**A:** prednisolone (PO)	Adults	60 mg	24 hourly	5 days, then taper to 50 mg 24 hourly for next 5 days
		Children	1 mg/kg	24 hourly	5 days, then taper by half for next 5 days
	OR				
	S: triamcinolone acetonide (IM)	Adults	40–80 mg	Single dose	Stat
		Children 6–12 years	0.2 mg/kg		
Antihistamines	**C:** Loratadine (PO)	Adults	10 mg	24 hourly	14 days
		Children 2–6 years	5 mg		
		Children > 6 years	10 mg		
	OR				
	S: desloratadine (PO)	Adults	5 mg	24 hourly	14 days
		Children 2–5 years	1.25 mg		
		Children 6–12 years	2.5 mg		

Surgical treatment
Direct laryngoscopy + microlaryngeal surgery (D/Scopy+MLS) to remove polyp or cyst-using microscope or Endoscope with microdebrider/shaver

15.7.5 Non-infectious Chronic Laryngitis

[Laryngopharyngeal reflux disease (LPR) with Vocal cord nodules or Laryngeal polyp]

Clinical Presentation
Dysphonia or hoarseness Dry Cough, Globus sensation, Frequent throat clearing, Dysphagia.

Investigations
Rigid laryngoscopy (Endoscopy) or Fiber optic Nasolaryngoscopy

Non-Pharmacological Management

- Dietary modification, spice foods and feeding times
- Life style changes; avoid alcohol, tobacco
- Voice rest

Pharmacological Management

Indication	Medicine	Population	Dose	Frequency	Duration
Acid Suppression Therapy	**A:** omeprazole (PO)	Adults	20 mg	24 hourly	8–12 weeks
	OR				
	C: pantoprazole (PO)	Adults	40 mg	24 hourly	8–12 weeks
		Children ≥ 5 years	20 mg		
		Children < 40 kg	20 mg		
		Children ≥ 40 kg	40 mg		
	OR				
	C: lansoprazole (PO)	Adults	30 mg	24 hourly	8–12 weeks
		Children 1–12 years (<30 kg)	15 mg		
		Children ≥ 12 years (>30 kg)	30 mg		
	OR				
	S: esomeprazole (PO)	Adults	40 mg	24 hourly	8–12 weeks
		Children 1–12 years	10–20 mg		
		Children > 12 years	20–40 mg		
Anti-inflammatory Therapy	**A:** prednisolone (PO)	Adults	60 mg	24 hourly	5 days, then taper to 50 mg 24 hourly for next 5 days
		Children	1 mg/kg		5 days, then taper by half for next 5 days
Antihistamines	**C:** loratadine (PO)	Adults	10 mg	24 hourly	14 days
		Children 2–6 years	5 mg		
		Children > 6 years	10 mg		
	OR				
	S: desloratadine (PO)	Adults	5 mg	24 hourly	14 days
		Children 2–5 years	1.25 mg		
		Children 6–12 years	2.5 mg		

Surgical treatment
Direct laryngoscopy + microlaryngeal surgery (D/Scopy+MLS) to remove polyp or cyst-using microscope or Endoscope with microdebrider/shaver

15.7.6 Recurrent Respiratory Papillomatosis (Laryngeal Papillomas)

It is the commonest benign laryngeal tumor of the larynx caused by Human papilloma virus (HPV), occurring in both children and adults. It has a higher recurrence rate in children than in adults, among adults it may turn into a malignancy.

Clinical Presentation

- Hoarse voice, audible respiration (inspiratory stridor)
- Progressive difficulty in breathing
- Progressive inspiratory stridor
- On and off cough

Investigations

- Perform a thorough respiratory system examination
- Indirect laryngoscopy for papilloma croups on the larynx
- Rigid laryngoscopy (Endoscopy) OR Fiber optic Nasolaryngoscopy

Non-Pharmacological Management

If in distress, perform a tracheostomy first then refer

Referral: Refer the patient to the next facility with adequate expertise and facilities

Surgical treatment

- Microsurgical debridement is the mainstay, observe laryngeal mucosa and think of voice quality, avoid introducing anterior laryngeal web (Direct Laryngoscopy under GA+ microlaryngeal surgery(D/Scopy+MLS) Bronchoscopy is advised every time when doing Direct Laryngoscopy under GA
- Tracheostomy shall be avoided, if it has to be done, only short term

15.7.7 Foreign Bodies in the Throat

If the foreign body is suspected to be in the hypopharynx, esophagus, trachea or bronchus

- Take a thorough history and do a thorough physical examination
- Do chest X ray to confirm your diagnosis (though some foreign bodies are radiolucent)

Refer to a next level hospital with facility for removal (never attempt if not trained)

Surgical treatment

- Oesophagoscopy for oesophageal foreign body (FB)
- Bronchoscopy for airway FB

15.7.8 Subglottic Hemangioma

Congenital subglottic hemangiomas are vascular lesions that undergo a phase of rapid growth that is initiated during the first few weeks to months of life. They may present as solitary lesions or as part of a segmental hemangioma syndrome.

Clinical Presentation

- Hoarseness of voice
- Inspiratory stridor
- Cough
- Cyanosis
- Concomitant cervical facial hemangioma

Pharmacological Management

A: prednisolone (PO) Children: 1mg/kg 24hourly for 5days then taper down by half for the next 5days.

AND

A: propranolol (PO) for children: Starting dose of 0.6mg/kg 12hourly for 1week, then increase dose to 1.1mg/kg 12hourly for 2weeks; then Maintenance dose 1.7mg/kg 12hourly for at least 6months.

Surgical treatment

Tracheostomy if severe inspiratory stridor is present.

15.7.9 Laryngomalacia

This is the most common congenital anomaly of the larynx, characterized by partial or complete collapse of supraglottic structures on inspiration. This is the most common cause of noisy breathing in infancy. Gastroesophageal reflux disease (GERD) has been implicated.

Clinical Presentation

- Inspiratory stridor relieved by lying prone
- Difficult breathing/dyspnoea
- Difficult feeding
- Chocking on feeding

Investigations

- Fiber optic nasolaryngoscopy when awake
- Direct laryngo-tracheo-bronchoscopy (DLTB)

Non-Pharmacological Management

- Sleep prone rather than supine
- Feeding modification
- Close observation of upper respiratory tract infections

Pharmacological Management

Indication	Medicine	Population	Dose	Frequency	Duration
Associated Gastroesophageal Reflux (common)	**A:** omeprazole (PO)	Adults	20 mg	24 hourly	4–8 weeks (review response)
		Children	0.7–1 mg/kg		
	OR				
	S: esomeprazole (PO)	Adults	20–40 mg	24 hourly	4–8 weeks
		Children	10–20 mg		

Surgical treatment

- Supraglottoplasty at any age for type III and IV, otherwise watchful waiting while on pharmacotherapy
- Tracheostomy for severe cases

15.7.10 Vocal Cords Paralysis

It is due to total interruption of nerve impulse resulting in no movement of laryngeal muscles. Vocal cord paralysis is a sign of disease and not a diagnosis by itself, vocal cord paralysis can be unilateral or bilateral.

Clinical Presentation

- Change in voice/hoarseness (for unilateral vocal cord paralysis)
- Vocal fatigue
- Dyspnoea/upper airway obstruction
- Stridor
- Cough and aspiration
- History of neck surgery(thyroidectomy)
- Neck or mediastinal tumors

Investigation

- Fiber optic nasolaryngoscopy
- Direct laryngo-tracheo-bronchoscopy (DLTB)
- Video stroboscopy

Non-Pharmacological Management
Speech therapy

Surgical treatment
Depends on the severity and desired outcome.

- Tracheostomy
- Arytenoidectomy
- Vocal cord lateralation through endoscopy
- Endoscopic Anterior-posterior cricoid split
- Cordectomy
- Thyroplasty type i& ii
- Injection of Teflon paste
- Muscle or cartilage implant

15.7.11 Infection of Thyroglossal Duct Cyst, Dermoid Cyst, Branchial Cleft Cysts

Clinical Presentation

- For Thyroglossal cyst- Midline upper neck mass which is cystic just below the hyoid bone. If infected my present with tenderness. My also present as discharging sinus
- For branchial cleft cysts mass or discharging sinus along the anterior border of the sternocleidomastoid muscle.

Investigation
Neck USS

Pharmacological Management
B: amoxicillin + clavulanic Acid (FDC) (PO)
Adults: 625 mg – 1 g 12 hourly for 7–14 days
Children ≤ 3 months: 30 mg/kg/day in 2 divided doses (12hourly) for 7–14 days
Children > 3 months: 25 mg/kg/day in 2 divided doses (12hourly) for 7–14 days
Surgical treatment

- Thyroglossal duct cyst excision (Sistrunk procedure)
- Branchial cyst/fistula excision

15.7.12 Subglottic Stenosis

Narrowing of airway below vocal cords and above first tracheal ring. Can be congenital or acquired (e.g., post-intubation, trauma, infection).

Case Definition

- Subglottic lumen narrower than normal for age:
- Neonates: <4.0 mm
- Infants: <4.5 mm
- Adults: <13 mm

Pediatric Myer-Cotton Grading:
I: <50%, II: 51–70%, III: 71–99%, IV: complete obstruction

Clinical Presentation

Neonates/Infants

- Biphasic stridor, retractions, feeding difficulty
- Failed extubation or persistent croup

Older children/adults

- Progressive dyspnea, stridor, hoarseness
- Recurrent “asthma” or upper airway infections

Referral Criteria

- All suspected or confirmed cases, especially pediatric
- Adults with progressive airway symptoms or failed conservative care
- Facilities without endoscopic capability → refer early

Investigations

- Flexible nasolaryngoscopy (screening)
- Direct laryngoscopy, Tracheoscopy & bronchoscopy (DLTB) (gold standard)
- Neck/chest X-ray
- CT neck (adults or high-grade cases)
- ABG/pulse oximetry for oxygenation
- Screen for GERD if recurrent symptoms

Non-Pharmacological Management

- Oxygen and positioning support
- Avoid repeated intubation/suctioning
- Nutritional support and speech therapy
- Early referral to ENT with airway expertise

Pharmacological Management

- Systemic steroids (short course for inflammation)
- PPI or H2 blockers for GERD-related inflammation (as recommended in LPRD section above)
- Antibiotics only if signs of infection (e.g., Amoxicillin + Clavulanic acid, Cefuroxime)

Surgical treatment

- Endoscopic (Grades I–II, selected III)
- Balloon dilation or laser excision
- Open surgery (Grades III–IV or failed endoscopy)
  - Laryngotracheal reconstruction (LTR)
  - Cricotracheal resection (CTR)
- Tracheostomy (temporary or definitive)

Note:

- Avoid prolonged/repeated intubation in neonates.
- Recurrent “croup” or failed extubation → consider SGS.
- Rationalize steroid and antibiotic use.
- Multidisciplinary care improves outcomes.

15.7.13 Deep Neck Spaces Infections

Clinical Presentation

- Truisms
- Induration and swelling below the angle of mandible
- Medial bulging of the pharyngeal wall
- Difficult swallowing (dysphagia/odynophagia)
- Difficult breathing
- Neck stiffness/torticollis
- Neck swelling, mass, or lymphadenopathy
- Systemic toxicity with fever and rigors

Investigations

- Full blood picture
- PCT (Serial test might help to monitor prognosis in serious cases)
- Culture and sensitivity for aspirated contents
- Neck + Chest plain x-ray
- Neck + Chest CT scan (Post Op scans can help avoid re-drainage)

Pharmacological Management

Broad-spectrum intravenous antibiotics are essential due to polymicrobial infections (aerobic and anaerobic bacteria)

Indication	Medicine	Population	Dose	Frequency	Duration
Empirical IV Antibiotic Therapy (initiate while awaiting C/S results)	**C:** amoxicillin + Clavulanic Acid (IV)	Adults	1.2 g	8 hourly	7–10 days
		Children > 3 months	30 mg/kg		
	OR				
	S: clindamycin (IV) In case of Penicillin Allergy)	Adults	600 mg	8 hourly	7–10 days
		Children	10–15 mg/kg		
	OR				
	B: ceftriaxone (IV)	Adults	1–2 g	12 hourly	7–14 days
		Children	50–100 mg/kg	24 hourly	
	AND				
Anaerobic Coverage	**A:** metronidazole (PO)	Adults	400 mg	8 hourly	7–14 days
		Children	7.5 mg/kg		
Step-down Oral Therapy	**B:** amoxicillin + clavulanic Acid (FDC) (PO)	Adults	625 mg	12 hourly	7–10 days
		Children ≤ 3 months	30 mg/kg/day (in 2 divided doses)	12 hourly	7–10 days
		Children > 3 months	25 mg/kg/day (in 2 divided doses)		
	AND				
Airway Edema (severe cases)	**B:** dexamethasone (IV)	Adults	10 mg	Single dose	Stat
		Children	0.15–0.3 mg/kg		
	AND				
Pain/Fever Control (as needed)	**A:** paracetamol (PO)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	
		Children > 10 kg	15 mg/kg		

Surgical treatment

Source control and surgical drainage if required. In presence of abscess incision and drainage should be performed.

15.7.14 Peritonsillar Abscess (Quincy)

Peritonsillar abscess is a collection of pus located between the capsule of the palatine tonsil and the pharyngeal muscles.

Clinical Presentation

- Severe sore throat (usually unilateral) with Fever
- "Hot potato" or muffled voice
- Pooling of saliva or drooling may be present
- Trismus, neck swelling and pain and may have ipsilateral ear pain
- Fatigue, irritability
- Swollen and/or fluctuant tonsil with deviation of the uvula to the opposite side

Pharmacological Management
Antibiotics: Indicated due to bacterial etiology (commonly group A Streptococcus or mixed anaerobic infections). Intravenous antibiotics are preferred initially

Indication	Medicine	Population	Dose	Frequency	Duration
Empirical IV Antibiotic Therapy	**C:** amoxicillin + clavulanic Acid (IV)	Adults	1.2 g	8 hourly	7–10 days
		Children > 3 months	30 mg/kg		
	OR				
	S: clindamycin (IV) (In case of Penicillin Allergy)	Adults	600 mg	8 hourly	7–10 days
		Children	10–15 mg/kg		
	OR				
	B: ceftriaxone (IV)	Adults	1–2 g	12 hourly	7–14 days
		Children	50–100 mg/kg	24 hourly	
	OR				
	C: clarithromycin (PO)	Adults	500 mg	12 hourly	7–14 days
		Children ≥ 6 months	15 mg/kg/day (in 2 divided doses)		
	OR				
	S: cefixime (PO)	Adults	400 mg	24 hourly	7–14 days
		Children ≥ 6 months to 12 years (<45 kg)	8 mg/kg		
	AND				
Pain/Fever Control (as needed)	**A:** paracetamol (PO/IV)	Adults	500 mg – 1 g	6–8 hourly	As needed
		Children ≤ 10 kg	10 mg/kg	4–8 hourly	
		Children > 10 kg	15 mg/kg		
	AND/OR				
	A: ibuprofen (PO)	Adults	200–400 mg	6–8 hourly	As needed
		Children ≥ 6 months	5–10 mg/kg		

Surgical treatment
- Needle Aspiration
- Incision and drainage (LA/GA)
- Drainage/quincy tonsillectomy
- Interval tonsillectomy

15.8 ENT Neoplasms

15.8.1 Juvenile nasopharyngeal angiofibromas (JNA)

Are rare vascular tumors seen in adolescent males.

Clinical features
- Nasal bleeding
- Nasal blockage
- May present with eye protrusion

Investigation
CT-Scan (with contrast) PNS/Skull base-will show widening of sphenopalatine fissure and anterior bowing of posterior wall of maxillary sinus.

Note: Never take biopsy for suspected case of JNA

Surgical treatment
Embolization of internal maxillary artery THEN
Excision of Angiofibroma (Open or Endoscopic/modified Denkers operation)

15.8.2 Salivary Gland Tumors

Salivary gland tumors include a heterogeneous group of lesions. Most salivary gland tumors are composed of more than one cell type. Tumours may arise from major or minor salivary glands. (Parotid, Submandibular, Lingual and minor salivary gland tumours)

Clinical Presentation
Painless progressive swelling of a given salivary gland.

Investigation

- Fine needle aspiration cytology (FNAC)
- Do not take incisional biopsy unless lesion is ulcerative.

Surgical treatment

- Partial or Total parotidectomy-for parotid tumours
- Submandibular gland tumor excision-for submandibular gland
- Sub lingual gland tumor excision
  - Minor salivary gland tumors excision

15.8.3 Parapharyngeal Tumours

Both benign and malignant tumors may arise from any of the structures contained in this space. Among parapharyngeal space (PPS) tumors; 70-80% are benign, and 20-30% are malignant. Most PPS tumors are of salivary or neurogenic origin.

Clinical Presentation

- Sore throat
- Tonsillar/pharyngeal mass
- Neck/submandibular mass
- Dysphonia
- Otalgia
- Snoring

Investigation

- Fine neddle aspiration cytology (FNAC)
- CT SCAN-Neck & skull base
- MRI –Head and neck

Surgical treatment

Parapharyngeal tumour excision

15.8.4 Cancer of the Larynx

It is the commonest ENT malignancy. Risk factors include cigarette smoking, alcohol intake, gastroesophageal reflux disease and human papilloma virus.

Clinical Presentation

- Progressive hoarseness of voice
- Difficulty in breathing (inspiratory stridor)
- Hemoptysis

Referral: Refer the patient to the next facility with adequate expertise and facilities

Investigations

Rigid Laryngoscopy (endoscopy) or Fiberoptic nasolaryngoscopy(diagnostic)

Surgical treatment

- Direct Laryngoscopy +Biopsy under General Anaesthesia (GA)
- Tracheostomy
- Total/Partial laryngectomy +/- neck dissection

Note: Any patient with progressive hoarseness of voice for more than two weeks should undergo laryngoscopy

15.8.5 Sino-Nasal Malignancy

Is a malignancy of the nose and paranasal sinuses? Risk factors include wood dust (both soft and hard), wielding dust, lather industry fumes, hydrocarbons fumes, and aflatoxin dust.

Clinical Presentation

- Nasal bleeding
- Nasal discharge
- Nasal obstruction
- Teeth loosening
- Cheek swelling
- Proptosis
- Hearing loss

Referral: Refer the patient to the next facility with adequate expertise and facilities

Investigations

- Biopsy-transnasal biopsy/Endoscopic
- CT-Scan –paranasal sinus (PNS)
- Chest x –ray
- Urinalysis-bence -Jones proteins

Surgical treatment

- Total Maxillectomy-Open OR
- Partial Maxillectomy-Open/Endoscopic

Note: Refer patient for adjuvant chemo and radiotherapy

15.8.6 Naso-Pharyngeal Malignancy

It is a malignancy which arises from the nasopharynx. Risk factors include genetic predisposition, Epstein Bar virus, smoked and/or salted foods.

Clinical Presentation

- Cervical lymphadenopathy, usually bilateral
- Nose bleeding
- Nasal blockage
- Unilateral hearing loss, tinnitus or ear pain

Referral: Refer the patient to the next facility with adequate expertise and facilities

Note: A patient presenting with cervical lymphadenopathy has nasopharyngeal carcinoma until proven otherwise

Investigations

- Biopsy-Transnasal/Endoscopic
- Fine needle aspiration cytology for neck mass
- CT-Scan-head and neck
- Chest x-ray
- Serology for Epstein Bar virus (EBV)

Non-Pharmacological Management

Radiotherapy

15.8.7 Oropharyngeal Malignancy

Oropharyngeal squamous cell carcinomas arise in the soft palate, tonsils, base of tongue, pharyngeal wall, and vallecula.

Clinical Presentation

- Sore throat
- Throat pain/painful swallowing
- Voice change (“hot potato” voice)
- Difficulty in breathing
- Oropharyngeal mass/ulcer

Investigations

- Rigid endoscopy
- Flexible Nasoendoscopy
- Transoral biopsy
- Serology for HPV (human papilloma virus)
- CT-Scan or MRI -Head & Neck

Management

- Surgery: open or transoral
- Definitive Management: Refer Malignancy chapter.

15.8.8 Hypo-Pharyngeal Malignancy

It is a malignancy which arises from the hypopharynx. Risk factors include cigarette smoking, alcohol intake and gastroesophageal reflux disease.

Clinical Presentation

- Progressive dysphasia
- Progressive odynophagia
- Hematemesis/hemoptysis
- Ear pain (referred otalgia)
- Cervical lymphadenopathy
- Difficulty in breathing (inspiratory stridor)
- Excessive salivation/Pooling of saliva

Referral: Refer the patient to the next facility with adequate expertise and facilities

Investigations

- Rigid Hypopharyngoscopy (endoscopy) or Fiber optic nasolaryngoscopy(diagnostic).
- CT-Scan-head and neck
- Chest x-ray

Surgical treatment

Direct Hypopharyngoscopy +Biopsy under general anesthesia (GA)

Definitive Management

Chemoradiotherapy depending on histological results –Refer to **malignancies chapter 22**

15.8.9 Metastatic Lymphadenopathy and Neck Masses

Cervical lymph nodes are a common site of metastases for malignant tumors that originate at primary sites in the head and neck. Primary lymphoma in neck nodes must be considered in any differential diagnosis. Sometimes the origin might be unknown

Clinical Presentation

Neck mass unilateral or bilateral, Neck ulcer.

Note:

- An adult patient with neck mass, should be approached with a presumption of malignancy until proven otherwise.
- Once the diagnosis of metastatic squamous cell carcinoma is made, a search for the primary tumor must be performed. The probable primary site can often be identified by history and physical examination; panendoscopy and directed imaging may be required.

Investigations

- Neck ultrasound
- Fine needle aspiration cytology (FNAC)
- Panendoscopy of upper aerodigestive areas (nose and paranasal sinuses, nasopharynx, oropharynx, larynx, hypopharynx and Oesophagoscopy.
- Direct nasal endoscopy (DNE)
- Fiber optic nasolaryngoscopy
- Rigid laryngoscopy (endoscopy)

Note: Do not treat patient with cervical lymphadenopathy as a case of TB adenitis until malignancy is ruled out and TB adenitis is proved.

Surgical treatment

Biopsy for histology from suspected site**,** Neck dissection: Radical or Modified Neck Dissection.

15.9 Speech Disorders

Speech disorder refers to any condition that affects a person's ability to produce sounds that create words. This includes stuttering, apraxia, dysarthria can be caused by brain damage/stroke, muscle weakness, hearing loss, dementia etc.

Investigations

Audiometry**,** Otoacoustic emission (OAEs)**,** Auditory Brainstem Response (ABR)

Non-Pharmacological Management

- Auditory verbal training-for post cochlea implantation
- Speech therapy for aphasia, stuttering, apraxia and dysarthria.
- Hearing Aids
- Cochlea implantation

Surgical treatment

Posterior tympanotomy-for cochlea implantation.

CHAPTER SIXTEEN

ORAL AND MAXILLOFACIAL CONDITIONS

These include diseases and disorders that affect the teeth, gums, and supporting structures of the mouth. They involve medical disorders that affect the jaw (maxilla and mandible), face, and related structures, such as sinuses, salivary glands, muscles, nerves, blood vessels and temporomandibular joint (TMJ). These conditions may be congenital, traumatic, infectious, neoplastic, or degenerative in nature.

Before doing oral examination or any dental procedures, patients should gurgle with hydrogen peroxide 3% or povidone iodine 0.5% or chlorhexidine gluconate 0.1% to minimize infectious agent's contamination between patient and oral health care provider.

16.1 Tooth Eruption and tooth Shedding

16.1.1 Eruption of Deciduous Teeth

Eruption of deciduous /primary teeth refers to the process where the first set of teeth emerge through the gingiva into the mouth. This typically begins around five months of age and continues until the child is about two and a half years old. The following conditions may associate with eruption process; eruption cysts, gingival cysts of the newborn and pre/natal teeth

Clinical Presentation

- Drooling
- Bulge gingiva
- Gingival soreness
- Mild fever; may not need treatment

Note:

- Nylon teeth" is a myth/belief existing in some traditions. These are conditions associated with the eruption of deciduous/primary teeth.
- Pre/ Natal teeth if they are loose may be removed by dental personnel, but if they are firm should not be removed

16.1.2 Shedding of Deciduous Teeth

Phenomenon where deciduous/primary teeth are replaced by permanent teeth. This process occurring between ages of 5–12 years as a normal physiological change. Deciduous teeth should be left to fall out themselves unless the teeth are carious or there is any other indication. Parents should be counseled accordingly and be instructed to assist their children to loosen the already mobile teeth.

Clinical Presentation

- Mixed dentition
- Loose deciduous teeth

Investigation

CBCT or OPG X-ray or/ and PA X-ray

Surgical treatment

Tooth extraction; when deciduous fail to exfoliate or permanent teeth erupt in wrong direction

Pharmacological Management

A: paracetamol (PO) 1g 8hourly for 3days

AND

A: amoxicillin (PO) 250mg 8hourly for 5days (If necessary)

Note: Recommended age for taking CBCT or OPG is above 6years

16.2 Malocclusions

Malocclusion is any variation in the arrangement of teeth leading to abnormal occlusion to the extent that may be functionally harmful or aesthetically objectionable.

Clinical Presentation

- Class I malocclusion: Diagnosed when there is any occlusal abnormality or individual tooth malocclusion in a case with normal arch relationship in anteroposterior plane.
- Class II malocclusion: Mesiobuccal cusp of upper first permanent molar occludes mesial to the buccal developmental groove of the lower first permanent molar
- Class III malocclusion: The upper first permanent molar occludes distal to the buccal developmental groove of the lower first permanent molar
- Skeletal malocclusions: These malocclusions are caused by defects in the underlying skeletal structure itself.

Investigation

CBCT or OPG X-ray

Non-Pharmacological Management

Preventive measures

- Parents counselling on avoiding oral habits to their child
- Caries control
- Release of abnormal frenal attachment
- Management of abnormal oral musculature and related habits

Non-surgical treatment

Interceptive orthodontics

Also known as early orthodontic treatment or Phase one orthodontics, is a proactive approach aimed at addressing dental and jaw development issues in children, typically between the ages of 6 and 10 years, during the mixed dentition phase when both primary and permanent teeth are present.

- Guide jaw and dental development to ensure proper alignment and function
- Create space for erupting permanent teeth, reducing the risk of crowding
- Correct harmful oral habits such as thumb sucking or tongue thrusting
- Assessing breathing pattern of the growing child such as mouth breather in a child with adenoids, guide ENT evaluations
- Address skeletal discrepancies that can affect facial aesthetics and function
- Space maintainers: Preserve space for permanent teeth if baby teeth are lost prematurely
- Palatal expanders: Widen the upper jaw to correct cross-bites and create space
- Partial braces or aligners: Address specific alignment issues in developing teeth

Definitive Orthodontics

Often referred to as "Phase II" or comprehensive orthodontic correction, is the full-scale alignment of permanent teeth and the correction of bite relationships after early intervention (Phase I) or as a single-phase approach. Main goals include: Precise alignment of all permanent teeth, Correction of bite issues (overbite, underbite, crossbite) and achieving proper jaw harmony and long-term functional stability. This treatment should start when most permanent teeth (excluding wisdom teeth) are erupted (around ages 10–14 years).

- Appliances Used; Fixed braces (metal/ceramic) or clear aligners (Invisalign)
- Treatment Duration; Generally, 12–30 months, often around 18–24 months, influenced by complexity

Retention Phase: After active treatment, patients wear retainers (fixed or removable) to maintain tooth position, retainer to be worn both day and night during the first six month and another six months during the night only.

Note: Fixed orthodontic treatment is a specialized procedure which shall be performed by Orthodontist for patient of all age groups. A Pedodontist (Pediatric Dentist) Shall provide fixed orthodontic treatment only to patient below twenty (20) years of age.

16.3 Dental Caries

Dental caries is a chronic non communicable disease of the teeth that results in the localized dissolution and destruction of calcified tissues. It is characterized by the demineralization of the inorganic portion and destruction of the organic substance of the tooth.

Clinical Presentation

Stage of Caries	Site/Extent of Lesion	Symptoms	Clinical Features
Enamel Caries	Lesion confined to enamel	Asymptomatic	• Chalky white spot or brownish discoloration • Surface roughness • Cavity may or may not be present
Early Dentinal Caries	Lesion in occlusal third of dentine	Usually asymptomatic; may have mild sensitivity	• Small cavity present • Sensitivity to hot, cold, or sugary substances
Mid Dentinal Caries	Lesion in middle third of dentine	Increased sensitivity	• Small to medium-sized cavity • Increased sensitivity to hot, cold, or sugary substances
Deep Dentinal Caries	Lesion in inner third of dentine	Pain (spontaneous or non-spontaneous), short duration	• Large cavity present • Pain triggered by hot, cold, sugary substances, or pressure • Pain subsides after removal of stimulus (usually < 30 minutes)

Prevention

- Proper Oral hygiene practice
- Proper counseling to avoid frequent use of sugary foods and drinks
- Age 0 - 5years use fluoride toothpaste with fluoride concentration of 1000ppmF to brush teeth at least 12 hourly
- Age 6years and above use fluoridated tooth paste with fluoride concentration of 1450ppmF – 1500ppmF to brush teeth at least 12 hourly

Table 16.1 Non restorative chairside treatment of dental caries (Primary and permanent teeth)

Affected tooth surface	Extent of the lesion	Treatment of choice
Occlusal caries	Non Cavitated	Sealants and 5% Sodium fluoride (NaF) varnish
	Cavitated	38% Silver diamine fluoride (SDF) solution
Buccal and lingual caries	Non cavitated	5% Sodium fluoride (NaF) varnish
	Cavitated	38% Silver diamine fluoride (SDF) solution
Approximal caries	Non cavitated	5% Sodium fluoride (NaF) varnish or sealants
	Cavitated	38% Silver diamine fluoride (SDF) solution
Root caries	Non cavitated	38% Silver diamine fluoride (SDF) solution or 5% Sodium fluoride (NaF) varnish
	Cavitated	38% Silver diamine fluoride (SDF) solution

Table 16.2 Restorative chairside treatment of dental caries (Primary and permanent teeth)

Type of Caries	Extent of Lesion	Treatment	Material of Choice
Enamel caries	Enamel	Selective caries removal and permanent filling	Cention N or Composite resin
Early dentinal caries	Outer one-third of dentine	Selective caries removal and permanent filling	Cention N or Composite resin or High-viscosity Glass Ionomer Cement
Mid dentinal caries	Middle one-third of dentine	Selective caries removal and permanent filling	Cention N or Composite resin or High-viscosity Glass Ionomer Cement
Deep dentinal caries	Inner one-third of dentine	Intermittent caries removal and indirect pulp capping **Note:** Recall after 6–8 weeks to confirm tertiary dentine formation, then place permanent filling	Calcium hydroxide and Zinc oxide eugenol / Intermediate restorative materials, then Cention N

Note:

- For temporary restoration use Zinc oxide eugenol or Reinforced zinc oxide eugenol
- For permanent restoration of Class, I, II, V, and pit & fissure use Cention N, or Composite resin or High viscosity glass ionomer cement.
- For permanent restoration of Class III, IV use Cention N or Composite resin.

Pharmacological Management
Analgesics: for toothache
A: paracetamol (PO) 1gm 8hourly for 3days
OR
A: ibuprofen (PO) 400mg 8hourly for at least 3days
OR
C: diclofenac (PO) 50mg 8hourly for at least 3days
OR
A: diclofenac (IM/IV) 75mg stat

16.4 Endodontic treatment/ root canal treatment

Endodontic treatment or root canal treatment is a dental procedure used to repair and save a badly damaged or infected tooth. It involves removing the infected or damaged pulp from tooth's root canals, cleaning and disinfecting the area, and then filling and sealing it. This procedure aims to eliminate infection and protect the tooth from future microbial invasion, ultimately saving the tooth from extraction.

Clinical Presentation

- Symptomatic irreversible pulpitis
- Asymptomatic irreversible pulpitis
- Pulp necrosis (with/ without fistula)
- Previously endodontically treated tooth
- Previously initiated therapy (pulpotomy or pulpectomy)
- Symptomatic apical periodontitis
- Asymptomatic apical periodontitis
- Chronic apical abscess
- Acute apical abscess
- Condensing osteitis

Non Pharmacological Management

- Administer local anesthesia if indicated
- Isolation of offending tooth (use rubber dam)
- Prepare access cavity to access pulp chamber and root canals
- Removing pulp tissues
- Cleaning and shaping the canals
- Obturation (filling and sealing the canals)
- Restoration

Note:

- Dental therapist and Assistant dental officer practicing in health center and district hospital shall perform endodontic treatment to anterior teeth only (Incisors & Canines) with single rooted canal
- Dental Surgeon (DDS) and Dental specialist shall perform endodontic treatment on all teeth.

Pharmacological Management

Treatment Category	Management
Root canal irrigants	**B:** sodium hypochlorite (NaOCl) 0.5%–8.25% As per procedure, During procedure. **AND** **D:** ethylenediaminetetraacetic acid (EDTA) As per procedure, During procedure.
Root canal medicaments	**B:** calcium hydroxide with iodoform, As per protocol and indicated **OR** **B:** eugenol As per protocol and indicated
Analgesics	**A:** paracetamol (PO) 1 g 8 hourly 3 days **OR** **A:** Ibuprofen (PO) 400 mg 8 hourly At least 3 days **OR** **C:** diclofenac (PO) 50 mg 8 hourly At least 3 days
Systemic antibiotic	**A:** amoxicillin (PO) 500 mg 8 hourly 5 days **OR** **A:** erythromycin (PO) 500 mg 8 hourly 5 days
Anti-infective	**A:** metronidazole (PO) 400 mg 8 hourly 7 days

Surgical treatment
Pulpotomy OR Partial pulpectomy OR Total pulpectomy OR Apexification AND Coronal restoration

Note:
Regarding coronal restoration; for grossly/ deep / extensive carious lesions, restore with the following procedure

- Sandwich technique
- Inlays and Onlays for vital tooth
- Post and core restoration for non-vital tooth

In pathological teeth discoloration conditions like amelogenesis imperfecta, intrinsic discoloration (e.g. dental fluorosis) or other conditions restore the teeth by direct or indirect veneers technique.

16.5 Tooth Wear (Attrition, Abrasion, Erosion, Abfraction)

Tooth wear is a progressive loss of tooth structure caused by mechanical or chemical processes unrelated to caries or trauma.

Clinical Presentation

- Flat, worn occlusal or incisal surfaces (attrition)
- Cracking enamel on cervical area not caused by poor brushing technique (abfraction)
- Notches on cervical margins from brushing (abrasion)
- Smooth, shallow lesions on facial surfaces from acids (erosion)
- Tooth sensitivity

Investigation

- CBCT
- OPG X-ray
- PA X-ray

Non-Pharmacological Management

- Educate on brushing technique and use of soft toothbrush
- Dietary counseling to avoid acidic foods and drinks
- Desensitizing toothpaste with active ingredients of potassium nitrate or stannous fluoride

Non-surgical treatment

- Professional application of 5% Sodium fluoride (NaF) varnish
- Use of occlusal splints for bruxism with decreased Occlusal vertical dimension (OVD) for 6 months and fabricate metal crown for at least 8 posterior teeth to raise OVD
- Composite filling or Glass ionomer cement for deep cervical abrasion

16.6 Dentine Hypersensitivity (DHS)

Is a common dental condition affecting one or more teeth when exposed to certain stimuli. This pain occurs when the dentin layer of the tooth becomes exposed and is triggered by thermal (hot or cold temperatures), osmotic (sweet), chemical (acidic foods and drinks), and tactile (brushing, probing).

Clinical Presentation

Short, sharp, and sudden pain

Prevention

- Proper oral hygiene practice
- Avoid coarse toothpaste
- Avoid highly acidic food staff

Non-Pharmacological Management

- Proper oral hygiene practice
- Desensitizing toothpaste with active ingredients of potassium nitrate or stannous fluoride

Non-surgical treatment

- Professional application sodium fluoride (NaF) 5% varnish
- Composite filling or Glass ionomer cement
- Crown fabrication (for bruxism)
- Endodontic treatment (for severe form)

16.7 Pericoronitis

Inflammation of the soft tissues covering the crown of erupting tooth and occurs more commonly in association with the mandibular third molar (wisdom) teeth.

Clinical Presentation

- High temperature
- Discomfort in swallowing and chewing
- Well localized dull pain, swollen and tender gum flap
- Signs of partial tooth eruption
- Bad smell (Foetor-ox oris)
- Trismus

Investigation

- CBCT
- OPG
- Periapical Dental X-ray

Non-Pharmacological Management

- Excision of the operculum/flap (flabectomy) under local anesthesia.
- Disimpaction of the third molar associated with the condition.
- Grinding or extraction of the opposing tooth.

Pharmacological Management

A: hydrogen peroxide mouthwash 3% (PO) 6hourly for 5days (Gurgle /rinse)

AND

A: amoxicillin (PO) 500mg 6hourly for 5days

AND

A: metronidazole (PO) 400mg 8hourly for 5days If severe (rare) refer to treatment of dental abscess section

16.8 Tooth extraction/ exodontia

Is a dental procedure involving the removal of a tooth from its socket in the jaw bone

Clinical Presentation

- Severe tooth decay
- Advanced periodontal disease; leading to lose and unstable teeth
- Impacted teeth
- Orthodontic treatment
- Tooth fracture; extending to the root or those that cannot be restored
- Periapical abscess that does not respond to endodontic treatment
- Supernumerary teeth
- Failed root canal treatment

Investigation

- PA X-ray or
- CBCT
- OPG X-ray

Note: Tooth extraction can be done under Local anesthesia or/and Sedation or General anesthesia In children/ Adult lidocaine gel 2% and lidocaine spray 10% used before injecting anesthesia

16.9 Impacted tooth/teeth

An impacted tooth is a tooth which is still completely or partially covered by mucosa and bone for more than 2 years following its physiological eruption time. Although the prevalence varies from location to location and from tooth to tooth. Third molars (wisdom teeth) are the most prevalent impacted teeth followed by maxillary canine teeth.

Table 16.3 Classifications of impacted teeth

S/N	Type of Impaction	Description
1	Mesioangular	Tooth is angled forward, toward the front of the mouth
2	Distoangular	Tooth is angled backward, toward the rear of the mouth
3	Vertical	Tooth is upright but fails to erupt fully
4	Horizontal	Tooth is lying completely on its side
5	Buccal or Lingual	Tooth is tilted toward the cheek (buccal) or tongue (lingual) side

Clinical Presentation

- Unerupted tooth
- Recurrent pain
- Swelling
- Bad arrangement of teeth
- Periodontal pocket
- Pericoronitis
- Trismus

Investigations

- Periapical X-ray
- OPG
- CBCT

Non-Pharmacological Management

- There are four treatment options for impacted teeth: observation, intervention, relocation and extraction (Disimpaction) depending with the classification, symptoms, age and orthodontic needs.
- Relocation of impacted tooth/teeth
- Relocation (also called orthodontic exposure and traction) is a common and effective procedure used to bring an impacted tooth into alignment within the dental arch using orthodontic forces. This is especially common for impacted maxillary canines, but may also apply to premolars or incisors.

Disimpaction of impacted tooth/teeth
This is the surgical procedure for removing an impacted tooth that has failed to erupt into its normal position in the dental arch due to physical barriers like bone, adjacent teeth, soft tissue or developmental anomalies.

Indications for Disimpaction
- Pain, pericoronitis (infection around impacted tooth)
- Recurrent food impaction or decay of adjacent tooth
- Periodontal damage to adjacent teeth
- Development of cysts or tumors (e.g., dentigerous cyst)
- Functional or esthetic concerns (especially for anterior teeth)
- Interference with prosthetic work or orthognathic surgery

Note: Disimpaction can be performed under local anesthesia, sedation or general anesthesia depending with the age, severity (multiple impacted teeth, deeply impacted tooth located in close proximity with the vital structures).

Pharmacological Management

Therapeutic Category	Management
Antiseptic mouthwash	**A:** hydrogen peroxide 3% mouthwash 3–4 times daily, As indicated **OR** **A:** povidone iodine 0.5% mouthwash 3–4 times daily, As indicated
Analgesics	**A:** diclofenac (IM/IV) 75 mg stat **THEN** **A:** paracetamol (PO) 1 g 8 hourly 3 days **OR** **A:** ibuprofen (PO) 400 mg 8 hourly 3 days **OR** **C:** diclofenac (PO) 50 mg 8 hourly 3 days
Systemic antibiotic	**A:** amoxicillin (PO) 500 mg 8 hourly 5–7 days **OR** **B:** azithromycin (PO) 500 mg 24 hourly 3 days
Anti-infective	**A:** metronidazole (PO) 400 mg 8 hourly 5 days

16.10 Post Extraction Complications

16.10.1 Bleeding socket

Can be defined as bleeding that continues beyond 8 to 12 hours after dental/tooth extraction. Local causes of bleeding include, traumatic extraction, bleeding due to disturbing the primary blood clot by the patient through rinsing or inadequate compression on the gauze. Systemic factors include platelet problems, coagulation disorders or excessive fibrinolysis, and inherited or acquired problems (medication induced).

Clinical Presentation
- Bleeding that continues beyond 12 hours after extraction
- Development of a large hematoma or ecchymosis within the oral soft tissues;

Primary Bleeding Socket
- Active bleeding from the socket
- Patient may be dehydrated and pale if has lost significant amount of blood
- Features of decreased pulse rate and volume, hypotension also if patient has lost significant amount of blood

Secondary bleeding
- The socket may show features of infection or trauma

Investigations
Depending with the severity of bleeding, patient may need further investigations such as full blood picture, grouping and compatibility testing and coagulation parameters

Non-Pharmacological Management
- If the patient is using anticoagulants, discuss with physician for decision to stop or adjust anticoagulants
- Depending with the results of the investigations above, patient may be given blood transfusion
- Give local anesthesia (lidocaine 2% with epinephrine (adrenaline) 1 in 80,000 IU).
- Clear any clot available and examine the socket to identify source of bleeding. Suturing of the wound only when necessary (like significantly traumatized gingiva).
- Give proper instructions to follow (bite on gauze pack for 30 minutes, not to rinse or eat hot foods on that day at least for 12 hours and avoid disturbance to the wound).

Pharmacological Management

C: tranexamic acid (PO) or (IV) 500 mg 8hourly for the first 24hours

AND

A: paracetamol (PO) 1g 8hourly for 3days

OR

C: diclofenac (PO) 50mg 8hourly for 3days

OR

A: ibuprofen (PO) 400mg 8hourly for 3days

16.10.2 Infected Socket

A post extraction complication due to infection of the clot due to contamination (infected socket). The condition is painful and if not managed well could lead to osteomyelitis.

Clinical Presentation

- Severe painful socket 2–4days after tooth extraction
- Fever
- Necrotic blood clot in the socket
- Swollen gingiva around the socket
- Sometimes there may be lymphadenopathy and trismus (inability to open the mouth)

Investigations

Periapical X-ray of the socket may be necessary when there is limited improvement despite treatment.

Non-Pharmacological Management

Socket debridement under local anesthesia with lidocaine 2% and irrigate with hydrogen peroxide 3% followed with copious amounts of normal saline. The procedure of irrigation is repeated the 2nd and 3rd day and where necessary can be extended to the 4th day if pain persists.

Pharmacological Management

Patient is instructed to rinse with

A: hydrogen peroxide 3% mouthwash 3–4 times a day.

OR

A: povidone iodine 0.5% solution 3–4 times a day.

AND

A: amoxicillin (PO) 500mg 8hourly for 5–7days

OR

B: azithromycin (PO) 500mg 24hourly for 3days

AND

A: metronidazole (PO) 400mg 8hourly for 5days

16.10.3 Dry Socket

This is a post extraction complication due to failure to form a clot (dry socket). The condition is very painful, and it differs from an infected socket by lack of clotting and levels of severity of pain.

Clinical Presentation

- Severe pain 2–4 days' post- extraction
- Pain exacerbated by entry of air on the site
- Socket devoid of clot
- Surrounded by inflamed gingiva

Non-Pharmacological Management

Treatment is under local anesthesia with lignocaine 2%, socket debridement and irrigation with hydrogen peroxide 3% followed with copious amount of normal saline. The procedure of irrigation is repeated on the 2nd and 3rd day and where necessary can be extended to the 4th day if pain persists.

Pharmacological Management

A: metronidazole (PO) 400mg 8hourly for 5days

AND

B: amoxicillin + clavulanic acid (FDC) (PO) 625mg 12hourly for 7days

16.11 Edentulism

Is the partial or full loss of natural teeth and subsequent resorption of the alveolar bone.

Clinical Presentation

- Sunken facial appearance
- Difficulty chewing/ speaking

Investigations

- CBCT
- OPG X-ray
- Peri Apical Dental X-ray
- Diagnostic cast

Non-Pharmacological Management

Patient education on maintenance of prosthesis

Non-surgical treatment

- Impression for working cast development
- Design and fabricate dental prosthesis (partial or complete dentures)

Note: Dental prosthesis can be partial or complete, and either removable or fixed

16.12 Denture Stomatitis

An inflammatory condition of the oral mucosa beneath a denture, often due to poor hygiene, fungal infection, or trauma from ill-fitting dentures.

Clinical Presentation

- Red, swollen mucosa beneath the denture
- Discomfort or burning sensation
- Sometimes asymptomatic

Investigations

Swab for Candida culture (if needed)

Non-Pharmacological Management

- Improve denture hygiene
- Instruct patient to remove denture at night

Non-surgical treatment

Professional denture cleaning

Pharmacological Management

A: nystatin oral suspension 100,000 units/mL (PO) rinse every 6hours daily for 7–14 days

OR

C: miconazole oral gel 2% (topical) apply every 6hours daily after meals

16.13 Flabby Ridge

Fibrous, mobile soft tissue commonly found in long-term denture wearers.

Clinical Presentation

- Unstable denture
- Discomfort under denture

Non-Pharmacological Management

Mucosal conditioning

Non-surgical treatment

- Modify impression technique (use mucostatic impression materials)
- Surgical correction if severe

16.14 Combination Syndrome

Specific pattern of bone resorption in maxillary edentulous patients opposed by mandibular natural teeth.

Clinical Presentation

- Maxillary anterior ridge resorption
- Mandibular anterior teeth supra-eruption
- Posterior bone loss in mandible

Non-surgical treatment

- Balanced occlusion
- Fabricate overdenture
- Implant-supported denture

16.15 Burning Mouth Syndrome Related to Prosthesis

Burning sensation in the oral cavity, often associated with denture use in the absence of visible mucosal changes.

Clinical Presentation

- Burning, tingling, or scalding pain
- Typically affects tongue, lips, palate

Non-Pharmacological Management

Psychosocial support

Non-surgical treatment

Denture adjustment

Pharmacological Management

D: clonazepam (PO)/(Topical)/(IV) 0.25mg - 1mg 8hourly at least for 14days

OR

A: amitriptyline (PO) 25 – 50mg every night at bedtime at least for 7 days

16.16 Epulis Fissuratum (Denture-Induced Hyperplasia)

Benign hyperplastic tissue reaction to chronic irritation from ill-fitting denture.

Clinical Presentation

Fold of excess tissue in the vestibule, Irritation or ulceration under denture

Non-surgical treatment

Denture adjustment

Surgical treatment

Surgical excision if lesion persists

Pharmacological Management

A: hydrogen peroxide 3% mouth wash 6hourly for at least for 7days

OR

B: povidone Iodine (PO) 0.5% solution 8hourly at least for 7days

OR

B: chlorhexidine gluconate (PO) 0.1% 12hourly at least for 7days

AND

C: lidocaine + Chlorhexidine gluconate + Metronidazole gel (PO) 8hourly at least for 7days

16.17 Gingival and Periodontal Conditions

16.17.1 Gingivitis

Gingivitis is an inflammatory process limited to the mucosal epithelial tissue surrounding the cervical portion of the teeth and the alveolar processes. Gingivitis has been classified by clinical appearance (e.g., ulcerative, hemorrhagic, necrotizing, purulent), etiology (e.g., drug-induced, hormonal, nutritional, infectious, plaque-induced), and duration (acute, chronic).

16.17.2 Chronic gingivitis

The most common type of gingivitis caused by the accumulation of microbial plaques in persons with inadequate oral hygiene.

Clinical Presentation

- Gingival redness
- Swollen and shiny gingival tissue
- Increased tendency of the gingival to bleed on gentle probing or spontaneously, during tooth brushing or even on touch and on biting bread and fruits.
- Bad breath from the mouth

Non-Pharmacological Management

Proper oral hygiene instruction and counselling.

Non-surgical treatment

Scaling to remove bacterial plaque and calculus with Hydrogen peroxide 3%.

Pharmacological Management

Therapeutic Category	Management
Analgesics	**A:** paracetamol (PO) 1 g 8-hourly At least 3 days **OR** **A:** ibuprofen (PO) 400 mg 8-hourly At least 3 days **OR** **C:** diclofenac (PO) 50 mg 8-hourly At least 3 days
Antiseptic mouthwash	**A:** hydrogen peroxide 3% (mouthwash) 6-hourly At least 7 days **OR** **A:** povidone iodine 0.5% (mouthwash) 8-hourly At least 7 days **OR** **B:** chlorhexidine gluconate 0.1% (mouthwash) 12-hourly At least 5 days
Topical oral gel	**C:** lidocaine + chlorhexidine gluconate + metronidazole gel (PO) 8-hourly At least 7 days
Systemic antibiotic	**A:** amoxicillin (PO) 500 mg 8-hourly At least 7 days **OR** **A:** erythromycin (PO) 500 mg 8-hourly At least 7 days

16.17.3 Acute Necrotizing Ulcerative Gingivitis (ANUG)

It is a painful and severe form of gingivitis, characterized by rapid destruction of gingival tissue, particularly in the interdental papilla. The condition is often associated with poor oral hygiene, smoking, malnourished children, weakened immune system, and individuals with debilitated diseases such as Diabetes and HIV/AIDS.

Clinical Presentation

- Painful swollen gingiva
- Bleeding gingiva
- Halitosis
- Gingival Ulcerations covered with Yellow-whitish slough
- Fever, malaise, and swollen regional lymph nodes
- In some patients (especially malnourished children), ANUG may presents with extensive destruction of the face and jaws in the severe form known as Cancrum Oris

Non-Pharmacological Management

Proper oral hygiene instruction and counselling

Surgical treatment

Scaling to remove bacterial plaque and calculus with Hydrogen peroxide 3%, under local anesthesia

Pharmacological Management

Therapeutic Category	Management
Analgesics	**A:** paracetamol (PO) 1 g 8-hourly At least 3 days **OR** **A:** ibuprofen (PO) 400 mg 8-hourly At least 3 days **OR** **C:** diclofenac (PO) 50 mg 8-hourly At least 3 days
Antiseptic mouthwash	**A:** hydrogen peroxide 3% (mouthwash) 6-hourly At least 7 days **OR** **A:** povidone iodine 0.5% (mouthwash) 8-hourly At least 7 days **OR** **B:** chlorhexidine gluconate 0.1% (mouthwash) 12-hourly At least 5 days
Topical oral gel	**C:** lidocaine + chlorhexidine gluconate + metronidazole gel (PO) 8-hourly At least 7 days
Systemic antibiotic	**A:** amoxicillin (PO) 500 mg 8-hourly At least 7 days **OR** **A:** erythromycin (PO) 500 mg 8-hourly At least 7 days
Anti-infective	**A:** metronidazole (PO) 400 mg 8-hourly At least 7 days

16.17.4 Gingival hyperplasia

A condition characterized by an excessive growth of gingiva. The condition can be localized (affecting a specific area) or generalized (affecting the entire gumline).
This condition can be caused by medications (such as anticonvulsants, immunosuppressants, and calcium channel blockers), Hormonal Changes (during puberty and pregnancy), and hereditary.

Clinical Presentation

- Puffy, swollen gingiva
- Gums that may partially or completely cover the teeth
- Potential difficulty with chewing and speaking
- Halitosis

Non-Pharmacological Management

- Oral hygiene instruction and counselling
- Address the underlying cause (e.g. changing medications)

Surgical treatment

Gingivectomy

Pharmacological Management

Therapeutic Category	Management
Analgesics	**A:** paracetamol (PO) 1 g 8-hourly At least 3 days **OR** **A:** ibuprofen (PO) 400 mg 8-hourly At least 3 days **OR** **C:** diclofenac (PO) 50 mg 8-hourly At least 3 days
Antiseptic mouthwash	**A:** hydrogen peroxide 3% (mouthwash) 6-hourly At least 7 days **OR** **A:** povidone iodine 0.5% (mouthwash) 8-hourly At least 7 days **OR** **B:** chlorhexidine gluconate 0.1% (mouthwash) 12-hourly At least 5 days
Topical oral gel	**C:** lidocaine + chlorhexidine gluconate + metronidazole gel (PO) 8-hourly At least 7 days
Systemic antibiotic	**A:** amoxicillin (PO) 500 mg 8-hourly At least 7 days **OR** **A:** erythromycin (PO) 500 mg 8-hourly At least 7 days

16.17.5 Desquamative Gingivitis

Clinical term describing red, glazed, and peeling gingiva often linked to systemic conditions (e.g., lichen planus).

Clinical Presentation

Red and painful gingiva**,** Erosions and sloughing epithelium.

Investigations

Biopsy if needed for diagnosis

Non-Pharmacological Management

- Gentle brushing; use soft bristle tooth brush
- Avoid irritants (spicy food, alcohol)

Pharmacological Management

A: hydrogen peroxide 3% mouth wash 6hourly for at least for 5days

OR

B: povidone Iodine (PO) 0.5% solution 8hourly at least for 5days

OR

B: chlorhexidine gluconate (PO) 0.1% 12hourly at least for 5days

AND

C: lidocaine + chlorhexidine gluconate + metronidazole gel (PO) 8hourly at least for 5days

AND

C: triamcinolone (Topical) 0.5% 8hourly at least for 5 days

16.18 Periodontitis

Defined as a microbially-associated, host-mediated inflammation that results in loss of periodontal attachment. This includes destruction of the periodontal ligament and alveolar bone, often accompanied by pocket formation, gingival recession, or both.

16.18.1 Periodontitis Levis

A periodontal disease characterized by the slow, progressive loss of the tooth-supporting tissues (periodontal ligament and bone).

Clinical Presentation

- Halitosis
- Inflamed gingiva
- Bleeding gingiva
- Gingival recession

Investigations

- CBCT
- OPG
- Periapical Dental X-ray

Non-Pharmacological Management

Proper oral hygiene instruction and counselling.

Surgical treatment

Scaling and root planning to remove bacterial plaque and calculus with hydrogen peroxide 3%

Pharmacological Management

Therapeutic Category	Management
Antiseptic mouthwash	**A:** hydrogen peroxide 3% mouthwash 6 hourly At least 7 days **OR** **B:** chlorhexidine gluconate 0.1% mouthwash 12 hourly At least 5 days **OR** **B:** povidone iodine 0.5% mouthwash 6 hourly At least 7 days
Topical oral gel	**C:** lidocaine + chlorhexidine gluconate + metronidazole gel (PO) 8 hourly At least 7 days
Systemic antibiotic	**A:** amoxicillin (PO) 500 mg 8 hourly **OR** **A:** doxycycline (PO) 100 mg 12 hourly 5 days
Anti-infective	**A:** metronidazole (PO) 400 mg 8 hourly 5 days

16.18.2 Periodontitis Gravis

Also known as advanced periodontitis, is a severe form of gum disease where the supporting structures of the teeth are severely damaged, leading to significant bone loss and potential tooth loss. It's characterized by deep pockets and loose or shifting teeth.

Clinical Presentation

- Halitosis
- Malocclusion
- Inflamed gingiva
- Bleeding gingiva
- Gingival recession
- Pain when chewing
- Loose or shift teeth

Investigation

CBCT, OPG X-ray , PA X-ray

Non-Pharmacological Management
Oral hygiene instruction and counselling.

Surgical treatment
- Scaling and root planning to remove bacterial plaque and calculus with hydrogen peroxide 3% (Under local anesthesia)
- Surgical procedure to repair damaged tissues (in advanced cases)
- **S:** Bone graft to restore lost bone (in advanced cases)

Pharmacological Management

Therapeutic Category	Management
Analgesics	**A:** paracetamol (PO) 1 g 8 hourly At least 3 days **OR** **A:** ibuprofen (PO) 400 mg 8 hourly At least 3 days **OR** **C:** diclofenac (PO) 50 mg 8 hourly At least 3 days
Antiseptic mouthwash	**A:** hydrogen peroxide 3% mouthwash 6 hourly At least 7 days **OR** **B:** chlorhexidine gluconate 0.1% mouthwash 12 hourly At least 5 days **OR** **A:** povidone iodine 0.5% mouthwash 8 hourly At least 7 days
Topical oral gel	**C:** lidocaine + chlorhexidine gluconate + metronidazole gel (PO) 8 hourly At least 7 days
Systemic antibiotic	**A:** amoxicillin (PO) 500 mg 8 hourly 7 days **OR** **A:** erythromycin (PO) 500 mg 8 hourly 7 days **OR** **A:** doxycycline (PO) 100 mg 12 hourly 10 days
Anti-infective	**A:** metronidazole (PO) 400 mg 8 hourly 7 days

16.18.3 Peri-implantitis

Inflammation of the tissues around a dental implant with loss of supporting bone.

Clinical Presentation
Bleeding on probing, Pocket formation around implant, Suppuration, Radiographic bone loss

Non-Pharmacological Management
Oral hygiene instructions

Surgical treatment
Periodontal debridement

Pharmacological Management

Therapeutic Category	Management
Analgesics	**A:** paracetamol (PO) 1 g 8 hourly At least 3 days **OR** **A:** ibuprofen (PO) 400 mg 8 hourly At least 3 days **OR** **C:** diclofenac (PO) 50 mg 8 hourly At least 3 days
Antiseptic mouthwash	**A:** hydrogen peroxide 3% mouthwash 6 hourly At least 7 days **OR** **A:** povidone iodine 0.5% mouthwash 8 hourly At least 7 days
Topical oral gel	**C:** lidocaine + chlorhexidine gluconate + metronidazole gel (PO) 8 hourly At least 7 days
Systemic antibiotic	**A:** amoxicillin (PO) 500 mg 8 hourly 7 days **OR** **A:** erythromycin (PO) 500 mg 8 hourly 7 days **OR** **A:** doxycycline (PO) 100 mg 12 hourly 10 days
Anti-infective	**A:** metronidazole (PO) 400 mg 8 hourly 7 days

16.18.4 Periodontal Abscess

Acute infection within the periodontal pocket.

Clinical Presentation
- Localized swelling and pain
- Pus discharge
- Tooth mobility

Non-Pharmacological Management
Drainage of abscess

Surgical treatment
- Incision and drainage and irrigate with hydrogen peroxide 3% 12 hourly + sodium chloride 0.9% 12 hourly
- Scaling to remove bacterial plaque and calculus with Hydrogen peroxide 3%, under local anesthesia

Pharmacological Management

Therapeutic Category	Management
Analgesics	**A:** paracetamol (PO) 1 g 8 hourly At least 3 days **OR** **A:** ibuprofen (PO) 400 mg 8 hourly At least 3 days **OR** **C:** diclofenac (PO) 50 mg 8 hourly At least 3 days
Antiseptic mouthwash	**A:** hydrogen peroxide 3% mouthwash 6 hourly At least 7 days **OR** **A:** povidone iodine 0.5% mouthwash 8 hourly At least 7 days
Topical oral gel	**C:** lidocaine + chlorhexidine gluconate + metronidazole gel (PO) 8 hourly At least 7 days
Systemic antibiotic	**A:** amoxicillin (PO) 500 mg 8 hourly 7 days **OR** **A:** erythromycin (PO) 500 mg 8 hourly 7 days **OR** **A:** doxycycline (PO) 100 mg 12 hourly 10 days
Anti-infective	**A:** metronidazole (PO) 400 mg 8 hourly 7 days

16.18.5 Systemic-Related Periodontal Disease

Periodontal disease influenced by systemic conditions like diabetes mellitus and HIV/AIDS.

Clinical Presentation
- Severe periodontitis disproportionate to local factors
- Rapid bone loss

Non-Pharmacological Management
- Proper oral hygiene practice and counselling
- Manage systemic condition

Surgical treatment
- Scaling to remove bacterial plaque and calculus with Hydrogen peroxide 3%, under local anesthesia
- Periodontal debridement

Pharmacological Management

Therapeutic Category	Management
Analgesics	**A:** paracetamol (PO) 1 g 8 hourly At least 3 days **OR** **A:** ibuprofen (PO) 400 mg 8 hourly At least 3 days **OR** **C:** diclofenac (PO) 50 mg 8 hourly At least 3 days
Antiseptic mouthwash	**A:** hydrogen peroxide 3% mouthwash 6 hourly At least 7 days **OR** **A:** povidone iodine 0.5% mouthwash 8 hourly At least 7 days
Topical oral gel	**C:** lidocaine + chlorhexidine gluconate + metronidazole gel (PO) 8 hourly At least 7 days
Systemic antibiotic	**A:** amoxicillin (PO) 500 mg 8 hourly 7 days **OR** **A:** erythromycin (PO) 500 mg 8 hourly 7 days **OR** **A:** doxycycline (PO) 100 mg 12 hourly 10 days
Anti-infective	**A:** metronidazole (PO) 400 mg 8 hourly 7 days

Note: Dental scaling and root planning procedure shall be performed by Dental therapist, Assistant dental officer, Dental Surgeon (DDS) and Dental specialist practicing from health centers to higher-level healthcare facilities.

16.19 Dental Abscess (Odontogenic Abscess)

Is a localized collection of pus in the orofacial region secondary to dental caries, deep fillings or failed root canal treatment and trauma to the jaws and supporting structures as a result of spread of polymicrobial infection.

Clinical Presentation

- Fever and chills
- Throbbing pain of the offending tooth
- Painful swelling around the orofacial area, submandibular and neck region
- Intraoral or extraoral Pus discharge
- Trismus (inability to open the mouth)
- Regional lymph nodes enlargement and tender

Investigation

- OPG or CBCT
- Pus swab for Gram stain, culture, and sensitivity.

Non-Pharmacological Management

- Incision and drainage of pus followed by irrigation with hydrogen peroxide 3% and copious amount of sterile saline (0.9% Sodium chloride)
- Dressing with dry or medicated gauze
- Extraction of offending tooth/teeth

Pharmacological Management

A: amoxicillin (PO) 500mg 8hourly for 5days
AND
A: metronidazole (PO) 400mg 8hourly for 5days.

In severe cases,
B: amoxicillin+ clavulanic acid (FDC) (PO) 625mg 12 hourly for 5days
AND
A: metronidazole (PO) 400mg 8hourly for 5days.

If a patient is allergic to penicillin
A: erythromycin (PO) 500mg 8hourly for 5days

Where parenteral administration of antibiotics is necessary (especially when the patient cannot swallow and has life threatening infection), consider the following
B: ceftriaxone (IV) 1gm 24 hourly for 5days
AND
B: metronidazole (IV) 500 mg 8hourly for 5days
AND
A: gentamicin (IV) 80mg 8hourly for 5days

Note:

- Incision and drainage are mandatory in cases of deeper spaces involvement followed by a course of antibiotics. The practice of prescribing antibiotics to patients with abscess and denying referral for definitive care until pus has established or resolved has been found to lead to more problems for orofacial infections therefore early referral for definitive care is important
- Depending on the level of debilitation patient may need admission to the ward for supportive therapy and dressing twice per day.

16.20 Ludwig's Angina

This is a serious life-threatening generalized septic cellulitis of the fascia spaces found on the floor of the mouth and tongue. It is an extension of infection from mandibular molar teeth into the floor of the mouth covering the submandibular, sublingual, and submental spaces bilaterally.

Clinical Presentation

- Brawny induration
- Tissues are swollen, board like, not pitted and no fluctuance
- Respiratory distress
- Dysphagia
- Tissues may become gangrenous with a peculiar lifeless appearance on cutting
- Three fascia spaces are involved bilaterally (submandibular, submental, and sublingual)

Investigations

Routine investigations

- Blood Glucose (Fasting/Random)
- Renal Function Tests
- Complete Blood Count (CBC)

Specific investigations

- OPG, CBCT, CT Scan
- Chest X-ray
- Pus swab for Culture and sensitivity

Non-Pharmacological Management

- Incision and drainage are done (even in absence of pus) to relieve the pressure and allow irrigation
- Only when the airway distress is significant and there is evidence that it is not relieved by incision and drainage then tracheostomy is needed.
- Patient should be admitted for Supportive care During incision and drainage pus should be taken for culture and sensitivity. Offending tooth should be removed at the same sitting if the patient can open the mouth.

Pharmacological Management

B: ceftriaxone (IV) 1g 24hourly for 5days

OR

B: amoxicillin + clavulanic acid (FDC) (PO) 625mg 12-8hourly for 5days

AND

B: metronidazole (IV) 500mg 8hourly for 5days

If allergic to penicillin use

A: erythromycin (PO) 500mg 6hourly for 5days

Once the patient can swallow, replace IV medication with oral treatment.

Note: For this condition and other life-threatening oral conditions consultation of available specialists (especially oral and maxillofacial surgeons) should go parallel with life saving measures.

16.21 Osteomyelitis of the Jaw

Osteomyelitis of the jaw is a localized or diffuse infection and inflammation of the bone and bone marrow of the mandible or maxilla, caused by bacterial invasion, often originating from a dental or periodontal infection, trauma, or surgical procedures.

Clinical Presentation

- In the initial stage there is no swelling
- Malaise and fever
- Enlargement of regional lymph nodes
- Teeth in the affected area become painful and loose.
- Later as the bone undergoes necrosis the area becomes very painful and swollen
- Pus ruptures through the periosteum and discharged outside the skin surface through a sinus

Investigations

- OPG
- CBCT
- CT-Scan
- Pus for culture and sensitivity

Non-Pharmacological Management

Treatment for osteomyelitis involves eliminating the source of infection and necrotic tissue, establishing drainage, restoring blood supply, and controlling the infection with appropriate antimicrobial therapy.

Pharmacological Management

For acute osteomyelitis of the jaw

S: clindamycin (PO) 150mg 12hourly for 5 days

AND

A: metronidazole (PO) 400mg 8hourly for 4-6weeks. If culture is available treat according to results.

For chronic osteomyelitis of the jaw which sequestrectomy has been done

A: metronidazole (PO) 400mg 8hourly for 5days

AND

S: clindamycin (PO) 300mg 8hourly for 5days

16.22 Cervicofacial necrotizing fasciitis

Necrotizing fasciitis (NF) is a life-threatening polymicrobial soft tissue infection characterized by rapid and progressive necrotizing process of the subcutaneous tissues, fats and fascial planes, with resulting skin gangrene and systemic toxicity.

Clinical Presentation

- Toothache or recent dental infection/extraction
- Severe pain out of proportion to clinical findings
- Swelling and erythema of the face, neck, or submandibular area
- Fever, malaise, chills, and trismus
- Crepitus (subcutaneous gas) may be felt on palpation
- Skin discoloration: dusky, violaceous, or gray patches followed by skin breakdown
- Rapid tissue necrosis

Investigations
Refer Ludwig's angina

Non-Pharmacological Management
Meticulous surgical debridement, meticulous daily wound dressing, and hyperbaric oxygen therapy

Pharmacological Management
Refer Dental Abscess

16.23 Fungal Infections

16.23.1 Oral Candidiasis

This is a fungal infection of the oral mucosa caused by Candida infection mainly Candida albicans.

Clinical Presentation
Features of candidiasis are divided according to the types as follows:

Pseudomembranous

- White creamy patches/plaque
- Cover any portion of mouth but more on tongue, palate, and buccal mucosa
- Sometimes may present as erythematous type whereby bright erythematous mucosal lesions with only scattered white patches/plaques

Hyperplastic

- White patches leukoplakia-like which are not easily rubbed-off.

Non-Pharmacological Management
Assess and correct the predisposing factor

Pharmacological Management
C: miconazole Oral gel 2% (PO) 2hourly

However, in chronic mucocutaneous candidiasis with immunosuppression, topical agents may not be effective. In such instances systemic administration of fluconazole or itraconazole Is advised.

16.23.2 Angular cheilitis (angular stomatitis)

Is a clinical entity characterized by erythema, rhagades, ulcerations, and crusting of one or both lip commissures and peri-labial skin, responsible of an unpleasant and painful discomfort.

- The cause of Angular cheilitis is multifactorial and could range from local etiologies (Reduced or loss of vertical dimension of the jaws, Habitual lip licking or picking, Ill-fitting orthodontic appliances) to systemic ones (nutritional deficiencies, infection, chemicals).

Clinical Presentations

- Angular cheilitis can be either unilateral or bilateral
- Soreness, erythema, pain, pruritus, burning sensation and fissuring at the angles of the mouth
- Commonly associated with denture stomatitis s but may represent a nutritional deficiency or it may be related to orofacial granulomatosis or HIV infection

Non-Pharmacological Management

- Improve the vertical facial height by newer dentures or fillers
- Habit cessation,
- Proper fitting appliances

Pharmacological Management
When the condition is caused by fungal infection, the following topical formulas can be used
A: nystatin suspension (PO) 100,000IU (1 ml) mixture held in the mouth for at least 3minutes before swallowing, 6hourly
OR
C: miconazole 2% oral gel apply 12 hourly for 7days

When the condition is caused by bacteria, the following can be used
C: lidocaine + chlorhexidine gluconate + metronidazole gel (PO) 8hourly at least for 7days

Where topical application has failed, or candida infection has been considered severe; use.
A: fluconazole (PO) 150mg 24hourly for 7days
OR
D: itraconazole (PO) 200mg 24hourly for 7days

Note: Candidiasis has several risk factors; it is recommended that for HIV/AIDS patients with candidiasis, refer to the Tanzania HIV/AIDS Guidelines.

16.24 Viral Infections

16.24.1 Herpes Simplex Virus

This is a viral infection commonly affecting the lips and perioral soft tissues presenting as papulovesicular lesions which ultimately ulcerate. The primary infection affects mainly the gingiva and palate.

Clinical Presentation

- A prodromal of tingling, warmth or itching at the site usually precedes the occurrence
- About 12 hours later, redness appears followed by papules and then vesicles
- These vesicles then burst, weep, dry, scab and then heal
- The length of the cycle is variable 5–12days mean time being 7days

Non-Pharmacological Management

- Adequate hydration
- Avoid salty and acidic drinks
- Cover lesions on the lips with Petroleum jelly and control any underlying cause

Pharmacological Management
This is an otherwise self-limiting condition but if persistent for 10days or recurrent infection use medication:

For Herpes Labialis
B: acyclovir cream applies 4hourly for 5days

For Herpes Stomatitis
B: acyclovir (PO) 200mg 6hourly for 7-10days
AND
B: acyclovir cream 12hourly for 7-10days

In immunocompromised patients
B: acyclovir (PO) 400mg 6hourly for 14days

For oral facial lesions of herpes zoster treat with
B: acyclovir (PO) 400–800mg 6hourly for 14days

Pain control by analgesics
A: paracetamol (PO) 1g 8hourly for 7days
OR
C: diclofenac (PO) 50mg 8hourly for 7days
OR
A: ibuprofen (PO) 400mg 8hourly for 7days

16.25 Aphthous Ulceration

Aphthous or recurrent aphthous stomatitis (RAS) or recurrent aphthous ulceration (RAU) are painful recurrent mucous membrane ulcerations. Usually affect the non-keratinized oral mucous membrane. (Buccal, labial, floor of the mouth, soft palate, ventral surface of the tongue, and alveolar mucosa.

Clinical Presentation
Minor Aphthous Ulcers

- Sudden onset, small round or ovoid painful ulcers 2–4 mm in diameter, surrounded by an erythematous halo and some edema.
- Occurs in groups of only a few ulcers (i.e. 1–6) at a time.

Major Aphthous ulcers

- Painful ulcers on non-keratinized oral mucous membrane, they are large 1–3 cm edged ulcers, and several may be present simultaneously.

Herpetiform ulcers

- These occur in a group of multiple tiny ulcers (<1–3 mm) which can coalesce into larger irregular ulcers which heals within 7–10days.

Pharmacological Management

B: chlorhexidine gluconate 0.1% mouthwash used 8hourly for 5days

OR

A: povidone iodine 1% mouthwash 8hourly for 5days

AND

C: triamcinolone acetonide cream 0.1% apply 12hourly for 5days

OR

D: dexamethasone oral paste apply 8hourly for 5 days

If systemic therapy is required;

A: prednisolone (PO) 20mg 8hourly for 3days then dose tapered to 10mg 8hourly for 2days then 5mg 8hourly for other 2 days.

Pain control by analgesics

A: paracetamol (PO) 1g 8hourly for 3days

OR

C: diclofenac (PO) 50mg 8hourly for 3days

OR

A: ibuprofen (PO) 400mg 8hourly for 3days

16.26 Dental implants

Dental implant. Is an artificial tooth root made of compatible metal usually titanium implanted in the jaw bone to replace the missing single or multiple missing teeth?

Indication for dental Implant(s)

- Replacement of a single missing tooth
- Replacement of multiple missing teeth
- Support over denture
- Retention of prosthesis in severely resorbed jaw bone

Further indication for edentulous patient

In a totally edentulous patient with good bone height and width

- Mandible 6 implants
- Maxillary 6 implants

In severe bone loss

- Maxillary 4 implants -tilted
- Mandible 4 implants -tilted

A number of 4-6 implants can be used to support a fixed prosthesis usually made of porcelain fused metal (PFM) or Zirconia. In a compromised or very severely bone loss 2 implants will be used to provide support and retention of removable prosthesis.

Implant surgery procedure

Implant surgery can either be one stage or two stages surgery depending on the bone condition

- In aesthetic zone consider temporization
- Some bone modifications can be done during implant surgery before implant by using bone grafting materials for better outcome.
- Patient should well motivated to cooperate during and after implant surgery for maintenance.

Investigation

- P.A X-ray
- OPG
- CBCT/ Medical CT scan
- Cast Models

Note: Proper review of medical history of patient is mandatory as it exclude medical condition which may interfere with implant success. e.g. DM and other medical conditions.

Surgical guide.

They are custom made for each patient. They are used as guides for drilling in the optimum locations implant placement then removed after placement.

Study cast

Evaluate occlusal centric relation, including any premature occlusal contacts, the relationship of the edentulous area to the adjacent natural teeth and opposing arches.

Intra-operatively, the following should be observed to have a successful Implant

- Assess anatomical variation of vital structures so that implant should not sit or touch vital structures.
- Maintain Sterility as interfere with Osseo-integration

Surgical technique
Adequate blood supply (proper incision design and flap reflection. Using sharp gradual series of drill sizes with copious amount of irrigation by normal saline.

Pharmacological Management
Post implant insertion
A: hydrogen peroxide 3% 6hourly for at least for 5days
OR
B: chlorhexidine gluconate 0.2% 12hourly at least for 5days
AND
A: metronidazole (PO) 400mg 8hourly for 7days
AND
A: amoxicillin (PO) 500mg 8hourly for 7days

16.27 Management of Maxillofacial Trauma

16.27.1 Traumatic Dental Injuries

It may result in loosening, displacement and or loss of teeth, fracture of teeth and or bone, lacerations, and bleeding. The commonest causes are falls (in sports and play) at home or school and motor accidents. Most affected are upper incisors.

Clinical Presentation

Type	Presentation
Tooth Concussion	Is an injury to supporting tissues of tooth, without displacement
Sublaxation	Is the partial displacement, but is commonly used to describe loosening of a tooth without displacement
Intrusion	Is the displacement of tooth into its socket often accompanied by fracture of alveolar Bone
Luxation	Is the displacement of tooth laterally, labially or palatally
Avulsion	Is the complete loss of tooth from the socket

Soft tissue Injuries Abrasion
Where friction between an object and the surface of the soft tissue causes a wound. This wound is usually superficial, denudes the epithelium, and occasionally involves deeper layers.

Contusion/Bruising
Indicates that some amount of tissue disruption has occurred within the tissues, which resulted in subcutaneous or sub mucosal hemorrhage without a break in the soft tissue surface.

Laceration
Is a tear in the epithelial and sub epithelial tissues. They often result from blunt or penetrating injuries due to motor traffic crashes, assaults, falls, or sports injuries.

16.27.2 Facial Bones Injuries

Types of Facial Bone Fractures Include:

- Nasal Bone Fractures.
- Mandibular Fractures: includes fractures of the body, angle, symphysis, Para symphysis, condyle, and ramus.
- Maxillary (Upper Jaw) Fractures: include Le Fort fractures: classified into three patterns based on fracture lines:
    - Le Fort I: horizontal maxillary fracture (separates maxilla from the palate)
    - Le Fort II: pyramidal fracture involving nasal bridge, maxilla, and orbital floor
    - Le Fort III: craniofacial disjunction, separating the entire midface from the skull base.
- Zygomatic bone Fractures: Involves the zygomatic bone and/or its articulations with maxilla, frontal bone, temporal bone, and sphenoid.
- Orbital Fractures: involves either the rims or the walls of the orbit. Common types of wall fractures: orbital floor (blowout), medial wall, lateral wall, and roof fractures.
- Naso-Orbito-Ethmoid (NOE) Fractures: fractures involving the central upper face. They affect the nasal bones, medial orbital walls, and ethmoid bone, and often disrupt the medial canthal ligament and lacrimal system.
- Palatal Fractures: Fractures of the hard palate, often associated with maxillary fractures.

1. Initial Assessment & Emergency Management
Follow ATLS principles:

- Airway with cervical spine control,
- Breathing,
- Circulation,
- Disability,
- Exposure.

Facial fractures demand extra vigilance for airway compromise from bleeding, edema, or bone displacement. The airway can quickly be secured using nasal/oral airway adjuncts, intubation, or emergency tracheostomy as needed.
A thorough history from the patient is required. In emergency setting, AMPLE mnemonic is used in trauma history to quickly gather essential information about a patient's medical background during emergency assessment:

- A – Allergies: Identify any known drug or food allergies (especially to antibiotics, anesthetics, or latex).
- M – Medications: Current prescriptions, over-the-counter drugs, anticoagulants (e.g., warfarin, aspirin), steroids, or herbal supplements.
- P – Past medical history: Includes significant illnesses (e.g., diabetes, heart disease, seizures), surgeries, previous trauma, bleeding disorders.
- L – Last meal: Important for anesthesia planning (risk of aspiration); also relevant in surgical timing.
- E – Events/environment related to injury: Mechanism of injury (e.g., fall, assault, MVC), use of safety gear (seatbelt, helmet), loss of consciousness, alcohol/drug use, environmental exposures (e.g., smoke inhalation).

2. Imaging & Diagnosis
Dental CT (CBCT) or normal CT scans are the standard radiological investigation, especially with suspected midface or complex fractures; Plain X-rays may be adequate for isolated nasal or mandibular injuries. In case of isolated mandibular fractures OPG can suffice.

3. Fracture Management
a) Closed Reduction
It is reserved for non-displaced or minimally displaced fractures (e.g., nasal, condylar, pediatric, body of the mandible). Midface bones (nasal and zygoma) closed reduction is best within 7–10 days in adults, sooner in children. For the mandibular fractures closed reduction should be carried as soon as possible.
Maxillomandibular fixation (MMF)/intermaxillary fixation (IMF): Establishes occlusion, used in closed or open techniques for mandible and midface stability. Duration typically 4–8 weeks, or shorter with rigid fixation. Use arch bars, interdental wires, or bone screws; treatment Modalities

b) Open Reduction and Internal Fixation (ORIF):
Indicated for displaced, unstable, comminuted, or load-bearing fractures (mandible, Le Fort, ZMC). Aim is to achieve anatomical reduction, occlusion restoration, facial contour.
Utilize titanium miniplates, reconstruction plates, 3D plates, lag screws, biodegradable implants as appropriate.
Choose incision and approach based on location (intraoral for symphysis/body; extraoral like Gillies for zygoma).

Note: ORIF for fractures of the jaws and midface should be performed by a specialist Oral and Maxillofacial surgeon.

4. Management Principles

Nasal Fractures

- Evaluate for septal hematoma; drain within 24 hours.
- Closed reduction (manual or instruments) ideally within 5–7 days post-injury in adults, sooner in children.
- Use external splints for 7–10 days.

Mandibular Fractures

- Non displaced/minimally displaced (e.g. condylar neck): Closed treatment with MMF for 4–6 weeks.
- Displaced/body/angle fractures: ORIF with rigid plating; restore occlusion via intraoperative MMF first.
- Provide nutritional and oral hygiene support; instruct on MMF care.

Midface Fractures
Le Fort I–III

- Indicated for displaced fractures with instability, altered occlusion, or orbital involvement.
- ORIF of buttress and orbital rim; MMF for 4-6 weeks.

Zygomatico-Maxillary Complex (ZMC)

- Displacement: ORIF via Gillies, intraoral, or transconjunctival approaches.
- Fix plate at zygomaticomaxillary buttress and/or frontozygomatic suture.

Orbital Fractures
Symptomatic entrapment or large floor defects: ORIF with titanium mesh or porous polyethylene implants

5. Antibiotics & Infection Prevention and Analgesics

- Give prophylactic antibiotics for open fractures or fractures communicating with oral/nasal cavities
  B: amoxicillin (clavulanic acid) 625mg 12hrly for 5 days

- Optimal oral hygiene (chlorhexidine rinses, brushing) and nutritional support play key roles in infection reduction.
- For pain control: Start with strong analgesics (e. g Tramadol (PO), Pethidine (IV) (if admitted)) for first 24hrs to 36 hours, then moderate analgesics (paracetamol (PO) or ibuprofen (PO)) until when the patient is free from pain.

6. Postoperative Care & Rehabilitation

- Use light pressure dressings to reduce edema; remove after 2–5 days.
- Monitor overnight for bleeding, airway issues, vomiting.
- Regular follow-ups: 5–7 days (sutures), every 2 weeks, and at 6–8 weeks for MMF removal if used.
- Gradually reintroduce diet from liquids to soft and then normal consistencies after removal of MMF.

7. Site-Specific Considerations

- Nasal fractures: Watch for septal hematomas—drain urgently to avoid deformity. Closed reduction within days yields favorable cosmetic results; remodeling may occur in children.
- Mandibular fractures: Favor ORIF for most load-bearing body and angle fractures; reserve closed reduction for minimally displaced, pediatric, condylar neck, comminuted, or atrophic cases.
- ZMC fractures: Surgery needed for displaced fractures—restore projection and orbital volume. Miniplates/screws via Gillies or similar approaches.
- Le Fort and midface: ORIF with MMF to restore buttresses and occlusion.
- Pediatric considerations: Prefer conservative treatment for nasal, condylar, and NOE fractures unless displaced. Surgical intervention (ORIF) indicated in displaced NOE type II–III. Growth concerns may necessitate revisional procedures later.
- Comminuted fractures in atrophic or edentulous mandibles: Consider reconstruction plate with load bearing properties.
- Patients with coagulation disorders: Coordinate with hematology; ensure optimized clotting profile preoperatively.

Pharmacological Management
Pain control by analgesics
A: paracetamol (PO) 1g 8hourly for 3days
OR
C: diclofenac (PO) 50mg 8hourly for 3days
OR
A: ibuprofen (PO) 400mg 8hourly for 3days

Prophylactic antibiotics are indicated in cases of suspected contamination or extensive damage
B: ampicillin + cloxacillin (FDC) (PO) 500mg 8hourly for 5days

16.28 Tumours and Tumour-Like Conditions of Oral Cavity and Facial Region

16.28.1 Benign Odontogenic Tumors

Each tumour presents with different cardinal features clinically, radiologically and on histopathological diagnosis.
Ameloblastoma

Clinical Presentation

- Recognized between ages of 10 to 80 years80% form in the mandible and 70% develop in the posterior molar region and often involve the ramus
- Painless, slow growing tumor that may be solid or cystic
- Loosening of teeth, with roots resorption
- Gradual facial asymmetry due to enlargement and destruction of bone
- Ping pong and/or bone cracking effects

Investigations
Radiographically, the tumour presents with multilocular radiolucency, honeycomb, or soap bubble appearance.

Note: Diagnostic confirmation of this tumour is through histopathology. Complete excision e.g. e.g. marginal resection, segmental resection plus bone grafting and partial or total resection of the jaw is the treatment of choice. Hence refer the patient to the center where there is oral and maxillofacial surgeon

16.28.1.2 Calcifying odontogenic tumor

Clinical Presentation

- Most often found in the mandibular molar/premolar region, but 33% of cases are found in the maxilla
- It is associated with an unerupted or impacted tooth in 50% of cases

Investigations

- Radiographically these lesions can be radiolucent, but more characteristically are mixed lucent and opaque masses, exhibiting a snow-driven appearance

Non-Pharmacological Management

- Complete excision of the tumour with border of normal bone should be curative, but curettage or incomplete excision has high recurrence rates.

16.28.1.3 Amelobastic Fibroma

Clinical Presentation

- Slower growing tumor than the simple ameloblastoma and does not infiltrate between bone trabeculae.
- Occurs during the first two decades of life
- 75% of ameloblastic fibromas are found in the posterior mandible in the area of a developing tooth. It is benign and expansile, growing as a pushing front rather than invading surrounding tissues

Investigations

- Radiographically this lesion appears as a uniocular or bilocular radiolucency, most often in the posterior mandible.
- The radiographic appearance is identical to that of unicystic ameloblastoma, and both lesions should be differential diagnoses because they affect similar age groups and have similar clinical and radiographic appearances. Histologic examination differentiates the two.

Non-Pharmacological Management

- Enucleation and curettage and extraction of associated teeth is usually adequate for small tumours. For big tumours conservative resection may be required, where necessary to be followed with reconstruction.

16.28.1.4. Adenomatoid odontogenic Tumors (AOT) Clinical Presentation.

- Usually occur in the second and third decades
- Usually encountered incidentally
- It has a female predilection
- Two thirds of the cases occur in the anterior maxilla, one third occur in the anterior mandible, and it is never found posterior to the premolars
- Two thirds of the cases are associated with an impacted tooth (usually the cuspid) Present with mild swelling or in association with a clinically missing tooth

Investigations

Radiographically this lesion generally appears as a well-demarcated radiolucency. In 75% of cases, it is associated with an unerupted tooth, usually the canine. It may contain radiopaque flecks, which represent calcified material.

Non-Pharmacological Management

Enucleation is curative and recurrence is almost unknown.

16.28.1.5 Odontogenic Myxoma

Clinical Presentation

- Occurs mostly in the second to fourth decades of life
- Clinically indistinguishable from ameloblastoma, but on aspiration while ameloblastoma yields
- straw-colored or yellow fluid Odontogenic myxoma may not yield anything due to the thick mucoid clear contents of the tumour.
- The radiographic appearance; typically, it has honeycomb appearance, although
- It often appears quite like ameloblastoma e.g multilocular radiolucency

Investigations

OPG, CBCT, Tissue biopsy (Confirmation is through histopathology)

Non-Pharmacological Management

Wide surgical excision Similar approach to the treatment of ameloblastoma. It has a high recurrence rate if not completely removed.

16.28.2 Cemento-ossious lesions

These are groups of benign fibro-osseous lesions that affect the jawbones, particularly the tooth-bearing areas. These lesions involve replacement of normal bone with fibrous tissue that contains varying amounts of mineralized material (bone, cementum, or both).

Clinical Presentation

- Commonly occurring in the posterior region of the mandible,
- Occurs mainly in females of African origin aged between 40 and 50 years.

Three main types:

a) Periapical
b) Focal and
c) Florid.

- Periapical type is usually seen in the anterior mandible,
- Focal type is usually involving single teeth in the posterior mandible
- Florid type is seen all quadrants but mainly in the posterior part of the mandible.
- Generally symptomless and are incidentally diagnosed during routine radiographic examinations.

Investigations

Radiographically ranging from radioluscencies, mixed radioluscent-radioopaque, and completely radiopaque lesions.

Non-Pharmacological Management

- They are only treated when they produce symptoms, interfere with other dental treatments or when infected.
- When surgery is indicated, complete enucleation is necessary.

Pharmacological Management

Management is similar to chronic osteomyelitis above

16.28.2.1 Odontoma (Compound and Complex)

This is a developmental malformation made up of enamel, dentin, cementum, and pulp (odontogenic tissues) and is considered a hamartoma. It is the most common odontogenic tumours.

Clinical Presentation

- Normally discovered incidentally during routine dental examinations or radiographs
- Missing eruption of the permanent tooth
- They can occur anywhere in the jaws but mainly in the anterior maxilla (compound) and posterior mandible (complex).
- Vary in size but can grow to huge lesions

Investigation

- Periapical X-ray, OPG, CBCT
- Generally, the lesions appear radiopaque with compound type appears as a collection of tooth-like structures, whereas the complex type appears as a disorganized mass of dental tissues.

Management

Surgical (Enucleation)

16.28.3 Non-Odontogenic Benign Tumours

16.28.3.1 Pregnancy Tumours (also called pyogenic granuloma)

Clinical Presentation

- Not a true tumour, but rather a rapid over growth of tissue in response to local irritation.
- They most commonly appear after first trimester, grow rapidly, and typically regress after delivery.
- Found on the gingiva mainly in between the teeth. Occasionally can occur on the tongue, lips and palate.
- They are exophytic, lobulated, or smooth surfaced lesion with a red to purplish color and a soft, spongy texture and easily bleed

Non-Pharmacological Management

- Surgical intervention is often not required. However, pregnancy tumors can be removed during the second trimester if they interfere with occlusion, are painful, bleed excessively, or are excessively large. Lesions excised during pregnancy often recur.
- After delivery, pregnancy tumors typically recede spontaneously but excision may be necessary for those cases which persist.

Note: Other non- odontogenic tumors are Osteomas, Myxomas, Chondromas, Central giant cell and Fibro-osteoma.

16.28.4 Benign Soft Tissues Non-Odontogenic Tumours

16.28.4.1 Head and Neck Vascular lesions (Vascular anomalies)

These are a group of disorders involving abnormal development or growth of blood vessels (arteries, veins, capillaries) or lymphatic vessels. Classified into two main groups hemangiomas and vascular malformations

Clinical Presentation

S/N	Feature	Hemangioma	Vascular Malformation
1	Time of Presentation	Present at birth; most diagnosed by 1 year of age	Present at birth but often not diagnosed until second decade
2	Growth Pattern	Rapid growth up to 6–8 months, then slows and involutes by 5–9 years	Slow growth throughout life; increases with infection, trauma, or hormonal changes; does not involute
3	Pathophysiology	Neoplastic growth with increased endothelial cell turnover	Growth due to abnormal flow dynamics and recruitment of collateral vessels
4	Osseous Involvement	Rare	Common (~35%)
5	Sex Distribution	Female-to-male ratio ≈ 5:1	Female-to-male ratio ≈ 2:1
6	Flow Characteristics	Usually low-flow lesion	May be low-flow (capillary, venous, lymphatic) or high-flow (arterial or arteriovenous)

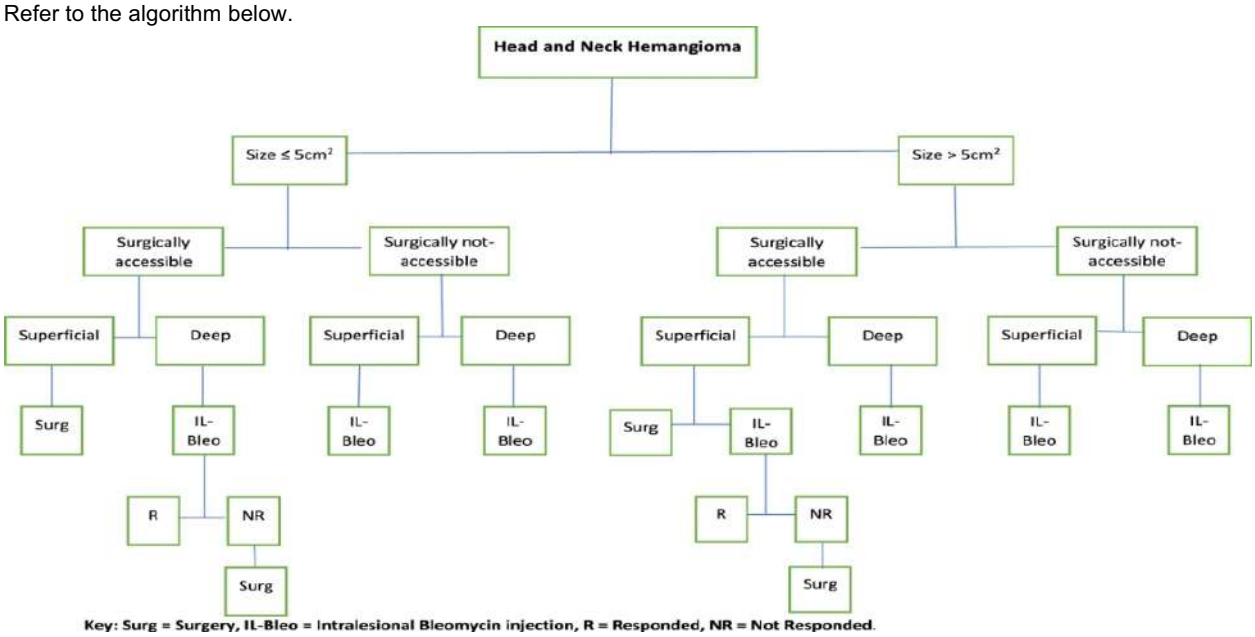
Investigations:

- US ultrasound,
- CDUS color Doppler ultrasound,
- MRI magnetic resonance imaging

Management

Currently, various medical and surgical options are available for the treatment of hemangiomas. In Tanzania we recommend Intralesional bleomycin injections (IL-Bleo) under Ultrasound guidance as the management of choice of head and neck hemangiomas.

Refer to the algorithm below.



16.28.5 Malignant Soft and Bone Tumours

16.28.5.1 Oral squamous cell carcinoma

Clinical Presentation

- A sore in the mouth that does not heal (most common symptom).
- Pain in the mouth.
- Persistent lump or thickening of mucosa in the cheek.
- Persistent white or red patch on the tongue, gums, tonsils, or lining of the mouth.
- Difficult moving jaw or tongue.
- Difficult chewing or swallowing.
- Enlarged cervical lymph nodes may be present

Note: Take a tissue biopsy of the lesion and send for histopathology investigation or refer the patient as early as possible to a center where there is oral and maxillofacial surgeon and Histopathology unit.

Management

- Depending on the stage of tumor, management include; wide tumour excision (stage I, II, and III) and neck dissection followed by radiotherapy or chemotherapy.
- For stage IV tumor; depending with general condition of the patient, management may range from palliative chemotherapy or radiotherapy or radio-chemotherapy.

16.28.5.2 Oral Kaposi's Sarcoma

Oral Kaposi's Sarcoma (OKS) is a malignant angioproliferative tumour of endothelial origin involving the oral cavity. It is caused by infection with Human Herpesvirus 8 (HHV-8).
It commonly occurs in the context of advanced HIV-related immunodepression and may represent the first manifestation of HIV infection.

Clinical Presentation

- slow- to fast-growing masses
- May appear as ecchymotic patches, nodular, and exophytic lesions presenting a color that can vary from dark reddish to purplish blue
- Most frequently affected intra-oral sites are the hard-palatal mucosa and the gingiva
- Size of the lesions varies from few millimeters to some centimeters and the growing of multiple lesions could lead to large, confluent masses involving an entire area of the oral cavity

Management.
Local surgery and highly active antiretroviral therapy (HAART) are considered keystones in the management of epidemic KS

Note: For detailed management of KS please refer to the malignancy on chapter twenty-two

16.28.5.3 Lymphomas

These are group of neoplasms of varying degrees of malignancy which are derived from B-cells of lymphoid tissues, the lymphocytes and histiocytes in any of their developmental stages.
While lymphoma primarily affects lymph nodes, it can also occur in non-lymph node tissue (tonsils, parotid gland, thyroid gland, tongue, paranasal sinuses, and nasal cavity), this is known as extra nodal lymphoma

Lymphoma is classified as Hodgkin lymphoma and non-Hodgkin lymphoma.
Both types of Lymphoma have similar symptoms which may include but not limited to painless swelling of lymph nodes, fever, Night sweats, Unexplained weight loss, and fatigue

Burkitt's lymphoma (African Jaw Lymphoma)
Burkitt lymphoma is an aggressive non-Hodgkin B-cell lymphoma characterized by rapid tumor growth, frequently affecting the jaw, abdomen, or central nervous system associated with Epstein-Barr virus (EBV).
Three clinical subtypes: endemic, sporadic, and immunodeficiency-related. The endemic form, common in Africa, is linked to malaria and EBV,

Clinical Presentation

- Confined almost exclusively to children between 2–14years of age.
- Rapidly growing tumor mass of the jaws, destroying the bone and causing teeth loosening with extension the maxillary, ethmoid and sphenoid sinuses as well as the orbit.
- Visceral organ involvement may occur.

16.28.6 Malignant Salivary glands tumours

These are malignancies arising from major salivary glands (parotid gland, submandibular gland, sublingual gland) and minor salivary glands of the upper aerodigestive tract.
The most common malignant salivary glands tumours include mucoepidermoid carcinoma (MEC), acinic cell carcinoma (ACC), adenoid cystic carcinoma (AdCC), carcinoma ex-pleomorphic adenoma (CExPA), and adenocarcinoma.

Clinical Presentation.

- Asymptomatic, firm mass with occasional pain and facial paralysis
- Some presents with ulceration

Investigations

- Ultrasound is the first non-invasive option for evaluating major salivary gland tumors
- Computerized tomography (CT)
- Magnetic resonance imaging (MRI)
- Fine needle aspiration cytology (FNAC)
- Open tissue biopsy

Management
Mainstay treatment of salivary gland malignancies is surgery (wide tumour excision and neck dissection) followed by adjuvant chemotherapy and/or radiotherapy.

Note: Diagnostic confirmation is through histopathology; hence, it is emphasized to do early detection and referral to all patients suspected to have head and neck malignancies. (For detailed management of malignant tumors please refer to the malignancy on chapter twenty-two)

16.29 Odontogenic and Non- Odontogenic Cysts

Odontogenic cysts

- A group of jaw cysts that are formed from tissues involved in odontogenesis (tooth development).
- Odontogenic cysts are closed sacs filled with fluid, and have a distinct membrane derived from rests of odontogenic epithelium.

Non-odontogenic jaw cysts

- A group of cysts arising from epithelial remnants of embryonic ducts left behind after embryonal facial and jaw development; they are located deep within the tissues in the region of former epithelial ridges, epithelial walls, and primary facial fissural and cleft structures.
- Some few examples of frequently encountered cysts in the orofacial region are:

16.29.1 Dentigerous cyst

Dentigerous cysts, also called follicular cysts, are slow-growing benign and non-inflammatory odontogenic cysts that are thought to be developmental in origin.

Clinical Presentation

- Uninfected dentigerous cysts are painless and non - tender on palpation.
- Larger cysts cause a marked, smooth, rounded expansion of the bone, which may be reduced to a thin layer of cortical plate.

Investigations

Radiographically, they usually present as a well-defined and unilocular radiolucency surrounding the crown of an unerupted or impacted tooth within the mandible.

16.29.2 Radicular (Apical) cyst

Radicular cyst is an inflammatory jaw cyst originating from epithelial remnants of the periodontal ligament because of inflammation that is generally a consequence of pulp necrosis.
The resulting cyst commonly involves the apex of the affected tooth either by dental caries or trauma.

Investigations

- Take OPG or Skull X-ray, the cysts appear as rounded, radiolucent areas sharply demarcated from normal.
- Apical periodontal cysts are associated with the roots of dead teeth bone by a thin, radiopaque, limiting line of compact or cortical bone.

Non Pharmacological Management

Dental cystectomy under local or general anesthesia.

16.29.3 Globulomaxillary cyst

The globulomaxillary cyst is a cyst that appears between a maxillary lateral incisor and the adjacent canine. It often causes the roots of adjacent teeth to diverge.

Investigations

It exhibits as an "inverted pear-shaped radiolucency" on radiographs, or X-ray films.

Non-Pharmacological Management

Dental cystectomy under local or general anesthesia.

16.29.4 Dermoid Cyst

Dermoid cysts are rare masses of the oral cavity derived from ectodermal elements. They are benign, slow-growing tumors that are typically asymptomatic but cause complications of inflammation or dysphagia, dystonia, and airway encroachment due to mass effects.

Clinical Presentation

- Massive swelling of the floor of the mouth, which had displaced the tongue cranially.
- Painless slowly growing cystic lesion in the sublingual and or submental spaces.
- A dentigerous cyst may be suspected where a tooth is missing from the arch without any history of previous extraction.

Non-Pharmacological Management

Enucleation through an external approach below the mandible or intraorally though an incision in the floor of the mouth.

16.29.5 Ranula Cyst

A mucous extravasation cyst involving a sublingual gland and is a type of mucocele found on the floor of the mouth.

Clinical Presentation

- Translucent, blue, dome-shaped, fluctuant swelling in the tissues of the floor of the mouth.
- The swelling is not fixed, may not show blanching, and is non-painful unless it becomes secondarily infected.
- The usual location is lateral to the midline, which may be used to help distinguish it from a midline dermoid cyst.

Non-Pharmacological Management

Excision of sublingual salivary gland which is affected.

16.30 Management of Oral Conditions during Pregnancy

The oral changes which are seen in pregnancy include gingivitis, gingival hyperplasia, pyogenic granuloma, and salivary changes.

Gastric acid secretion and the reflux of the acid into the oral cavity leads to worsening of enamel erosion, increased caries risk, increased tooth mobility and loss.

For the first trimester (1-12weeks)

During the first trimester, it is recommended that the patients be scheduled to assess their current dental health, to inform them of the changes that they should expect during their pregnancies, and to discuss on how to avoid maternal dental problems that may arise from these changes.

Recommendations

- Educate the patients about the maternal oral changes which occur during pregnancy. Emphasize strict oral hygiene instructions and thereby, plaque control.
- Limit dental treatment to a periodontal prophylaxis, normal filling, and emergency treatments only.
- Avoid routine radiographs.
- They should be used selectively and only whenever they are needed.

For the second trimester (13-24weeks)

- During the second trimester, the organogenesis is complete, and the risk to the fetus is low.
- The mother has also had time to adjust to her pregnancy, and the fetus has not grown to a potentially uncomfortable size that would make it difficult for the mother to remain still for long periods.

Recommendations

- Maintenance of oral hygiene and plaque control.
- It's safe to perform scaling, polishing and curettage if necessary.
- Active oral diseases should be controlled.
- It's safe to perform elective procedures i.e. Root canal, extraction, restorations.
- Avoid routine radiographs. Use selectively and when they are needed.

For the third trimester (25-40weeks)

The fetal growth continues and the focus of the concern now, is the risk to the upcoming birth process and the safety and comfort of the pregnant woman. It is safe to perform a routine dental treatment in the early part of the 3rd trimester.

Recommendations

- Maintenance of oral hygiene and plaque control.
- It's safe to perform scaling, polishing and curettage if necessary.
- Active oral diseases should be controlled.
- It's safe to perform elective procedures.
- The radiograph use should be minimized.
- Procedures should not to be performed after mid time of the third trimester, unless it is emergency or life threatening condition

Note: Pregnancy should not be considered as an absolute reason to deny required dental care. Pregnant patients must be educated about the importance of maintaining good oral hygiene, expected changes in the oral cavity and routine dental visits.

16.31 Temporal Mandibular Disorder and Chronic Orofacial Pain

Temporomandibular disorders (TMD) are disorders of the jaw muscles, temporomandibular joints, and the nerves associated with chronic facial pain.

16.31.1 Temporomandibular Disorders (TMDs)

A collective term embracing several clinical problems that involve the masticatory musculature, the temporomandibular joint and associated structures, or both.

Clinical Presentation

- Facial pain.
- Limitation of jaw motion.
- Clicking on the joint site
- Muscle tenderness and stiffness.
- Along with any number of associated symptoms in the head, face, and neck region.

Investigations

- Plain X-ray of involved joint/ joints.
- Panoramic X-ray
- CBCT or CT scan
- Diagnostic arthroscopy (Intervention Radiology)

Non-Pharmacological Management

Reassurance and counseling

Provide counseling to the patient on the natural history and course of temporomandibular disorders, the role of stress and parafunctional habits such as clenching and grinding of the teeth, the frequency of the problem in the population, and the self-limited nature of the disorder.

Heat application

Application of heat to the sides of the face with a heating pad, hot towel, or hot-water bottle. Vigorous treatment may be achieved with ultrasound or short-wave diathermy heat treatments, which are widely available in physiotherapy units.

Fabrication of Intraoral Occlusal Orthotic Appliances

These devices are worn on the teeth like a retainer or a removable denture and are usually made of processed, hard acrylic.

Physiotherapy

Perform manual manipulation, massage, and ultrasonography, which are helpful in reconditioning and retraining the masticatory and the other cranio-cervical muscles that are usually involved in temporomandibular disorders.

Arthrocentesis

Under Local anesthesia TMJ joint lavage is done through cutaneous needle puncture using 25 to 60ml of lactate Ringer Solution with or without intraarticular injection.

Pharmacological Management

A: amitriptyline (PO) 25mg nocte for 1month.

AND/OR

A: ibuprofen (PO) 400mg stat then 200mg 8hourly 7-14days

OR

C: diclofenac sodium (PO) 50mg 8hourly for 7-14days

OR

D: meloxicam (PO) 7.5-15mg 12hourly-24hourly for 7-14days

Note: Consider concomitant use of gastro protective treatment in patients with preexistent history of peptic ulcers or when giving NSAIDs for a duration of 2 weeks or more

Intra articular injection

D: methylprednisolone (Intra articular) 40mg/ml per day repeat every after 2-12 weeks, maximum of 4injections per year for a duration of 2years.

OR

S: triamcinolone (Intra articular) and 40mg/ml per day repeat every after 2-12 weeks, maximum of 4injections per year for a duration of 2years.

OR

D: betamethasone (Intra articular) 12mg/ml 6mg/ml for small joints per day repeat every after 2-12 weeks, maximum of 4injections per year for a duration of 2years.

AND

A: lidocaine 1% (Intra articular) 1-2mls.

AND

S: hyaluronic acid (Intra articular)16mg once per week for 3 consecutive weeks

Supplements

S: glucosamine sulfate1500mg +chondroitin sulfate 1200mg (FDC) (PO) taken with meal once a day for 3-6months

Surgical management for advanced disease

- TMJ Arthroplasty
- Total joint replacement

16.31.2 Temporomandibular Joint (TMJ) Dislocation.

TMJ dislocation occurs when the mandibular condyle moves out of its normal position in the glenoid fossa of the temporal bone, typically anterior to the articular eminence. It can be unilateral or bilateral and is often painful and distressing for the patient.

Clinical Presentation

- Inability to close the mouth
- Pain in the preauricular area
- Difficulty speaking and swallowing
- Facial asymmetry (especially in unilateral dislocations)
- Mouth stuck in an open position
- Palpable depression in the preauricular area
- Condyle displaced anteriorly and inferiorly

Investigations

- Clinical diagnosis based on history and physical examination
- Plain X-rays (Panoramic or Lateral TMJ view): may help confirm dislocation

Management

- Acute Anterior TMJ Dislocation:
- Manual Reduction (Hippocratic technique)
- Patient seated with head supported
- Provider stands in front, places thumbs over the lower molars (with gauze padding) and fingers under the mandible
- Downward and posterior pressure applied to guide the condyle back into place
- Use sedation (e.g., midazolam, diazepam) or local anesthetic if needed to overcome muscle spasm

Post-reduction care

- Apply a soft bandage (Barton bandage) to limit mouth opening
- Advise soft diet for 1–2 weeks
- Avoid wide mouth opening (yawning, dental procedures)

Note: for chronic TMJ dislocation, or unattended dislocation for more than two weeks, refer the patient to maxillofacial surgeon for surgical reduction.

16.31.3 Chronic Orofacial Pain other than Temporomandibular Disorders

16.31.3.1Trigeminal Neuralgia

A sudden, usually unilateral, severe, brief, stabbing, recurrent pain in the distribution of one or more branches of the fifth cranial nerve.

Clinical Presentation

- Episodes of severe, shooting, or stabbing pain that may feel like an electric shock.
- Spontaneous attacks of pain triggered by things such as touching the face, chewing, speaking, or brushing teeth.
- Pain in areas supplied by the trigeminal nerve, including the cheek, jaw, teeth, gums, lips, or less often the eye and forehead.
- Pain affecting one side of the face at a time

16.31.3.2 Persistent Idiopathic Orofacial Pain (a Typical Facial Pain, a Typical Odontalgia)

A persistent facial pain that does not have the characteristics of the cranial neuralgias and is not attributed to another disorder.

Clinical Presentation

- Poorly localized deep pain that does not follow anatomically defined patterns.
- Patients may have had multiple dental treatments to try and remove the pain.
- There is a female preponderance in the third to fourth decades.

Investigation

- Thorough clinical history and examination
- Take radiographs of the dentition preferable OPG

Non-Pharmacological Management

Irreversible or invasive procedures should not be undertaken on teeth to try and relieve the pain if the clinical picture, vitality testing or radiographic examination would not support the procedure.

Pharmacological Management

A: amitriptyline (PO) 25mg nocte 24hourly for 1month. (Dosage can be adjusted up to 75mg in 24hrs.)

AND

A: carbamazepine (PO) 200mg 24hourly for 1month.Dosage can be adjusted up to 1200mg at the same frequency and duration.

16.31.4 Osteoarthritis and Rheumatoid arthritis of TMJ

For details management of these two conditions, refer a chapter for disease of musculoskeletal system

16.32 Management of Cleft Lip and Palate

A cleft lip is a birth defect where the upper lip fails to form completely, creating a gap that may extend into the nose. It can occur on one side (unilateral) or both sides (bilateral) and may appear as a small notch or a wide opening.
A cleft palate occurs when the tissues that form the roof of the mouth (palate) do not fully come together during fetal development. This results in an opening that can affect the hard palate (the bony front portion) and/or the soft palate (the soft back portion) of the mouth. Cleft palates can occur with or without a cleft lip

Component of Management	Recommended Intervention	Timing/Remarks
1. Multidisciplinary Team Care	• Management should be coordinated by a multidisciplinary cleft team comprising a maxillofacial/plastic surgeon, pediatrician, speech-language pathologist, orthodontist, prosthodontist, endodontist/pediatric dentist, audiologist, psychologist/social worker, nutritionist, and nurse coordinator.	Team approach from diagnosis through adulthood.
2. Prenatal Diagnosis and Counselling	• Antenatal ultrasound may detect cleft lip from 18–20 weeks of gestation. • Provide genetic counselling where indicated. • Counsel parents regarding feeding, treatment plan, prognosis, and recurrence risk.	During pregnancy following diagnosis.
3. Initial Postnatal Care	• Assess feeding ability, airway, associated congenital anomalies/syndromes, and hearing. • Provide feeding support using appropriate feeding techniques and specialized bottles/teats where available. • Manage airway compromise, particularly in Pierre Robin sequence. • Refer early to a specialized cleft team.	Immediately after birth.

Component of Management	Recommended Intervention	Timing/Remarks
4. Surgical Management	Cheiloplasty (Cleft Lip Repair): • Techniques: Millard rotation-advancement, Tennison-Randall, etc. • Goal: Restore normal lip anatomy, function, and symmetry.	Around 3 months of age (Rule of 10s).
	Palatoplasty (Cleft Palate Repair): • Goals: Restore separation of oral and nasal cavities, enable normal speech. • Techniques: Von Langenbeck, Furlow double-opposing Z-plasty, Veau-Wardill-Kilner V-Y	Usually between 9–18 months to facilitate normal speech development.
	Alveolar Bone Grafting: • Purpose: Stabilize maxillary arch, support tooth eruption.	Usually at 7–9 years before eruption of permanent canine teeth.
	Secondary Procedures: • Speech surgeries (e.g., pharyngeal flap, sphincter pharyngoplasty). • Revision surgeries (lip and nose). • Orthognathic surgery (for maxillary advancement in adolescence).	Speech surgery, lip/nasal revision, fistula repair, and orthognathic surgery when indicated.
5. Dental and Orthodontic Care	• Nasoalveolar moulding (NAM) before primary lip repair where expertise is available. • Preventive dental care including oral hygiene instruction and professional fluoride application. • Interceptive orthodontics for arch expansion and tooth alignment. • Comprehensive orthodontic treatment during mixed/permanent dentition. • Prosthodontic rehabilitation (obturators, crowns, implants) when indicated.	Continuous from infancy through adulthood.
6. Speech and Language Therapy	• Early speech and language assessment and therapy following palate repair. Assess and manage velopharyngeal insufficiency.	Begins after palate repair and continues as required.
7. Audiology and Hearing Care	• Regular hearing assessment. • Monitor for otitis media with effusion. • Insert tympanostomy (ventilation) tubes when indicated. • Manage hearing impairment according to severity.	Regular follow-up throughout childhood.
8. Psychosocial Support	• Psychological assessment and counselling. • Family education and support. • Promote school and community integration and address self-esteem and body image concerns.	Throughout childhood and adolescence.
9. Long-Term Follow-Up	• Regular follow-up to monitor facial growth, dental development, speech, hearing, nutrition, psychosocial wellbeing, and need for additional surgical or rehabilitative interventions.	Continue into adolescence and adulthood.
10. Public Health Measures	• Promote early detection and timely referral. • Strengthen community awareness and health worker training. • Facilitate access to comprehensive cleft care through national referral systems and financial protection mechanisms.	Ongoing health system intervention.

16.33 Systemic Diseases Associated with Dental Conditions

Disease	Oral Presentation / Signs / Symptoms	Management in Dental Settings
Diabetes Mellitus	• Xerostomia • Increased dental caries • Periodontal disease (early onset, severe) • Delayed wound healing • Oral candidiasis	• Monitor blood glucose pre-treatment (ideally <180 mg/dL) • Short morning appointments after meals • Consider antibiotics if poorly controlled • Emphasize oral hygiene and regular dental visits • Defer invasive procedures if uncontrolled (HbA1c >8%)
Cardiovascular Diseases (e.g., Hypertension, Angina, Heart Failure)	• Gingival hyperplasia (e.g., calcium channel blockers like nifedipine) • Bleeding tendencies • Palpitations during treatment	• Limit epinephrine in local anaesthesia (especially in hypertension) • Monitor blood pressure • Avoid treatment in unstable angina or recent MI (<6 months) • Avoid NSAIDs in patients on anticoagulants • Adjust chair positioning (heart failure)
HIV/AIDS	• Oral candidiasis (thrush) • Hairy leukoplakia • Kaposi sarcoma • Linear gingival erythema • Necrotizing ulcerative periodontitis (NUP) • Xerostomia	• Standard infection prevention and control (IPC) • Prompt treatment of opportunistic infections • Antifungal therapy as indicated • Regular periodontal care • Coordinate with physician (CD4 count, viral load)
Hematologic Disorders (e.g., Anemia, Leukemia)	• Pale mucosa (anemia) • Glossitis, angular cheilitis • Gingival bleeding, ulcerations, petechiae, enlargement (leukemia)	• Avoid invasive procedures if platelet count <50,000/µL • Pre-operative blood tests • Gentle oral hygiene practices • Consult physician/hematologist
Gastrointestinal Disorders (e.g., Crohn's disease, Ulcerative colitis, GERD)	• Aphthous-like ulcers (Crohn's) • Mucosal tags, cobblestoning (Crohn's) • Enamel erosion (GERD) • Halitosis	• Topical corticosteroids for ulcers • Fluoride therapy for enamel erosion • Avoid NSAIDs in IBD • Dietary advice and stress management
Chronic Kidney Disease (CKD)	• Uremic breath (ammonia-like) • Xerostomia • Enamel hypoplasia • Bone changes (renal osteodystrophy) • Increased bleeding risk	• Avoid nephrotoxic drugs (e.g., NSAIDs, tetracyclines) • Monitor bleeding status • Schedule on non-dialysis days • Consider antibiotic prophylaxis (if AV shunt present)
Liver Disease(e.g., Hepatitis, Cirrhosis)	• Jaundice (yellow mucosa) • Prolonged bleeding • Glossitis, angular cheilitis • Fetor hepaticus	• Avoid hepatotoxic drugs (e.g., high-dose paracetamol, some antibiotics) • Assess coagulation (INR/PT) • Minimize invasive procedures • Strict infection control
Autoimmune Diseases (e.g., Sjögren's syndrome, SLE, Rheumatoid arthritis)	• Severe xerostomia (Sjögren's) • Oral ulcers (SLE) • TMJ involvement (RA) • Increased risk of caries and candidiasis	• Saliva substitutes; consider pilocarpine • Regular fluoride application • Gentle oral hygiene instruction • Monitor effects of immunosuppressive therapy

CHAPTER SEVENTEEN
MUSCULOSKELETAL DISORDERS

17.1 Infections

17.1.1 Osteomyelitis

Osteomyelitis is an infection of the bone or bone marrow caused by pyogenic bacteria or mycobacteria or fungi. This condition is most common in children under 12 years. Staphylococci aureus are the most frequent responsible organisms. In patients with sickle cell disease Salmonella species become more common pathogens than in healthy hosts. Can be classified as acute or chronic depending on duration of symptoms.

17.1.1.1 Acute osteomyelitis

Clinical Presentation

- Fever, malaise severe pain at the site of infection, fatigue, irritability, restriction of movement (pseudo paralysis of limb in neonates) local edema, erythema, and tenderness
- A history of recent trauma, surgery, or infection of another organ If the infection is close to a joint there may be a 'sympathetic' effusion or concomitant septic arthritis.

Note: Risk Factor: Poor social economic status, immunosuppression and malnutrition

Investigations

- Total and differential White Blood Cell count
- Erythrocyte sedimentation Rate
- C-Reactive protein
- Urinalysis
- Urine for Culture and Sensitivity
- Blood for culture and Sensitivity
- Aspirated pus\ for culture and sensitivity
- Bone and or deep tissues for Culture and sensitivity
- Polymerase Chain Reaction (PCR) for special case like *Kingella kingae* species
- Bone Scan using Technetium –99in acute infection
- Ultrasound
- Plain X – ray
- CT scan in complex anatomical regions like shoulder, pelvic, spine

Pharmacological Management

- Polymerase Chain Reaction (PCR) for special case like Kingella kingae species
- Bone Scan using Technetium –99in acute infection
- Ultrasound
- Plain X – ray
- CT scan in complex anatomical regions like shoulder, pelvic, spine

Should start empirically, then changed according to culture and sensitivity results
B: ampicillin + cloxacillin (FDC) (IV)1–2g 6hourly then oral until CRP and x ray become negative.
OR
S: ceftriaxone+ sulbactam (FDC)(IV)1.5gm 12hourly for 2weeks
THEN
B: amoxicillin + clavulanic acid (FDC)(PO) 625mg 8-12hourly for 4weeks.

Patients with penicillin allergy consider.
S: clindamycin (IV) 60mg 6hourly for 2 weeks then orally to complete 4- 6weeks
AND
C: ciprofloxacin (IV)400mg12hourly for 2 weeks then orally to complete 4-6weeks

For sickle cell patients if salmonella spp. is suspected, consider
C: Ciprofloxacin (IV) 400mg 12hourly for 4weeks, you may change to oral after 2weeks

Surgical treatment
Surgical drainage and bone drilling or window recommended in all cases presenting with history lasting > 24 hours,

17.1.1.2 Chronic osteomyelitis

Clinical Presentation
A patient with a history of osteomyelitis who is experiencing a recurrence of pain, erythema, and swelling in association with or without pus draining sinus

Investigations
- Total and differential White Blood Cell count
- Erythrocyte sedimentation Rate
- C-Reactive protein
- Stop antibiotics for two weeks before bone biopsy for culture and sensitivity
- Polymerase Chain Reaction (PCR) for special case like Kingella kingae species
- Bone Scan using Technetium–99in acute infection
- Plain X-ray
- CT scan in complex anatomical regions like shoulder, pelvic, spin

Pharmacological Management
C: amoxicillin + clavulanic acid (FDC)(IV) 1.2g 12hourly for 2weeks then oral 625mg 8-12hourly for 4-6weeks
AND/OR
S: antibiotic beads (Gentamicin/ Vancomycin in calcium sulphate/ phosphate beads or bone cement beads)

Surgical treatment
- Extensive Surgical Pus drainage, debridement of all devitalized tissue and dead bone, dead space filled with antibiotic beads or bone cement spacer for later bone reconstruction surgical procedure.
- Procedure like Sequestrectomy, Saucerization and bone resection
- Skeletal stability is achieved by External fixation as temporally or definitive procedure
- Reconstruction procedure is done after eradication of infection depending on the size of the defect, these include:
  - Shortening for small defects
  - Bone graft for small defects up to 2 cm
  - Mascullate procedure up to 2 to 8cm defect
  - Bone transfer Or Bone transport for bigger defects

Antibiotics cement mixture
S: vancomycin at a dosage of 1–4g per 40g of cement
AND/OR
B: gentamicin 80 to 160mg per 40g of cement

17.1.2 Septic Arthritis

Inflammation of a synovial membrane with purulent effusion into the joint capsule, often due to bacterial infection, but can be caused by fungi and mycobacteria species. If not treated within 24 to 48hours may cause irreversible joint erosion, septicemia and can even be fatal.

Clinical Presentation
As for acute osteomyelitis however this time sign and symptoms will be localized around the affected joint (refers Kocher's criteria in standard text book for clinical diagnosis)

Pharmacological Management
Treat like acute osteomyelitis

Surgical drainage
- Open surgery – incision and drainage followed by meticulous irrigation
- Arthroscopic joint drainage, debridement and washout with copious amount of normal saline

17.1.3 Gonococcal Arthritis

Pharmacological Management
A: benzylpenicillin (IV) 2.5–5 MU 6hourly for 7days
AND
D: ceftriaxone + Sulbactam (IV) 1.5g 24hourly for 7days
OR
S: cefepime (IV) 2g 12hourly for 7days

Note
- Adjust treatment basing on culture and sensitivity results.
- Repeat serial CRP, FBP, ESR starting 48hrs after initiation of appropriate treatment until normalize

Surgical drainage
- Open surgery- i.e., incision, drainage and irrigation with copious amount of Saline
- Arthroscopic joint drainage, debridement and joint washout with copious amount of normal saline

17.1.4 Fracture related infections (FRI)

This is a surgical site infection post-surgical treatment of fracture. It occurs more frequent in open fractures, can be early or late infection and can occur in unhealed or healed fracture

Clinical Presentation of FRIs

- Pain
- Loss of ROM
- Swelling
- Local warmth
- Signs-sinus, effusion, wound erythema
- X rays –periosteal reaction, subchondral bone resorption

Non-Pharmacological Management

- Rest and splintage of affected joint for 48hrs
- Nutritional support
- Addressing the predisposing condition
- Physiotherapy to improve range of motion of nearby joint

Pharmacological Management

Should be guided by results of culture and sensitivity, but initially broad-spectrum antibiotic.
C: amoxicillin + clavulanic acid (FDC)(IV)1.2g12hourly until the result for C/S are out then change accordingly.

Stage 1: Extensive surgical debridement, remove metal implant and replace with external fixation, traction or orthotics, use antibiotic beads/ antibiotic impregnated bone cement to deliver high concentration of local antibiotics

Stage2: Revision surgery once CRP and other inflammatory marker become negative

17.1.5 Prosthetic joint Infection (PJI)

Surgical site infection following arthroplasty surgery. Can be Early or late PJI. Early is infection within <4/52 post-surgery and Late PJI is infection occurring >4/52

Clinical Presentation

- Pain
- Loss of ROM
- Swelling
- Local warmth
- Signs- sinus, effusion, wound erythema
- X rays –periosteal reaction, subchondral bone resorption

Investigations

- Total and differential White Blood Cell count
- Erythrocyte sedimentation Rate
- C-reactive protein
- Aspirated pus for culture and sensitivity
- Synovial, Bone or deep tissues for Culture and sensitivity
- Bone Scan using Technetium–99 in acute infection
- Plain X-ray
- CT scan in complex anatomical regions like shoulder, pelvic, spine
- Magnetic Resonance Imaging (MRI) in Acute Stage

Non-Pharmacological Management

Hydration**,** Walking aid in case of pathological fracture.

Pharmacological Management

Start empirical treatment while awaiting culture and sensitivity results, adjust drug according to laboratory results, and continue treatment until CRP become negative.

S: ceftriaxone + sulbactam (IV) 1.5g 24hourly for 6weeks
OR
S: Clindamycin (IV) 600mg 8hourly for 6weeks
AND/OR
D: ceftazidime (IV) 2g 12hourly for 6weeks
OR
S: meropenem (IV) 500mg to1g 8hourly for 6 weeks
Guided by results of culture and sensitivity results

Antipyretic for fever and analgesics for pain

Indication	Medicine	Dose & Frequency	Route	Comments
Fever / Mild Pain (First-line)	**A:** paracetamol	Adults: 1 g 6–8 hourly Children: 10–15 mg/kg 6–8 hourly	PO/IV	Preferred antipyretic; safe in most patients
	OR			
Mild–Moderate Pain	**A:** ibuprofen	Adults: 400 mg 8 hourly	PO	Avoid in renal impairment, peptic ulcer disease, or high bleeding risk
	OR			
	A: diclofenac	Adults: 50 mg 8–12 hourly	PO/IM	Use lowest effective dose; caution in CVD/renal disease
	OR			
	B: tramadol	Adults: 50–100 mg 6–8 hourly	PO/IV	Monitor for dizziness, nausea
Severe Pain	**OR**			
	C: morphine	Adults: 2.5–10 mg IV every 2–4 hours (titrate)	IV	For severe pain; monitor respiratory status
	OR			
	B: pethidine	Adults: 50–100 mg 4–6 hourly	IM/IV	Less preferred (risk of toxicity)

Surgical treatment

Early infection: Aggressive debridement of all infected tissues, irrigation with NS and replace polyethylene liner, then IV antibiotics for 6 weeks based on culture and sensitivity results

For late infection: staged treatment protocol

Stage1: Removal of prosthesis and replace with cement spacer or antibiotics for 6/52 . The first stage can be repeated until infection is eradicated.

Stage 2: Use of cement in re implantation and use -stemmed /revision or tumor components (Prosthesis) Joint arthrodesis when it is impossible to do second stage surgery (salvage procedure)

17.1.6 Tropical Pyomyositis

This is a condition whereby there is pyogenic infection of large muscle/muscles with extensive necrosis of the involved muscle. This condition occurs more commonly in the tropics, affecting immunocompromised individual than normal individual. The cause is uncertain since abscess multiple pockets explored early are sterile but later culture of the pus usually yields Staphylococcus aureus.

Clinical Presentation
Fever and painful induration/fluctuation of one or more of the large muscles, mostly in the lower extremities

Investigations

- Complete blood count (CBC)
- Erythrocyte sedimentation rate (ESR
- C–Reactive Protein test (CRP)
- Ultrasound
- Plain X-ray
- Muscle biopsy for culture and sensitivity

Pharmacological Management
High level facilities treatment should be guided C/S results

B: amoxicillin + clavulanic acid (FDC) (PO) 1g 12hourly for 7 -14 days
OR
A: erythromycin (PO) 500mg 6-8 hourly for 7-14days
OR
D: ceftriaxone + sulbactam (IV)1.5g 12hourly for 7-14days
OR
S: clindamycin (IV) 600mg 8hourly for 7days
OR
S: vancomycin (IV) 1g 12hourly for 7days

Surgical treatment
Incision and drainage and irrigation with copious amount of saline

17.1.7 Necrotizing Fasciitis

Life threatening progressive rapidly spreading inflammatory infection located in deep fascia, most commonly caused by Streptococcus species or polymicrobial

Clinical Presentation

- Early Sign and symptoms mimic acute osteomyelitis.
- Foul smelling discharge
- Late-stage multiple discoloration develops a large of gangrenous skin
- Presence of features of toxic shock

Investigations

- Complete blood count (CBC)
- Erythrocyte sedimentation rate (ESR
- C–Reactive Protein test (CRP)
- Ultrasound
- Plain X-ray
- Muscle biopsy for culture and sensitivity

Non-Pharmacological Management

- Hydration
- Rest
- Nutritional support
- Addressing the predisposing condition
- Physiotherapy to improve range of motion of nearby joint

Pharmacological Management

A: gentamicin (IV) 80mg 8hourly for 7 days

AND

B: chloramphenicol (IV) 500mg 6hourly for 7-10days +/- S: Clindamycin (IV) 600mg 8hourly for 7-10days

Alternatively

A: benzathine benzylpenicillin (IV) 2-4 MU 6hourly for 7days

AND

S: clindamycin (IV) 600mg 8hourly +/- C: ciprofloxacin 400mg (IV) 8hourly for 7days

Alternatively

A: benzathine benzylpenicillin (IV) 2-4MU 6hourly for 7days

AND

S: clindamycin 600mg (IV) 8hourly for 7days

OR

S: vancomycin 1g 12hourly for 7days

Antipyretic for fever and Analgesics for pain

Indication	Medicine	Dose & Frequency	Route	Comments
Fever / Mild Pain (First-line)	**A:** paracetamol	Adults: 1 g 6–8 hourly Children: 10–15 mg/kg 6–8 hourly	PO/IV	Preferred antipyretic; safe in most patients
	OR			
Mild–Moderate Pain	**A:** ibuprofen	Adults: 400 mg 8 hourly	PO	Avoid in renal impairment, peptic ulcer disease, or high bleeding risk
	OR			
	A: diclofenac	Adults: 50 mg 8–12 hourly	PO/IM	Use lowest effective dose; caution in CVD/renal disease
	OR			
	B: tramadol	Adults: 50–100 mg 6–8 hourly	PO/IV	Monitor for dizziness, nausea
Severe Pain	**OR**			
	C: morphine	Adults: 2.5–10 mg IV every 2–4 hours (titrate)	IV	For severe pain; monitor respiratory status
	OR			
	B: pethidine	Adults: 50–100 mg 4–6 hourly	IM/IV	Less preferred (risk of toxicity)

Surgical treatment

- Serial extensive surgical debridement,
- Skin grafting once the wound granulates with no sign of infection

17.2 Inflammatory condition

There are group of diverse inflammatory conditions due to different causes which affects joints and other musculoskeletal tissue

17.2.1 Osteoarthritis

It is a common form of arthritis, characterized by degenerative loss of articular cartilage, subchondral bony sclerosis, and cartilage and bone proliferation subsequent osteophyte formation. Gradual onset of one or more joints may be involved.

Clinical Presentation

Pain is the commonest symptom**;** Specific clinical features depend on the joint involved e.g. enlargement of distal interphalangeal joint (Bouchard's nodes).

Investigation

- Plain X-ray of involved joints
- CT scan
- MRI scan

Non-Pharmacological Management

- Diagnostic arthroscopy
- Synovial fluid analysis
- Rest the Joint
- Use crutches or walker to protect weight bearing joints in severe cases
- Crepe bandage or braces also can be worn during the active phase of disease
- Reduction of weight in obese patients
- Physiotherapy exercises

Pharmacological Management

A: ibuprofen (PO) 400mg stat then 200mg 8hourly 7-14days

OR

C: diclofenac sodium (PO) 50mg 8hourly for 7-14days

OR

D: meloxicam (PO) 7.5-15mg 12hourly - 24hourly for 7-14days

OR

S: dexketoprofen (PO) 12.5mg 4–6hourly or 25mg 8hourly for 7 -14days

AND/OR

B: tramadol (PO) 50mg 8hourly for 7-14days

OR

D: tramadol (37.5) + paracetamol 325mg (PO) 8hourly for 7 to 14days

OR

A: ibuprofen + paracetamol (PO) 900mg 8hourly for 7 to 14days

AND

A: prednisolone (PO)5-10mg 24hourly for 5-7days

Topical non – steroid anti- inflammatory drugs

A: diclofenac gel 12hourly for 2weeks

OR

S: ketoprofen gel12hourly for 14 days

Note: Co-administer proton pump inhibitors as gastroprotection when prescribing NSAIDs, in patients with gastritis, history of peptic ulcer disease, or high GI risk factors.

A: omeprazole (PO) 20mg 24hourly

OR

C: pantoprazole (PO) 40mg 24hourly

OR

S: esomeprazole 40mg 24 hourly 14 - 30 days

Intra articular injection

Intra-articular corticosteroids Consider in cases where a joint is actively inflamed. To be prescribed and administered by a specialist only. Not more than 2–3 injections per year per joint are recommended. Intra-articular corticosteroid.

D: methylprednisolone (Intra articular) 80mg for large joint and 20 - 40mg for small joints 24hourly repeat every after 2-12weeks, maximum of 4 injections per year for a duration of 2years.

OR

S: triamcinolone (Intra articular) 80mg/ml for large joint and 40mg/ml for small joints 24hourly repeat every after 2-12 weeks, maximum of 4 injections per year for a duration of 2years.

OR

D: betamethasone (Intraarticular) 12mg/ml for large joint and 6mg/ml for small joints 24hourly repeat every after 2-12weeks, maximum of 4 injections per year for a duration of 2years.

AND

A : lidocaine 1% 1-2mls.

AND

S: Hyaluronic acid (Intra articular) 16mg once per week for 3 consecutive weeks

Supplements

S: glucosamine sulfate1500mg + chondroitin sulfate 1200mg (FDC)(PO) taken with meal once a day for 3-6 months

Surgical treatment for advanced disease

- Corrective Osteotomy for angular deformities around the weight bearing joint like knee, ankle or hip
- Arthroscopic debridement of the joint.
- Total joint replacement (Total Knee replacement, Total Hip replacement, Total or/ reverse shoulder replacement
- Joint fusion/arthrodesis for limb salvage
- Excisional arthroplasty

17.2.2 Heterotopic Ossification

Heterotopic ossification is defined as bone formation in non-osseous tissues. Usually occurs in trauma such as fractures and surgical procedures, the exact cause remains unknown.

Clinical Presentation

- Pain and reduced ROM following trauma or post-surgical intervention.
- Swelling and tenderness, which can mimic a low – grade infection.
- Bone in soft tissue starts to appear on plain radiographs 4 to 6weeks after the trauma/surgery

Pharmacological Management

A: indomethacin (PO) 75-150mg per day in single daily dose or divided dose 12hrly

OR

A: ibuprofen (PO) 200 – 400mg 8hourly

Post-surgical treatment

A: indomethacin (PO) 75mg to 150mg 24hourly for 6 weeks to prevent recurrence

Surgical treatment

- Surgery is delayed for 6 months after the initial trauma/surgery to allow the bone to mature and a distinct fibrous capsule to develop.
- Provide low dose radiotherapy Post surgery

17.2.3 Tendinopathies

These are clinical syndrome characterized by chronic, localized tendon pain exacerbated by mechanical loading. Caused mostly by tendon overuse and metabolic factors. Classified as Acute or Chronic.

Clinical Presentation

- Pain with palpation of the affected part
- Kinetic chain changes (muscle weakness, abnormal movement patterns or joint stiffness)
- Pain during tendon loading which may be also referred pain.
- Muscle spasm

Investigations

- MRI for tendinopathy involving deep tendon like around the shoulder joint
- Ultrasound scan (grey scale or colour Doppler USS)
- Plain X-ray

Non-Pharmacological Management

- Physiotherapy (active exercise, stretching)
- Activity modification
- Correction of any biomechanical faults
- Joint mobilization and friction(massage).
- Reduction of aggravating activities
- Ice, heat (chronic tendinopathy)

Pharmacological Management

Pain management in acute state as needed

A: ibuprofen (PO) 400mg stat then 200mg 8hourly for 7-14days

OR

C: diclofenac sodium (PO) 50mg 8hourly for 7-14days

OR

D: meloxicam (PO) 7.5-15mg 12-24hourly for7-14days

OR

D: tramadol 37.5mg + paracetamol 325mg (PO) 8hourly for7-14days

OR

A: paracetamol 500mg+ ibuprofen 400mg (PO) 8hourly for 7-14days

Topical analgesics can be added in combination with oral medications in cases of severe pain,
A: diclofenac gel applies 12hourly
OR
S: ketoprofen gel apply12hourly

For patient with gastritis or peptic ulcer disease use Proton pump inhibitors in combination with above medications
A: omeprazole 20mg 24 hourly for 2 weeks or more
OR
C: pantoprazole 40 mg 24 hourly for 2 weeks or more

Corticosteroid Therapy
A: prednisolone (PO) 40mg 24 hourly for 3 days then taper down over 2-4weeks
OR
D: betamethasone (Intralesional) 12mg 24hourly; repeat every after 2-12 weeks, maximum of 4 injections per year for a duration of 2years.
OR
S: triamcinolone 40mg per injection site once weekly not to exceed 40mg/day maximum of 3 injections in one year at interval of 1-3 weeks between injections.
OR
D: methylprednisolone (Intralesional) 20-80mg stat (maximum 3-4 injections per year)

Surgery
When no improvement after 6 months of combined physiotherapy and medical treatment. Open surgery or arthroscopic surgery surgical debridement, and or tendon transfer can be done.

17.2.4 Plantar Fasciitis

Planter Fasciitis is a degenerative disease of plantar fascia probably due to overuse or trauma that leads to micro tears. Depending on duration of symptoms it can be acute 4-6 weeks, subacute 6-12 weeks and chronic >12weeks with/without refractory.

Clinical Presentation
- Pain in the medial side of the heel, most noticeable with initial steps after a period of inactivity
- Paresthesia
- Tightness of Achilles tendon

Investigations
- Plain X-ray
- Ultrasound
- Nerve conduction and Electromyographic studies
- MRI in chronic with refractory.

Non-Pharmacological Management
- Weight reduction
- Rest and activity modification
- Stretching/massage
- Ice
- Night splints
- Custom orthotics (for client with Pes cavus or planus)
- Extra corporeal shock wave therapy (ESWT) (for subacute and chronic)

Pharmacological Management
Pain management in acute state
A: ibuprofen (PO) 400mg stat then 200mg 8 hourly
OR
C: diclofenac sodium (PO) 50mg 8hourly for 7-14days
OR
D: meloxicam (PO)7.5-15mg 12-24hourly for 7-14days
OR
A: ibuprofen and paracetamol (FDC) (PO) 900mg 8hourly for 14days
AND

Topical analgesics can be added in cases of severe pain,
A: diclofenac gel apply 12hourly
OR
S: ketoprofen gel apply 12hourly

Proton pump inhibitors
A: omeprazole 20mg 24 hourly for 2 weeks or more
OR
C: pantoprazole 40 mg 24 hourly for 2 weeks or more
AND
Corticosteroid Therapy
A: prednisolone (PO) 40mg 24 hourly for 3 days then taper down over 2-4 weeks
OR
S: triamcinolone per injection site 40 mg once weekly not to exceed 40mg/day repeat every after 2 to 12 weeks, maximum of 4 injections per year for a duration of 2 years
OR
D: betamethasone (Intralesional) 12mg 24hourly; repeat every after 2-12 weeks, maximum of 4 injections per year for a duration of 2years

Surgery
- Open partial plantar fascia release with simultaneous release of first branch of lateral plantar nerve
  or
- Endoscopic partial plantar fascia release

17.3 Metabolic Bone Diseases

17.3.1 Osteoporosis and Brittle Bone Diseases

Disease which is characterized by low bone mass, microtextural disruption and skeletal fragility and it has no clinical manifestation until there is a fracture. Contrary to Brittle bone disease which are inheritable with many different phenotypic presentations, however medication for the treatment of these two diseases are more or less similar.

Clinical Presentation

- Bone pain
- Presence of fragility fracture (spine, hip, wrist, humerus, ribs and pelvis)
- Family history of osteoporotic fracture

Investigations

- Complete blood count
- Dual-energy X-ray Absorptiometry (DEXA) to measure spine and hip bone density as reference point
- Serum25-hydroxyvitaminD,
- Serum Calcium

Diagnostic criteria

Table 17.1 T-score chart based on the mineral density measurement by DEXA. Osteoporosis is diagnosed when a person's BMD is equal to or more than 2.5 standard deviations below this reference measurement.

Status	Hip BMD
Normal	T- score of-1 or above
Osteopenia	T-score lower than -1 and greater than-2.5
Osteoporosis	T-score of - 2.5 or lower
Severe osteoporosis	T-score of - 2.5 or lower, and presence of at least one fragility fracture

Non-Pharmacological Managements

- Fall prevention.
- Diet containing Calcium and vitamin D.
- Exercise
- Cessation of smoking
- Exposure to sunlight

Pharmacological Management

Pain management

A: ibuprofen (PO) 200mg to 400mg 8 to 12 hourly for 7 to 14 days

OR

D: meloxicam 7.5-15mg (PO)12hourly to 24hourly for7-14days

AND/OR

Topical analgesics can be added in cases of severe pain,

A: diclofenac gel applies12hourly

OR

S: ketoprofen gel apply 12hourly

AND

Proton pump inhibitors

A: omeprazole 20mg 24hourly for 2weeks or more

OR

C: pantoprazole 40mg 24hourly for 2weeks or more

AND

Calcium and vitamin D supplementation

C: calcium 600mg + Vitamin D 800 IU (PO) 24 hourly for 3 months then re-evaluate

AND

Bisphosphonate treatment should be given for a period of five years.

S: ibandronate (IV) 3mg every 3 months administered over 15-20minutes (treatment only)

OR

S: zoledronic acid 4mg (IV) yearly for 5 years

17.3.2 Hypocholecalciferolemia (Vitamin D Deficiency)

This disease is characterized by hypocalcemia and or hypophosphatemia. The acceptable concentration of Vitamin D is between 30-60ng/Ml.

Clinical Presentation

In children

- Bone pain or tenderness, muscle weakness (rickety myopathy or "floppy baby syndrome"
- Increased tendency for fractures
- Skeletal deformity i.e Genu varum, Genu Valgum, Cranial, spinal, and pelvic deformities
- Growth disturbance
- Tetany, Craniotabes, Costochondral swelling "rickety rosary", Harrison's groove
- Double malleoli sign due to metaphyseal hyperplasia
- Widening of wrist raises early suspicion, it is due to metaphysical cartilage hyperplasia

Adult

- Mild cases are generally asymptomatic.
- Bone pain and tenderness.
- Difficulty rising from a sitting position due to muscle weakness
- Bone deformities (osteomalacia)
- Cognitive decline and dementia
- Inadequate dietary and supplemental vitamin D intake

Investigations

- Serum calcium
- Serum25-hydroxyvitaminD, (25(OH)D) levels
- Serum alkaline phosphatase
- Renal function test
- Parathyroid function test
- Dual energy X ray absorptiometry (bone density scan) DEXA
- Fasting serum phosphate

Table17.2 Interpretation of Serum 25-hydroxy vitamin D, (25(OH)D) levels

Status	Endocrine Society Guidelines
Deficient	Below20ng/mL
Insufficient	21-29ng/mL
Sufficient	30-60ng/mL
Ideal	40-60ng/mL
Considered safe	<100ng/Ml

Non-Pharmacological Management

- Sun light exposure
- Bracing
- Protective waking
- Isometric exercises

Pharmacological Management

Children1-18years
C: cholecalciferol 2,000IU 24 hourly for 6weeks
OR
C: cholecalciferol 50,000IU once a week for 6weeks followed by maintenance therapy of 600-1000IU 24 hourly for 3-6months then re-evaluate by measuring serum 25 (OH)D levels

Adults
C: cholecalciferol 6000IU 24 hourly or 50000IU once a week for 8weeks or 6000IU followed by maintenance therapy of 1,500-2,000IU/day.

17.3.3 Osteoporotic Vertebral Compression Fractures (VCFs)

Discussed in Chapter Eight Nervous System Disease Conditions

17.4 Condition which may require Amputation.

Amputation is the surgical removal of part of a limb or extremity such as an arm, leg, foot, hand, toe, or finger. This is the treatment of choice for diseased limbs and devastating extremity injuries for which attempts at salvage and reconstruction may be lengthy, emotionally, and financially costly and have a less than satisfactory results.

Clinical indication

- Trauma most common reason for extremity amputation
- Vascular disease
- Infection
- Metabolic disease
- Tumor
- Congenital anomalies

Goals of amputation

- Preserve functional length
- Prevention of adjacent joint contractures
- Preservation of useful sensibility
- Early prosthetic fitting
- Prevention of symptomatic neuromas
- Early return of patient to work and recreation

17.4.1 Diabetic Foot Ulcers

A common surgical complication in diabetic patients. Ulcers can be secondarily infected by staphylococci, streptococci, coliforms, and anaerobic bacteria which can lead to cellulitis, abscess formation, gangrene, and osteomyelitis.

Clinical Presentation
The three main factors that lead to tissue necrosis in the diabetic foot:-

- Neuropathy
- Infection
- Ischemia

Non-Pharmacological Management

- Metabolic control
- Relieve pressure: non-weight bearing mocking cessation is essential.
- Wound care
- Frequent (e.g., weekly) removal of excess keratin and allow efficient drainage of the lesion.

Pharmacological Management
D: ceftriaxone + sulbactam (IV) 12hourly for 7-10days
AND
B: metronidazole (IV)500mg 8hourly for 7-10days

Change antibiotics depending on culture results
S: piperacillin + tazobactam (IV) 4.5g 6-8 hourly 7-14days (for severe/complicated cases)
OR
S: meropenem (IV) 1g 8 hourly 7-14 days

Surgical treatment
- Surgical debridement
- Amputation depending Wagner's classification

Table17:3 Wagener's Classification for Diabetic Foot Ulcers

Ulcer Grading	Description
GRADE0	No ulcer but high-risk foot
GRADE1	Superficial ulcer
GRADE2	Deep ulcer, no bony involvement or abscess
GRADE3	Abscess with bony involvement (as shown by X- ray)
GRADE4	Localized gangrene e.g. toe, heel etc
GRADE5	Extensive gangrene involving the whole foot
Note: Grade1-3ulcers are termed non – gangrenous ulcers and Grade 4 and 5 ulcers are termed gangrenous ulcers	

17.5 Common Congenital Anomalies of Musculoskeletal System

17.5.1 Talipes equinovarus (congenital clubfoot)

Talipes equinovarus is one of the most common musculoskeletal birth defects affecting approx. 1/1,000 live births. If untreated it causes long-term functional disability. The condition can vary in its degree of severity ranging from quite mild to very severe. It may present with other defects such as spina bifida, arthrogryposis multiplex congenita, congenital myotonic dystrophy, or diastrophic dysplasia.

Clinical Presentation

Birth deformities of the foot with
- Small foot and calf
- Cavus (tight intrinsic muscles)
- Adductus of forefoot (tight tibialis posterior)
- Varus (tight tendo Achilles, tibialis posterior, tibialis anterior)
- Equinus (tight tendoachilles)

Investigations
- Most clinical diagnosis
- Plain X-ray

Management
Non operative management – Ponseti method of serial manipulation and casting,
- The goal is to rotate foot laterally around a fixed talus.
- Order of correction follows acronym (CAVE) 1. Cavus 2. Adductus 3. Varus 4. Equinus.
- Heel cord tenotomy needed in at least 80-90% of children followed by Foot abduction orthosis (FAO) until the child is 4 years old.
- Non noncompliance to FAO is the biggest risk factor for deformity recurrence

Table17:4 Management of Congenital Talipes Equinovarus (Clubfoot) – Ponseti Method

Age/Stage	Intervention	Key Clinical Considerations
Birth to 4 months	Serial manipulation and casting (Ponseti method)	Perform weekly serial casting with the knee flexed to 90°. Correct deformities sequentially: (1) Cavus by supinating the forefoot (avoid pronation); (2) Forefoot adduction and hindfoot varus by abducting the foot around the head of the talus; (3) Equinus corrected last.
Approximately 6–8 weeks (or when indicated)	Percutaneous Achilles tendon tenotomy (TAL)	Required in approximately 80–90% of patients when equinus persists after correction of cavus, adduction, and varus. Perform only when the foot is abducted to at least 60°, the heel is in valgus, and equinus remains. Following tenotomy, apply a cast with the foot in maximum dorsiflexion for 3 weeks.

Age/Stage	Intervention	Key Clinical Considerations
4–8 months (Maintenance phase)	Foot Abduction Orthosis (FAO)	Begin immediately after removal of the post-tenotomy cast. Wear 23 hours/day for the first 3 months, then during sleep (night-time and naps)until 4 years of age. Position affected foot at ≥60° external rotation (normal foot approximately 30° in unilateral cases). The brace should be fitted before tenotomy to allow immediate use after cast removal.
2–5 years (if recurrent dynamic deformity develops)	Tibialis anterior tendon transfer (TATT) ± repeat Achilles tendon lengthening or gastrocnemius recession	Approximately 30–50% of children with recurrent dynamic deformity may require tendon transfer. Indicated in children demonstrating dynamic forefoot supination during gait despite successful initial correction. Repeat Achilles tendon lengthening or gastrocnemius recession may be required if recurrent equinus is present.

Operative management

- Posteromedial soft tissue release and tendon lengthening for children of < 2 years
- Medial column lengthening or lateral column – shortening osteotomy, or cuboid decancellation indicated for children older than 2years
- Talectomy: in severe, rigid recurrent club foot in children between 6-10 years or those with arthrogryposis
- Gradual correction with Ilizarov frame/Tylor Spacial frame or other ring fixators for neglected cases
- Triple arthrodesis for skeletal mature

17.6 Angular Deformity of the limbs

17.6.1 Rickets

Refers to softening and weakening of bones in children, usually due to vitamin D deficiency. Vitamin D promotes the body's absorption of calcium and phosphorus. Extreme or prolonged lack of vitamin D makes it difficult to maintain proper calcium and phosphorus levels in bones, which can cause rickets.

Types of Rickets

- Nutritional rickets
- Vitamin D dependent rickets
- Vitamin D Resistant Rickets
  - Type I
  - Type II
- Congenital rickets

Differential diagnosis

- Blounts disease
- Hypophosphatemia
- Metaphysealy dysplesia

Clinical Presentation

- Delayed growth
- Bowlegs (varus deformity)
- Knock knees (valgus deformity)
- Windswept deformities
- Weakness and pain in the spine, pelvis and leg

Investigations

- Alkaline Phosphatase
- Serum Calcium
- Serum Phosphorus
- X rays of the deformed part

Management

Vitamin D supplements

Surgical management

- Growth modulation like hemi epiphysiodesis
- Corrective osteotomies around the knee
- Gradual correction with TSF

17.6.2 Physiological Bowing/Knocked Knees

Is considered bending of knees at an early age due to early walking and overweight below the age of 2 years

Diagnosis process

- Diagnosis is mainly by physical examination–obvious varus/valgus deformity and metaphysical widening.
- Blood tests to measure the levels of calcium and phosphate in the blood (**Refer to table17.2)**
- Bone X-rays to check for bone deformities.

Management

- First consultation: rule out if it's physiological – bow legs at young age before the age of 3 years without signs of rickets
- If it is physiological then consider follow up every 6 months +/- vitamin D supplements
- At the age of 3 years if deformity more than 8 degrees consider Surgical treatment like – hemi epiphysiodesis at around the age of 3years if the deformity is due to Blount's disease consider hemi epiphysiodesis/corrective osteotomy.

17.7 Musculoskeletal Tumors and tumor like conditions

This section is discussed in the **Malignancies chapter 22;** please refer to that section for detailed information.

17.7.1 Tumor like conditions (Simple Bone Cyst, Aneurysmal Bone cyst & Fibrous Dysplasia)

Benign lesion of bone occurs in adolescents. Lytic lesions with clear cut zones of transition. ABC may show fluid levels in MRI. Fibrous dysplasia has ground glass matrix They may present with pain and swelling or with pathological fracture.

Incidence: not very common

Differential Diagnosis: GCT, cartilaginous tumors

Clinical Presentation: nothing specific except painful swelling, Pathological fracture.

Investigations: X-ray, CT- scan

Management

Surgery: Is the mainstay of treatment.
Curettage and bone grafting.
Pathological fracture, Internal fixation with Implants or immobilize in plaster cast after curettage and grafting

CHAPTER EIGHTEEN

TRAUMA & INJURIES

18.1 General Management of Trauma and Injuries

Trauma may occur because of motor vehicle crashes, fights, falls, gunshots, sports, animal bites etc. and is associated with head, musculoskeletal, visceral, and neurovascular injuries. The aim of managing trauma is to prevent further injuries and life-threatening complications that may lead to increased morbidity and mortality. There is a systematic trauma protocol in place, ABCDE protocol, emphasizing on the primary survey, resuscitation, secondary survey, and finally definitive care.

Clinical Presentation

- There is a history of trauma
- Level of consciousness
- ABCDE

Table: 18.1 Initial Trauma Management by Level of Care

Level of Care	Key Interventions
Community / Dispensary Level	• Clear airway and protect cervical spine • Control bleeding: apply direct pressure and dress wounds with sterile/clean gauze • Assess circulation: pulse, blood pressure, capillary refill • Analgesia: **A:** diclofenac (IM/IV) 75 mg 12-hourly for 1–3 days • Immobilize fractures and spine: – Use splints for long bones – Sandbags/bedsheets/neck collar for cervical spine – Rigid spinal board or stretcher immobilization • If unconscious: place in recovery (coma) position while protecting spine • Provide anti-tetanus prophylaxis as per protocol • Stabilize pelvic fractures (pelvic binder/bedsheet) • Refer to higher-level facility
Health Centre Level	• Manage as above using ABCDE Trauma Protocol • Review pre-referral resuscitation • Maintain rigid cervical collar • Catheterize bladder if unconscious • Administer IV fluids: Normal Saline or Ringer's Lactate • Keep patient nil per os (NPO); insert NGT if unconscious; give oxygen via face mask (target SpO_2 >92%) • Wound care: surgical debridement and dressing • Antibiotics: **A:** ampicillin (IV) 500 mg 6-hourly for 3 days OR **B:** chloramphenicol (IV) 500 mg–1 g 6-hourly for 3 days OR **B:** ampicillin + cloxacillin (IV) 1 g 8-hourly for 3 days • Anti-tetanus prophylaxis as per protocol(**see table 18.2 below**) • Anti-rabies prophylaxis if indicated • Refer if: – Coma (needs ICU/CT scan) – Open fractures requiring surgery – Failed resuscitation, need for transfusion or laparotomy
Hospital Level	• Activate trauma response ("code trauma") involving multidisciplinary team (ER, surgery, neurosurgery, radiology) • Conduct primary and secondary survey (ABCDE) • Review prior resuscitation • Systematic assessment for major injuries: – Head and eye injuries – Dental trauma – Spinal injuries – Chest injuries – Abdominal/pelvic injuries • Provide definitive management accordingly • Ensure equipped emergency/casualty setting • Refer for specialized care if required

Table 18.2 A, B, C, D, E Trauma Protocol

Component	Assessment	Intervention
A – Airway	• Is airway patent? • Presence of secretions • Tongue fall • Mouth/nose bleeding • History of drowning, vomiting, or aspiration	• Insert oral airway • Chin lift / jaw thrust • Suction airway if needed • Endotracheal intubation (ETT) if compromised
B – Breathing	• Respiratory rate (Adults: 10–20/min; Children: 30–60/min) • Chest symmetry and movement • Chest in-drawing • Tracheal position (central or deviated) • Air entry on auscultation	• Assist ventilation (mouth-to-mouth, Ambu bag, nasal prongs) • If inadequate → ETT and mechanical ventilation • Insert chest tube (hemothorax, pneumothorax, tension pneumothorax) • Seal open chest wounds
C – Circulation	• Pulse (rate, volume) • Blood pressure • Heart sounds • Signs of shock	• Control bleeding • Establish IV line • Administer isotonic fluids • Manage shock accordingly
D – Disability	• Level of consciousness using Glasgow Coma Scale (GCS)	• Manage head injury as indicated • Protect airway if reduced consciousness
E – Exposure	• Fully expose patient to assess injuries • Look for soft tissue injuries, fractures • Assess for hidden injuries (chest, abdomen, spine)	• Prevent hypothermia (cover patient after exam) • Catheterization • Insert nasogastric tube (NGT) if indicated • Treat identified injuries • Surgical intervention as required

Important investigations for trauma patients - guided by Clinical Presentation and clinician assessment

- Trauma series X-rays (limb x-ray +/- cervical spine, chest, pelvic)-are mandatory.
- FBP, blood type, and crossmatching
- Random blood glucose
- Serum electrolyte
- Brain CT-scan
- Non-contrast CT of fracture ideal for assessing intra-articular and complex fractures
- MRI to ascertain spinal cord injury and soft tissue injuries or occult fractures
- Compartment pressure testing – to rule-out or confirm compartment syndrome
- Focused abdominal sonography for trauma (FAST) which is a rapid and focused bedside examination to identify the presence of intraperitoneal or pericardial free fluid

18.2 Timing and algorithms of Polytrauma Management.

Polytrauma patients are the ones with two or more significant system injuries, including life threatening injury (severe, moderate head, chest, or abdomen injury).

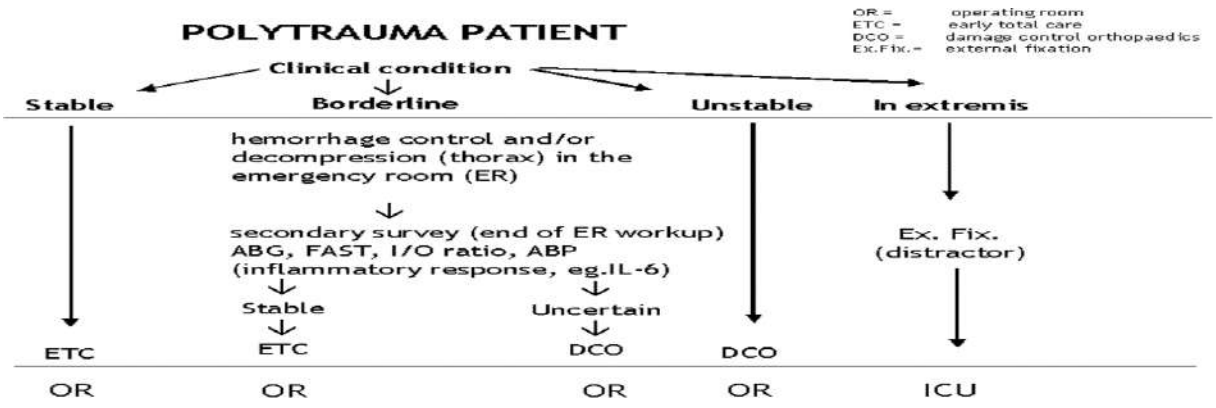
The priorities in trauma care are treating the lethal injury first (damage control) then reassess and treat again having the following objectives:

- life salvage
- limb salvage
-
- salvage of total function if possible

The steps in management are:

- Primary survey
- Resuscitation
- Secondary survey
- Definitive care

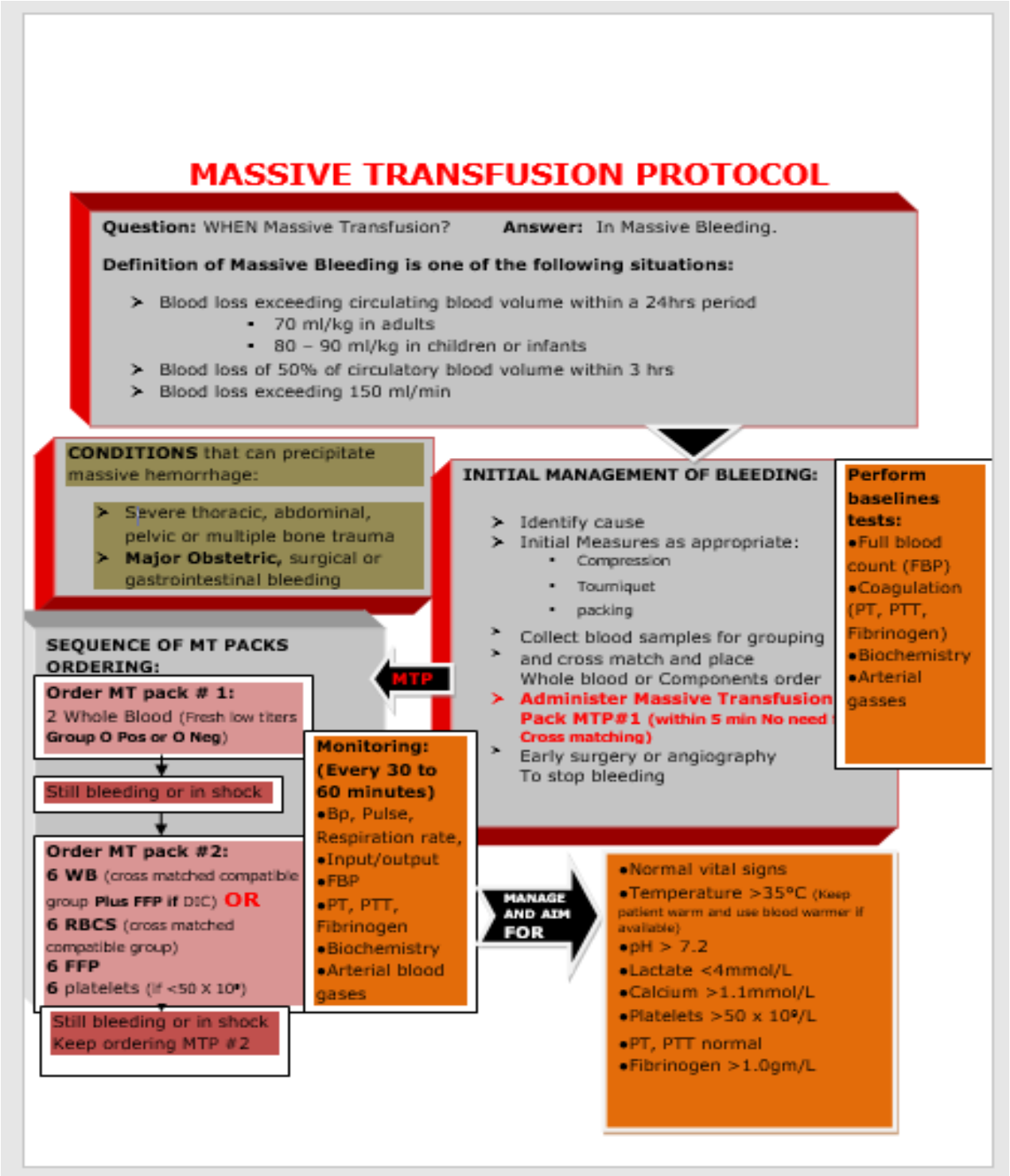
Figure18.1 Algorithm in managing a polytrauma patient



Massive transfusion protocol

Massive transfusion protocols are activated by a clinician in response to massive bleeding. Generally, this is activated after transfusion of 4-10units. MTPs have a predefined ratio of RBCs, FFP/cryoprecipitate, and platelets units (random donor platelets) in each pack (e.g., 1:1:1 or 2:1:1 ratio) for transfusion.

Figure 18.2: Clinical flowchart/infographic of a Massive Transfusion Protocol (MTP) used in emergency care for patients with severe or life-threatening bleeding.



18.3 Traumatic Brain Injury (TBI)

TBI is defined as an alteration in brain function, or other evidence of brain pathology, caused by an external force. TBI is a leading cause of death and permanent disability worldwide. Primary brain injury occurs at time of trauma (e.g., cortical contusions, brain lacerations, diffuse axonal injury) while secondary injury develops following the initial insult (brain edema, hypoxemia, ischemia due to elevated intracranial pressure). TBI is often associated with ophthalmic, ENT, dental and maxillofacial injuries.

Clinical Presentation

- History and/or clinical evidence of blunt or penetrating trauma to the head
- Transient or sustained alteration in level of consciousness s
- Other evidence of altered brain function i.e., seizures, amnesia, focal deficits

Clinical classification of TBI

- Perform the Glasgow Coma Scale (GCS) to assess clinical severity of TBI across care paths. (see below)
- Report each component of GCS; Eye, Verbal, and Mo tor response, e.g., E4V4M5, not just the total score.
- If a GCS component is untestable due to intubation, sedation, etc., record the reason.

Table 18.3: Glasgow Coma Scale

Score	Eye Response (E)	Motor Response (M)	Verbal Response (V)
6		Obeys commands	
5		Localizes/purposeful movement to pain	Oriented
4	Spontaneous eye opening	Withdraws from pain	Confused conversation
3	Eye opening to speech	Flexion to pain (decorticate posturing)	Inappropriate words
2	Eye opening to pain	Extension to pain (decerebrate posturing)	Incomprehensible sounds
1	No eye opening	No motor response	No verbal response
	4 points	**6 Points**	**5 Points**

Eye Response (E): 1–4
Motor Response (M): 1–6
Verbal Response (V): 1–5
➡ Total GCS Score = E + M + V (Range: 3–15)

Table18.4: Traumatic Brain Injury Severity Classification Based on GCS

Mild Traumatic Brain injury	**Glasgow coma scale 13 –14** Good prognosis with minimal or no long -term sequel
Moderate Traumatic Brain Injury	**Glasgow coma scale 9 –12** Fair prognosis
Severe Traumatic Brain injury	**Glasgow Coma Scale <8** (comatose) Poor prognosis with high mortality and long -term disability

Management of TBI
Prehospital and Lower-Level Health Facilities Interventions

- Take important history from patients and relatives (AMPLE)
- Apply the BLS trauma protocol and perform a rapid neurological assessment
- Protect the C -spine stabilizes the neck with rigid neck collar/improvised alternative devices until the x-ray c-spine is done
- Give oxygen therapy to all patients with O2 saturation <92% (rate of 4L/min)
- Give IV normal saline infusion through large gauge cannula
- Avoid SBP of <90 mmHg in adults and older children

- Catheterize the bladder and ensure urine output above 30ml per hour
- Refer all polytrauma or isolated TBI patients with GCS<13, to center capable of providing definitive care.
- Referred patients should be accompanied by a competent adult during transport.
- Inform the destination hospital (by phone or letter of referring to non-emergencies) of the impending transfer.

Note: Do not give dextrose infusion for resuscitation in TBI.

Referral hospital and higher-level Facilities
Interventions

- Follow the ATLS ABCD trauma protocol
- Send for rapid non -contrast brain CT scan all moderate and severe TBI patients
- Consider CT scan in mild TBI cases with following clinical stigmata
  - signs of basal skull fracture (hemotympanum, racoon eyes, CSF leak, Battle's sign)
  - GCS of less than 15 2hrs post TBI
  - Persistent headache and vomiting post TBI
  - Post-traumatic seizures or presence of focal neurological deficits,
  - age 65years or older, any history of bleeding or clotting disorders, or on blood thinners/anticoagulants.
  - dangerous mechanism of injury or deterioration of GCS

Management of mild TBI patients

- Admit and observe for 24 hours all patients with mild TBI and normal CT scan
- Discharge with instructions on danger signs that may require hospital re-admission.
  - Seizures, severe headache, focal neurological deficits
  - Alteration in level of consciousness and confusion
- Perform clinic al follow up assessment after 2weeks.
- Individualize management of mild TBI with abnormal CT findings based on clinical judgement.

Management of Moderate and Severe TBI

- Multidisciplinary approach is of paramount importance in TBI management.
- Admit all moderate and severe TBI patients to ICU for neurocritical care management.
- Initiate a Cerebral Perfusion Pressure/Intracranial Pressure (CPP-ICP) oriented protocol.

Critical Care Management of Moderate and Severe TBI
Management of Airway and Mechanical Ventilation

- Consider endotracheal intubation and mechanical ventilation for all severe TBI patients.
- Rapid sequence intubation is mostly recommended with direct laryngoscope
- For intubated patients: maintain ETCO2 between 35-45mmHg, PH7.3 to 7.4, Spo2 >95%.
- Maintain ventilation rates as follows: children, 20breaths/min; adolescents/adults, 10 breaths/min.
- Target tidal volume of 6 -7ml/kg to maintain the ETCO2 within the above target range.
- Avoid prophylactic hyperventilation except only for obvious signs of herniation.
- In such cases, only mild hyperventilation is recommended with ETCO2 target range of 30-35mmHg.
- Consider early tracheostomy to reduce mechanical ventilation days in anticipated prolonged intubation patients (severe and some Moderate TBI) (within 7 to 10days)

Management of Blood Pressure

- Maintain SBP at 100mmHg to ensure cerebral perfusion.
- Give IV fluid resuscitation with an initial bolus of 1L of NS and 20ml/kg.
- Consider vasopressors if adequate volume resuscitation does not maintain target MAP

Note: Treatment of hypertension: In TBI, the treatment of acute hypertension is not recommended. Might be a sign of Cushing triad (High BP, Bradycardia, irregular respiration), pain or paroxysmal. sympathetic discharges, blockage of ETT or tracheostomy.

ICP Monitoring and Management

- Monitor ICP using external ventricular drain (EVD) technique (**gold standard of ICP** monitoring) the insertion is done at OR
- Consider ICP monitoring in GCS 8 or evidence of structural brain damage on initial CT scan.
- Initiate ICP treatment to monitored patient whenever ICP increases to 20-25 mm Hg
- Perform interval plain CT scan to monitor ICP where no invasive facilities to monitor ICP is available.
- Use a “stepladder approach” with escalating treatment measures to manage ICP.
  - Head of bed elevation at 200 adequate analgesia sedation using short-acting agents
  - Prescribe hyperosmolar agents in presence of intracranial mass lesions.

C: mannitol (IV) 0.25 - 1gm/kg boluses 4-6hourly for 24-72hours.

OR

C: sodium chloride 3% (IV) at 3mls/kg infused over 4hrs, repeat electrolyte after 3hrs if still low the dose can be repeated. Don’t exceed 10Meq/ml rise in 24hrs.

- Use hypertonic saline in medical management of TBI patients with hypovolemia to avoid lowering the CPP
- Monitor serum sodium levels and osmolality every 6hours during hyperosmolar therapy
- Stop if serum osmolality exceeds 320mOsm/L or serum Sodium level exceeds 150mEq/L
- Consider barbiturate coma for patients who fail to respond to aggressive measures to control ICP

Note: The use of steroids is NOT recommended for improving outcome for reducing ICP in TBI

Neurosurgical Interventions for TBI

- Refer for emergency neurosurgical evaluation all patients with epidural hematomas (EDH), subdural hematomas (SDH), cerebral contusions, or intracerebral hematomas (ICH) with significant mass effect to the brain.
- Consider craniotomy and hematoma evacuation for EDH with estimated volume above 30CC and Subdural hematoma with thickness above10mm or midline shift above 5mm
- A lower threshold for surgical intervention is recommended for posterior fossa mass lesions.
- A formal craniotomy is necessary to perform adequate evacuation of intracranial mass lesions
- Consider decompressive craniectomy to relieve ICP only when medical treatment of raised ICP has failed and benefits outweigh the risks for such a procedure.
- Elevate depressed skull fractures where surgical approach is indicated:
  - Open depressed fractures, gross contamination to prevent infection,
  - Low bleeding risk, e.g., no risk of dural venous sinus lacerations.
- Exoscope Cistern ostomy.

Note: Depressed skull fracture over the sagittal sinus SHOULD NOT be treated surgically because of the high risk of uncontrollable hemorrhage

Extracranial Surgical Interventions

- Delay non emergent extracranial surgical interventions in TBI patients unless they are life- saving procedures.
- Orthopedic operations should ideally be delayed 24 -48 hours to allow initial stabilization of ICP
- Consider damage control orthopedics with initial external fixation and later definitive treatment to minimize the risk for "second hit "phenomenon

Table: 18.5 Management of Seizures and Supportive Care in Traumatic Brain Injury (TBI)

Section	Component	Management
Seizures Related to TBI	Indication	• Treat all patients with overt seizures • Provide prophylaxis in high-risk patients: – Severe TBI – Brain contusion – Intracranial hemorrhage – Penetrating brain injuries
	Pharmacological	• **C:** phenytoin (IV/PO) 15 mg/kg loading dose in 250 mL 0.9% sodium chloride over 30 minutes, then 100 mg 8-hourly for 14 days **OR** • **S:** levetiracetam (IV/PO) 20 mg/kg loading dose, then 1000 mg 12-hourly for 7 days (extend to 2 weeks if seizures present at admission) **OR** • **A:** carbamazepine (PO) 200 mg 12-hourly for 2 weeks
Sedation and Analgesia	Sedation	• **D:** propofol (IV) 5 mcg/kg/min for 3–5 minutes; increase by 5 mcg/kg/min every 5–10 minutes as needed
	Analgesia	• **S:** fentanyl (IV) 100 mcg/2 mL bolus stat before procedures
Temperature Management	Goal	• Maintain normothermia (<38°C)
	Treatment	• **D:** paracetamol (IV) 1 g 8-hourly (Pediatrics: 15 mg/kg) for 5–7 days or when required
Blood Glucose Management	Goal	• Maintain blood glucose 4–8 mmol/L
	Consideration	• Avoid glucose-containing fluids unless treating hypoglycemia
Nutrition in Severe TBI	Initiation	• Start enteral feeding (PO/NGT/OGT) within 24–48 hours
	Caloric Target	• 100% (paralyzed) or 140% (non-paralyzed) of resting metabolic expenditure
	Feeding Intolerance	**B:** metoclopramide (IV) 10 mg 8-hourly for 5–7 days
Antibiotic Management	Indication	• Penetrating TBI • Closed TBI with invasive monitoring or therapeutic interventions
	Pharmacological	**D:** ceftriaxone + sulbactam (IV) 1.5 g 12-hourly for 7–14 days **AND** • **B:** metronidazole (IV) 500 mg 8-hourly for 7–14 days
Electrolyte Management	Monitoring	• Frequent monitoring of serum electrolytes and osmolality
	Sodium Balance	• Maintain normal sodium levels to prevent/worsen cerebral edema
	Common Disorders	• Monitor for Diabetes Insipidus (DI) and SIADH
Peptic Ulcer Prophylaxis	Prophylaxis	**C**: pantoprazole (IV) 40 mg 24 hourly for 2 weeks
DVT Prophylaxis	Mechanical	• Compression stockings or intermittent pneumatic compression
	Pharmacological	• Only in low hemorrhage risk patients
	Post-Neurosurgery	• Initiate after 72 hours if no contraindications
	Drug	**D:** low molecular weight heparin (SC) 40 mg 24 hourly until DVT risk is minimal

Management of anemia post TBI:
Consider PRBC or whole blood transfusion in TBI patients with hemoglobin <8g/dl

Rehabilitation post TBI

- Offer rehabilitation services in TBI patients to improve patient's ability to return to premorbid function
- Involve multidisciplinary specialties to treat resultant mental and physical problems caused by TBI, provide social and emotional support, and assist patients to adapt to changes occurring during the recovery period.
- Consider provision of available both inpatient hospital rehabilitation and outpatient home - based rehabilitation care
- Individualize rehabilitation program as tolerated by the respective patients.

18.4 Spinal Cord Injury (SCI)

Acute spinal cord injury (SCI) refers to disturbances to patients normal sensory, motor, or autonomic function resulting from trauma. Following the initial insult, up to 25% of spinal cord injuries is thought to occur not at the time of the initial trauma but later during treatment or transport. SCI management, therefore, should be multidisciplinary incorporating appropriate prehospital services, Advanced Trauma Life Support (ATLS) protocols, prompt neurosurgical interventions, and timely rehabilitation.

Clinical Presentation

- Pain
- Numbness
- Paresthesia
- Motor deficit
- Dyspnea

Investigations

- Spine X -rays (cervical, Thoracic, Lumbar)
- Pelvic x-ray
- Spine CT scan --assist in decision making and surgical planning.
- Spine MRI making and prediction of neurologic outcome.
- FAST/eFAST for associated injuries

Table: 18.6 Management of Spinal Cord Injury (SCI)

Level of Care	Intervention Area	Management
Prehospital & Primary Health Facilities	Basic Life Support	• Provide basic life support (BLS) • Prevent further neurological deficits
	Spinal Immobilization	• Immobilize cervical spine using rigid neck collar or improvised device • Advocate spinal immobilization for all suspected/confirmed spine trauma
	Bladder Care	• Catheterize if urinary retention is present
	Referral	• Arrange immediate transfer to facility with specialized spine care
Referral & Specialized Health Facilities	Initial Assessment	• Follow Advanced Trauma Life Support (ATLS) protocol
	Airway Management	• Assess need for intubation • If indicated, perform Rapid Sequence Intubation (RSI) • Minimize cervical spine movement during intubation
	Sedation (Intubated Patients)	**S:** fentanyl (IV) 50 micrograms/hour continuous for 24–72 hours
	Circulatory Support	• Avoid hypotension and bradycardia • Maintain MAP ≥85 mmHg (blunt & incomplete penetrating SCI)
	Fluid Resuscitation	• Give fluid challenge: up to 2 L Normal Saline bolus
	Vasopressor Support	• If hypotension persists : **S:** norepinephrine 0.05 mcg/kg/min IV infusion, titrate to MAP ≥85 mmHg
	Shock Management	• Manage shock as per emergency care guidelines
	Positioning	• Remove backboard early • Transfer to firm padded surface/mattress
	Associated Injuries	• Identify and treat life-threatening injuries (e.g., chest, abdominal trauma)
	Neurological Assessment	• Perform detailed neurological and physical examination • Use validated tools (e.g., ASIA impairment scale)
	Spine Care	• Maintain spinal alignment at all times (log rolling technique)
	Pain Management (Non-intubated)	**S:** fentanyl (IV) 25–50 mcg hourly for 24–72 hours, then PRN **OR** **C:** morphine (IV) 2–5 mg hourly for 24–72 hours, then PRN

Table 18.7 ASIA Impairment Scale

Class	Description
A	**Complete:** No sensory or motor function preserved in sacral segments S4–S5
B	**Incomplete:** Sensory but not motor function preserved below the neurological level, including sacral segments S4–S5
C	**Incomplete:** Motor function preserved below the neurological level; most key muscles have a muscle grade < 3
D	**Incomplete:** Motor function preserved below the neurological level; most key muscles have a muscle grade ≥ 3
E	**Normal:** Sensory and motor functions are normal

Conservative Management options (This will depend on classification of the SCI injury, imaging finding and expertise)

- Tong Traction
- Thoracolumbar orthoses
- Hard neck collars (Philadelphia type of collar)
- Bedrest

Table18.8: Comprehensive Management of Spinal Cord Injury (SCI)

Section	Component	Management
Surgical Management of SCI	Surgical Indication	Consider prompt decompression and stabilization with spine implants (open or minimally invasive)
	Timing	Target surgery within 72 hours post-trauma when possible
	Benefits	• Early mobilization • Reduced complications • Improved neurological outcomes
	Decision Making	Based on expert judgment and available resources
	Counselling & Consent	• Inform patient/caretaker on prognosis and expected outcomes • Document counselling and obtain signed consent
Other Considerations in SCI Care	Steroid Use	Controversial—follow institutional guidelines
	DVT Prophylaxis	Start within 72 hours if not contraindicated: **D:** low molecular weight heparin (SC) 40 mg 24 hourly until risk minimized
Rehabilitation	Timing	Initiate as soon as medically stable
	Modalities	• Ambulation training • Overground walking • Functional electrical therapy
	Assistive Devices	• High-back wheelchair • Axillary crutches
ICU/HDU Management (Cervical SCI)	A. Respiratory Goals – Objectives	• Prevent atelectasis • Enhance secretion clearance • Prevent pneumonia
	Ventilated Patients	• Initiate VAP protocol (oral care 4-hourly, HOB >30°) **A:** chlorhexidine mouth wash 15 mL 12-hourly then PRN **AND** **B:** salbutamol nebulizer solution2.5 mg/3 mL 4-hourly for 72 hrs then PRN
	Non-Ventilated Patients	Assess need for ventilation **B:** salbutamol nebulizer 2.5 mg/3 mL 4-hourly for 3 days then PRN
	Airway Care	• Frequent suctioning • Consider early tracheostomy (<7 days)
	Monitoring	• Monitor ABG and maintain targets (as per TBI protocol)
	B. Cardiovascular Goals – Objectives	• Maintain hemodynamic stability • Avoid hypotension and bradycardia
	Hypotension	Fluid resuscitation as required **S:** norepinephrine (IV) 0.05 mcg/kg/min titrate to MAP ≥85 mmHg
	Persistent Hypotension	• Check cortisol level • If <20 mcg/dL: **A:** Hydrocortisone (IV) 100 mg 8-hourly for 24 hrs
	Bradycardia	Assess for mucous plugs **A:** atropine (IV) 0.5 mg hourly PRN if HR <40 or symptomatic
	Persistent Bradycardia	**A:** salbutamol (PO) 2 mg 6-hourly (up to 4 mg) for 24 hrs
	C. Gastrointestinal Goals – Feeding	• Enteral feeding (NGT/OGT/PEG) • Monitor residuals (<250 mL after 4 hrs)
	Feeding Intolerance	**B:** metoclopramide (PO/NGT) 10 mg 6-hourly for 3 days
	Bowel Care	• Ensure daily bowel movement • If none for 72 hrs: **A:** bisacodyl (PR/PO) 10 mg 12-hourly for 24 hrs then PRN
	Stress Ulcer Prophylaxis	**C:** pantoprazole (IV) 40 mg 24 hourly for 7–14 days

Section	Component	Management
Pain and Spasticity Management	Pain Assessment	Use Visual Analogue Scale (VAS)
	General Pain	**A:** diclofenac (IM/IV) 75 mg 12-hourly for 3–5 days **OR** **B:** tramadol (PO/IM/IV) 50 mg 8-hourly for 3–7 days
	Neuropathic Pain	**D:** pregabalin (PO) 75 mg 12-hourly for 14 days
	Spasticity	**S:** baclofen (PO) 10 mg 8-hourly for 14 days **OR** **S:** tizanidine (PO) 2 mg 8-hourly for 14 days
	Monitoring	• Adjust doses as needed • De-escalate opioids early
Nutrition Goals	Feeding	Start enteral nutrition within 48 hours (NGT/PEG)
	Glucose Control	Maintain blood glucose <180 mg/dL
Bladder Management	Catheter Use	Remove when no longer required
	Intermittent Catheterization	Perform every 4–6 hours
	Catheter Change	Every 14 days or if UTI suspected
	Patient Training	Assess readiness for self-intermittent catheterization
Prevention of Venous Thromboembolism (VTE)	Mechanical	Compression devices for lower limbs
	Pharmacological	**D:** low molecular weight heparin (SC) 40 mg daily starting 72 hours post-op • Duration guided by daily risk assessment
Skin Care	Pressure Injury Prevention	• Frequent repositioning • Use moisturizers
	Support Devices	• Air mattresses • Sacral silicone dressings
	Collar Use	Remove as advised by neurosurgeon
	Wound Care	Early specialist consultation if sores develop
Rehabilitation & Mobilization	Goals	• Improve functional ability • Prevent contractures
	Mobilization	Early transfer to wheelchair (within 24 hours if tolerated)
	Pressure Relief	Enforce pressure relief protocol during sitting
	Physiotherapy	• Chest physiotherapy • PT/OT involvement
	Family Involvement	Engage family in counselling and care
Psychosocial Support	Support	Promote coping strategies
	Education	Educate patient and caregivers

18.9 Chest Trauma

Table 18.9: Classification of Thoracic Injuries

Injury to the chest/thorax are generally divided into blunt and penetrating can involve multiple areas of the chest/thorax including

System	Thoracic Injury
Airway and Pulmonary Injuries	• Bronchial injury • Tracheobronchial injury • Pulmonary contusion • Diaphragmatic injury • Hemothorax • Pneumothorax (tension and non-tension)
Cardiac and Great Vessel Injuries	• Blunt cardiac injury • Penetrating cardiac injury • Cardiac tamponade • Major thoracic vessel injury • Traumatic aortic transection
Musculoskeletal Chest Wall Injuries	• Rib fracture (with or without flail chest) • Clavicle fracture • Sternal fracture • Scapulothoracic dissociation
Other Thoracic Injuries	• Esophageal injury/perforation • Pneumomediastinum

Clinical Presentation:

Chest pain and shortness of breath, Difficulty in breathing, Dyspnea and tachypnea.

Investigations

- ABO Grouping and cross-matching
- FBP
- Blood Urea Nitrogen and Creatinine
- Electrolytes
- PT, PTT, INR
- Lactate levels and Blood Gases
- Fast USS, eFAST
- Chest X-ray and CT scan chest

Management
Resuscitation:

- Maintain ABCs.
- Maintain airway, stabilize the cervical spine
- Give oxygen, If O2 sat below 92%, If dyspneic, Low O2 saturation with reduced or absent air entry, suspect pneumothorax/hemothorax
- If tension pneumothorax is suspected, needle decompression is performed followed by chest tube insertion +UWSD
- IV Fluids:
  Give
  A: sodium chloride 0.9% or compound sodium lactate. (Adult 2000mls and Pediatrics 20ml/kg).

Give Blood

- If severe pallor, ongoing bleeding, Hb<5 and Hb<7 (with active bleeding in trauma)
- Adults 2units within 1hour and pediatric 20ml/kg 1hour (whole blood) or 10ml/kg (pRBC)
- If ongoing indication for blood, start massive transfusion in the following ratio: 1-unit pRBCs (20ml/kg in Pediatrics): 1-unit FFP (20mls/kg in Pediatrics): 1-unit PLT (20ml/kg in Pediatrics)

Pharmacological Management
Pain Management and Sedation
D: paracetamol (IV) 1g stat in Pediatrics 15mg/kg stat.

In Severe Pain
C: morphine (IM) 5-10mg stat
OR
B: pethidine (IV) 50-100mg stat +/- Low dose ketamine for additional sedative effect (0.3mg/kg)

In contaminated wounds
B: ceftriaxone (IV) 1g stat
AND
B: metronidazole (IV) 500mg stat

Note

- Almost all penetrating injuries will need thoracic surgeon review and intervention with ICU admission.
- Mild blunt chest injuries can be admitted in the ward for monitoring before discharge

18.6 Abdominal Trauma

Unrecognized abdominal injury remains a frequent cause of preventable death after trauma.
The initial evaluation in abdominal trauma patient must include the primary and secondary survey There are two basic categories of abdominal trauma:

- Penetrating trauma where surgical consultation is important e.g. Gunshot, stabbing.
- Non-penetrating trauma e.g., compression, crush, seat belt, acceleration/deceleration injuries.

Investigations

- FAST/eFAST
- Pelvic X-ray FBP
- Diagnostic peritoneal lavage.
- Blood grouping and x-match
- Abdominal CT scan for stable patient
- CXR

Management

- Goal of acute management is to stabilize the patient and to determine need for urgent laparotomy
- An exploratory laparotomy may be the best definitive procedure if abdominal injury needs to be excluded

Absolute indications for surgery

- Hemodynamic instability
- CXR with free air
- Peritonitis or drainage of fecal contents
- Evisceration of bowels

Pharmacological Management

D: paracetamol (IV) 1g 8hourly for 24hours

OR

C: morphine (IV) 10mg 6hourly for 24hours

18.7 Soft Tissue Injuries

Clinical Presentation

- Pain only, traumatic swelling, bruises with intact skin, cuts, abrasions, puncture wounds or open wounds of varying size and severity
- Injury to internal organs must be recognized and referred, including subtle signs of organ damage, e.g.;-
  - blood in the urine – kidney or bladder damage
  - shock – internal bleeding
  - blood or serous drainage from the ear or nose – skull base fracture
- An injury causing a sprain or strain may be initially overlooked. Exclude fractures by performing appropriate X-rays

Note:

- Closed injuries and fractures of long bones may be serious and damage blood vessels
- Contamination with dirt and soil complicates the outcome of treatment

Emergency management

- Immobilize injured limb after reduction by POP cast or splint
- Monitor vital signs
- Monitor the arterial pulse and capillary refill below an injury on the limb with swelling.

Wound care

- Surgical debridement of the wound
- Suture or splint when needed
- Avoid primary suture if the wound is infected:
  - Dirty or contaminated
  - Crushed
  - In need of debridement
  - Projectile inflicted
  - Caused by bites

Pharmacological Management

A: paracetamol (PO) 15mg/kg 6hourly in 24 hours

OR

A: diclofenac (IM/IV) 75mg 12hourly (if can't tolerate oral medication)

AND

B: ceftriaxone 1g (IV) 12hourly 3days.

AND

B: metronidazole (IV) 500mg 8hourly for 3days.

AND

A: tetanus prophylaxis: 0.5mL Tetanus Vaccine and 1mL Tetanus immunoglobulin (Depending on the immunization protocol)

Topical medication

C: mupirocin gel 1.3% patch –apply one patch on the affected area 12hourly for 2weeks.

Table18.10: Protocol in Provision of Tetanus Prophylaxis

Patient Category	Non-tetanus prone	Tetanus prone
Immunized and booster within 5 years	Nil	Nil
Immunized and 5 to 10 years since booster	Nil	TT
Immunized and >10 years	TT	TT
Incomplete immunization or unknown	TT and TIG	TT and TIG

TT = Tetanus Vaccine; TIG = Tetanus Immunoglobulin

18.8 Sprains and Strains

It is a type of soft tissue injury where the muscle and tendons are affected. Exclude fracture by performing x-ray

Clinical Presentation

- History of trauma
- Pain, especially on movement
- Unable to use the limb
- Tenderness on touch
- Limited movement

Causes of Soft Tissue injury

- Sport injuries
- Slips and twists
- Overuse of muscles
- Abnormal posture

Note: In children always bear non-accidental injuries (assault) in mind.

Non-Pharmacological Management

- Immobilize with firm bandage and/or temporary splinting e.g. triangular sling, back slab etc.
- Ankle/Knee support
- Perform X-ray to rule out dislocations or subluxations

Pharmacological Management

Children over 12 years and adults:

A: ibuprofen (PO) 200-400mg 8hourly for 3days

OR

A: paracetamol (PO) 500mg-1g 6-8hourly as needed

AND

A: diclofenac gel 1% - apply 2–4 g to each affected area 6 hourly

OR

S: ketoprofen gel apply 12hourly day for 2weeks

OR

S: heparin gel 0.5-1g for 7-14days (for sprain/stain associated with hematomas)

Referral

- If Severe progressive pain. Do X- ray to exclude bone fractures or joint dislocation.
- Progressive swelling
- Extensive bruising

18.9 Ligament rupture

Causes of ligament injuries

- Over use
- Sports related trauma
- Motor vehicle/ cycle crush
- Fall from height/ or same level

Clinical Presentation

- Pain
- Swelling
- Bruising
- Joint instability
- Difficult in weight bearing

Investigations

- X-ray to rule out fractures
- USS
- MRI scan to diagnose and grade

Non-Pharmacological Management

- Non operative treatment (grade I and II)
- Bracing
- Physiotherapy (RICE) and rehabilitation

Pharmacological Management

Pain management

C: diclofenac (PO) 50mg 8hourly for 14 days

OR

B: meloxicam (PO) 7.5mg - 15mg12hourly to 24 hourly for 14 days

OR

B: aceclofenac (PO) 100mg - 200mg 12hly to 24hrly for 14 days

Topical medication

A: diclofenac gel apply BD for 14 days

OR

S: ketoprofen gel Apply BD for 14 days

Surgical treatment for grade III injuries

Ligament reconstruction surgeries i.e ACL reconstruction, PCL reconstruction and PLC reconstruction

18.10 Tendon injuries

Tendon is anatomical structures that connects muscle to the bone, with aging they become more prone to injuries.

Causes of injury:

- Blunt trauma
- Penetrating/Cut/Laceration wound
- Overuse (tendinitis)
- Degenerative tears

Clinical Presentation

- Pain at the site of affected tendon worse with movements
- Loss of function
- Weakness
- Stiffness and decreased range of motion,
- Atrophy of the muscles
- Popping sound at time of injury

Diagnosis

A thorough physical examination, including special tests is essential

Investigations

X-ray, USS, MRI scan for grading/classifying the injury.

18.11 Dislocations

A dislocation is complete and persistent separation of two or more bones that form a joint with part of the supporting joint capsule and some of its ligaments are disrupted. Dislocations can be congenital or acquired. In subluxation, the bones in a joint are partly out of position. Traumatic dislocations are orthopedic emergency.

Clinical Presentation

- History of trauma/assault
- Pain on the affected joint
- Deformity
- Loss of function

Investigations

- Plan x-ray
- CT scan to assess associated injuries
- MRI scan

Management

- It's an orthopedic emergency
- Closed reduction, under conscious sedation or general anesthesia
- Open reduction if closed reduction fails
- Chronic dislocation
- Surgical open reduction and fixation of underlying cause

Recurrent dislocation:

Arthroscopic or open surgical stabilization of the joint

18.12 Closed fractures

A disruption or break in the continuity of the structure of bone caused by direct or indirect vector forces. e.g. compression, traction, and shear). Fractures can be open or closed with different fracture pattern; transverse, oblique, spiral or comminuted. Simple fractures can be treated at the receiving hospital, whereas complex fractures require transfer to specialized hospitals

Clinical Presentation

- History of Trauma/assault
- Swelling,
- Tenderness
- Misalignment
- Inability to move or use an affected limb or joint
- Acute pain caused by movement
- Wound

Investigations

- X-Ray limb+/-cervical spine, chest, pelvic
- CBC, blood typing, and cross-matching
- Non-contrast CT of fracture ideal for assessing intraarticular and complex fractures
- MRI to ascertain soft tissue injuries or occult fractures
- Compartment pressure testing
- Abdominal pelvic ultra sound as part of multiple trauma assessment plan.

Management
Start with ABCDE Trauma Protocol

Non-Pharmacological Management

At Community/dispensary level /health Centre level

- Immobilize injured limb by POP cast/Slab or splint.
- Monitor vital signs.
- Monitorthearterialpulseandcapillaryrefillbelowaninjuryonthelimb withswelling
- Refer the patient if open fracture or if specialized services are needed

Definitive treatment at Health Centre to hospital level
Non - Operative treatment
Depends on the affected bone, each bone has its treatment protocol but generally undisplaced fractures are treated by casting or splint, displaced /angulated factures require closed reduction, followed by a period of immobilization using either, casting or traction (skin and skeletal traction). Traction or cast may be used as part of first aid or definitive treatment. Slings are mainly used for immobilization of upper limb fractures.

Pharmacological Management

- Pain management
- Prophylaxis of DVT/PE

Operative Management of Long Bone Fractures at Hospital Level
Indications for surgery

- Open fractures
- Unstable fractures
- Severe displacements (e.g., rotational deformities) and displaced fragments
- Inadequate manual reduction and fixation
- Intra articular fractures
- Pathological fractures
- Multiple fractured patient
- Floating joint, e.g., floating knee/ elbow or shoulder

Pharmacological Management
Table18.11: Pre-operative and post-operative management of patients who require surgical intervention

Aim	Drug of Choice	Duration of treatment
Prevention and treatment of Deep venous thrombosis	**D:** low molecular weight heparin (SC) 40mg 12hourly after surgery **OR**	For 10-35days or more until risk of DVT reduced
	S: rivaroxaban (PO) 10mg to 15mg 24hourly	12-35days
	Note Do serial FBP to monitor response to treatment	
Antidote for heparin overdose	**B:** protamine (IV) 1mg per mg low molecular weight heparin (SC) (if low molecular weight heparin (SC) given within 8hrs If > 8hrs of overdose or bleeding continue give 0.5 per mg low molecular weight heparin (	Start
Multimodal pain management for post-operative patient	**A:** diclofenac (IM/IV) 75mg 12hourly **AND**	3days
	B: pethidine (IV) 100mg 6hourly **OR**	
	A: diclofenac (IM/IV) 75mg 12hourly **AND** **B:** tramadol 100mg (IV) 8hourly **OR**	3days
	A: diclofenac (IM/IV) 75mg 12hourly **AND** **D:** paracetamol (IV) 1g 8hourly	3days
Reduction of intraoperative bleeding	**C:** tranexamic acid (IV) 500mg to 1g over 30minutes before inflation of tourniquet and 3hours after 1st dose	
Prophylactic antibiotics for orthopedic procedures	**Prophylaxis for general orthopedic procedures including trauma** **D:** cefuroxime (IV)750mg to 1.5g 30minutes before incision **OR** **C:** cefazolin 2g to 3g (if ≥120 kg) 30 to 60 minutes before skin incision **Prophylaxis for arthroplasty** **D:** cefuroxime (IV) 750mg to 1.5g at induction of anesthesia **OR** **C:** cefazolin 2g to 3g (if ≥120 kg) 30 to 60 minutes before skin incision	

18.13 Open Fracture

Is an injury where the fractured bone and/or fracture hematoma are exposed to the external environment via a traumatic violation of the soft tissue and skin. The skin wound may lie at a site distant to the fracture and not directly over it. Gustilo-Anderson classification is often used to classify open fractures into type I to IIIC

Clinical Presentation

- History of trauma/assault, pain, swelling, and deformity, loss of function or loss of sensation below level of injury
- Over lying bleeding wound or puncture or visible protruding bone from the wound, obvious contamination

Table18.12: The Gustilo-Anderson Classification of Open Fractures

Type I: <1cm wound and clean	Type IIIB: >10cm wound and high-energy, but with inadequate soft tissue coverage requiring rotational flaps.
Type II: 1-10cm wound and clean	Type IIIC: All injuries with vascular injury
Type IIIA: >10cm wound and high-energy, but with adequate soft tissue coverage	

Investigations

- Plain film radiograph of the affected area (s)
- Doppler ultra sound
- CT scan for comminuted or complex fracture Patterns
- CT angiography when suspecting vascular injury

Table18.13: Pharmacological and Surgical Management of Open Fracture

Open fracture Gustilo -Anderson type 1	**B:** ampicillin + cloxacillin (FDC) (IV) 1g 8hrly for 3days **OR** **B:** ceftriaxone (IV) 1g 24hourly for 3days **AND** **A:** tetanus vaccine (IM) 0.5ml repeat at 4-8weeks after first dose and 6-12months after second dose. **AND** **A:** tetanus immunoglobulin (TIG)(IM) 250units (single dose) for prophylaxis and 3000-6000units for active tetanus
Open fracture Gustilo-Anderson type II	**A:** gentamicin (IV) 80mg 12hourly for 3days **AND** **B:** ceftriaxone (IV) 1g 12hourly for 3days **AND** **A:** tetanus vaccine (IM) 0.5ml repeat at 4 - 8weeks after first dose and 6-12months after second dose. **AND** **A:** tetanus immunoglobulin (TIG) (IM) 250units (single dose) for prophylaxis and 3000-6000units for active tetanus
Open fracture Gustilo-Anderson type III	**A:** gentamicin (IV) 80mg 12hourly for 3days **AND** **B:** ceftriaxone (IV) 1g 12hourly for 3days **AND** **B:** metronidazole (IV) 500mg 8hrly for 3days **AND** **A:** tetanus vaccine as per immunization protocol or as above regime. **AND** **A:** tetanus immunoglobulin (TIG) (IM) 250IU single dose or as above regime same for pediatric above 7years **Add:** **A:** benzathine benzylpenicillin (IV) 2–4MU 4hourly for 3days (when suspicious with clostridium species)

Surgical management	
NOTE: Type 1 – 2 in our setting can be managed by medical doctors /general surgeon with basic principles of trauma management in appropriate setting, Type 3A and 3B can be managed by orthopedics alone, 3B requires plastics input, and 3C requires vascular input	Debridement of the wound and the fracture site, removing all devitalized tissue present, should happen within 6-24hours, repeat debridement every 24-48 hours as needed. The use of External fixation or internal fixation for fracture fixation should be individualized. Soft tissue coverage should happen within 72hours, or as guided by plastic surgeon advice.

18.14 Peripheral vascular injury

Injury to peripheral arteries, which can compromise viability of the limb and is life threatening. Accounts for approximately 80% of all vascular injuries. It is a surgical emergency.

Causes:

- Penetrating injury (Gun short injuries, Open fractures type IIIC)
- High energy injuries, i.e motor cycle /vehicle accidents
- Dislocation of major joint, i.e knee joint
- Crush injuries

Clinical Presentation

- Observed pulsatile bleeding
- Arterial thrill (i.e, vibration) by manual palpation
- Bruit over or near the artery on auscultation
- Signs of distal ischemia with comprehensive neurovascular assessment
- Visible expanding hematoma

Investigations

- x-ray
- CT angiography
- CT scan
- Ankle brachial index
- Baseline investigations; CBC, blood grouping, renal function tests

Management

Multidisciplinary approach

- Cross match and prepare blood (4 to 8 units)
- Recanalization using Forgaty catheter
- Vascular repair, such as end to end anastomosis, segmental reconstruction/ replacement of entire segment

18.15 Pelvic and acetabular fractures

Fractures of the pelvis typically resulting from high energy blunt trauma although fail and elderly patients may sustain injuries from low energy mechanism, and the injuries ranges from benign to life threatening. Hemorrhage is the leading cause of death overall.

Associated injuries

- Chest injury
- Long bone fractures
- Spine fractures
- Urological injuries
- Head and abdominal injuries

Classified depending on the direction of force causing the injury

- Anterior-posterior compression
- Lateral compression
- Vertical shear

Clinical Presentation

- Pain
- Shock
- Inability to bear weight.
- Limb length discrepancy with possible rotation of one or both extremities.
- Flank hematoma
- Laceration of perineum
- Degloving injuries
- Scrotal, labial or perineal hematomas

Investigations

- FBP, grouping Cross-matching
- Chemistry panel
- Radiography
  - Pelvic X- ray AP, and JUDET VIEWS
  - trauma series radiography whenever necessary (Cervical, Chest and Pelvis)
  - Abdominal pelvic USS
  - CT (contrast enhanced)
  - Pelvic angiography in case of persistent shock or suspected vascular injuries
  - Cystography
  - MRI
  - Retrograde urethrogram

Management
Start with ABCDE Trauma Protocol irrespective of the level of facility

Non-Pharmacological Management

At Community/dispensary level/health Centre level

- Immobilize pelvic fracture with Pelvic binder/ bed sheet
- Monitor vital signs.
- Monitorthearterialpulseandcapillaryrefillbelowaninjuryonthelimbwithswelling

Refer patients with pelvic fractures upon resuscitation. The referring professional should inform the destination hospital (by phone) of the impending transfer and in non-emergencies a referral letter summarizing signs and symptoms and initial management should be sent with the patient.

Definitive treatment at hospital level

Non-Operative treatment

- BLS/ATLS protocol
- Secure Air way with cervical spine control, ABCD (AMPLE protocol)
- Resuscitation
- DVT Prophylaxis

Give,

- **A:** diclofenac (IM/IV) 75mg stat, then continue with ibuprofen (PO) OR Paracetamol (PO) when required
- Pelvic binder/sheet
- Bed rest.
- Weight bearing as tolerated (for stable fractures)

Operative treatment.

- Anterior subcutaneous pelvic fixator (ANFIX)
- External fixator
- Pelvis reconstruction surgery with Plates and /or Screws
- Diverting colostomy (in open pelvic fractures)
- Acetabular reconstruction surgery for acetabular injuries

18.16 Fractures in Children

18.16.1 Supracondylar Fracture

This fracture occurs just above the two condyles of the distal humerus, commonly seen between 5- 10 years. Can be extension type (95%) or flexion type (5%). Further classified by Gartland as type I, II and III in order of severity of injury.

Clinical Presentation

- History of injury,
- Swelling,
- Subcutaneous ecchymosis,
- Pain,
- Limited range of motion,
- Bony crepitus,
- Deformity,
- Tenderness around the elbow,
- May include loss of sensation and loss of pulse to the forearm if accompanied with nerve or vascular injury.

Investigation

- Plain x-ray (AP & amp; L)
- Doppler ultra sound if suspecting vascular injury
- CT scan for complex fractures
- CT angiography for complex fracture with vascular injury.

Management

Follow trauma management protocol for prehospital, primary facility and hospital

Table18.14 Definitive management

Type	Management
Gartland's Type-I and Type-IIA	- Closed manipulation and reduction under general anesthesia or deep sedation. - Maintenance of reduction with a plaster slab or arm cast and sling for three weeks. Confirm reduction by X-ray. Start physiotherapy after three weeks
Gartland's Type-IIB and Type-III	Close reduction under image intensifier and percutaneous pinning with Kirschner. Keep K wires for three weeks, start physiotherapy as soon as pain permit
Gatland type I to III with vascular injury or open wound or failed close reduction	Open reduction and internal fixation using 'Kirschner Wires, keep K wires for three weeks, start physiotherapy as soon as pain permit

Note:

- Patients with gross swelling at the elbow, poor skin condition with contusion and blistering, vascular insufficiency should be kept on skin or skeletal traction before close definitive management unless they warrant emergency surgical intervention
- Skeletal traction: A Kirschner -wire is passed through the olecranon process and an overhead traction is applied

18.16.2 Epiphysial injuries

Fractures involving the epiphyseal plate at the end of the long bone of a growing child. Classified by Salter Harris classification into 5 types based on fracture line

Clinical Presentation

- History of injury,
- Swelling,
- Subcutaneous ecchymosis,
- Pain,
- Limited range of motion,
- Bony crepitus,
- Deformity,
- Tenderness around the affected joint,
- May include loss of sensation and loss of pulse below the affected joint if accompanied with nerve or vascular injury.

Investigations

Plain radiography, CT Scan, MRI.

Table18.15: Definitive management

Type	Fracture pattern or radiological image	Management
Salter-Harris I	Fracture line through Physis only, can be minimally or grossly displaced	Closed manipulation and reduction under general anesthesia or deep sedation. Maintenance of reduction with a plaster slab or cast confirm reduction by X-ray
Salter-Harris II	Fracture line through Physis + metaphysis with triangular fragment extending to metaphyseal area (Thurston-Holland sign)	Closed reduction and casting **OR** Closed reduction and percutaneous screw or wire fixation **OR** Screw for larger metaphyseal fragment **OR** Wires crossing physis for smaller metaphyseal fragment
Salter-Harris III	Fracture line through Physis + Epiphysis. CT scan may be needed to evaluate articular displacement	Closed reduction and casting **OR** Close reduction under image intensifier/open reduction, screw fixation. Screw along width of epiphysis avoiding physis
Salter-Harris IV	Fracture line through Epiphysis, physis, and metaphysis	Close reduction under image intensifier/open reduction to facilitate anatomical reduction of physis to minimize risk of physeal bar. Fixation best accomplished from epiphysis to epiphysis and/or metaphysis to metaphysis
Salter-Harris V	Crush injury to entire physis. Difficult to diagnose, require comparison X-ray or CT scan or MRI	Splintage and close follow up

Note

Fracture of upper extremities and lower limb requires arm sling after reduction and protective walking with crutches, respectively. Immobilize for three to six weeks while assessing sign of healing by imaging.

18.17 Compartment syndrome

Is condition which follow trauma/ repeated strenuous activities causing micro trauma resulting into elevation of the interstitial pressure in a closed Osseo fascial compartment that results in microvascular compromise. Can be acute or chronic.

Clinical Presentation

- History of Trauma or repeated extensive exercises
- Severe pain at rest with any movement, especially passive stretching of the muscles.
- Pain out of proportion to original injury should raise suspicion.
- Paresthesia
- Late stage Pallor, Pulselessness and Poikilothermia

Investigations

- Urine myoglobin
- Urinalysis
- X-ray
- Ultrasound,
- CT,
- MRI
- Measure compartment pressure (Using Tonometer/fiberoptic transducer /Simple needle/Wick Catheter/Slit catheter)
- Complete Blood Count
- Coagulation studies
- Creatine phosphokinase (CPK)
- Serum creatinine
- Serum electrolyte

Non-Pharmacological Management

- Remove Bandages and casts
- Elevate the affected limb to the level of the heart
- Nutritional support
- Early rehabilitation to minimize complications

Pharmacological Management

- Facilitate renal clearance of myoglobin (aim urine output at 1 – 2 mL/kg/hr)
- Infuse intravenous fluids at 500 mL/hr. 0.9% sodium chloride or sodium lactate compound (ringer's lactate)crystalloid solution
- Consider 22.4m Eq sodium bicarbonate to alkalinize urine
- Hemoglobin and myoglobin are more soluble in an alkaline solution.

Antibiotics
B: ampicillin + cloxacillin (FDC) (IV) 1–2g 8hourly for 3days
OR
S: clindamycin (IV) 600mg 8hourly for 3days
AND

Analgesics
A: diclofenac (IM/IV)75mg 12hourly 24-72hours
OR
B: pethidine (IV)100mg 6hourly for 24-72hours
OR
B: tramadol (IM/IV) 50-100mg 8hourly for 24-72hours
Change to oral medication as soon as a patient can tolerate

Prophylaxis medication
Anti-venoms for snake or insect bite and tetanus immunoglobulin and toxoid in case of animal bite or penetrating trauma

Surgical–fasciotomy

- Compartment pressures >30mmHg, is an indication for fasciotomy
- Perform single or two incisions are made to release intra-compartmental pressure depending on the site
- Wounds are often closed by skin grafting.

Note

- Acute compartment syndrome is a surgical emergency which requires surgical management within 6-8hours, patient diagnosed in primary health care facilities should be referred immediately.
- The referring professional should inform the destination hospital (by phone) of the impending transfer.

CHAPTER NINETEEN

METABOLIC AND ENDOCRINE DISEASE CONDITIONS

19.1 Diabetes Mellitus

Diabetes mellitus is a clinical syndrome characterized by persistently high blood glucose values due to deficiency or diminished effectiveness of insulin.

Classification

Diabetes mellitus can be classified as follows:

- **Type 1 Diabetes Mellitus (**T1DM) – due to autoimmune β-cell destruction
- **Type 2 Diabetes Mellitus** (T2DM) – due to a progressive loss of β-cell insulin secretion frequently with underlying insulin resistance
- **Gestational Diabetes Mellitus (**GDM) – diabetes diagnosed at any time of pregnancy that was not clearly overt diabetes prior to gestation
- **Specific types of diabetes** – due to other causes e.g., MODY, LADA, diseases of the exocrine pancreas, endocrinopathies and drugs or chemicals.

Clinical Presentation

- Main clinical features of diabetes are thirst, polydipsia, polyuria, tiredness, loss of weight, blurring of vision.
- Many people have no classical symptoms and may only present late with the symptoms related to complications e.g., pruritus vulvae and balanitis due to infections, paresthesia or pain in the limbs, non-healing ulcers, and recurrent bacterial infections.

WHO diagnostic Criteria 2011

- Fasting plasma glucose level ≥ 7.0 mmol/L (126 mg/dL)
- Plasma glucose≥ 11.1 mmol/L (200 mg/dL) two hours after a 75 g oral glucose load in a glucose tolerance test
- Symptoms of hyperglycemia and random plasma glucose ≥11.1 mmol/L (200 mg/dL)
- Glycated hemoglobin (HbA1c) ≥ 6.5%.

Note: HbA1c is not reliable in individuals with hemoglobinopathies (sickle cell anemia, thalassemia) other types of anemia and other conditions affecting red blood cell lifespan.

19.1.1 Diabetes Mellitus in Pregnancy

Women in early pregnancy with levels of HbA1c≥6.5% or blood glucose levels fasting ≥7.0 mmol/l or two hours ≥11.1 mmol/l which are diagnostic of diabetes should be treated as having pre-existing diabetes (type 1 or type2).

The diagnosis of gestational diabetes mellitus after 15weeks pregnancy should be based on any one of the following values:

- Fasting plasma glucose = 5.1-6.9 mmol/l (92 -125 mg/dl)
- 1-h post 75g oral glucose load >=10.0 mmol/l (180 mg/dl) *
- 2-h post 75g oral glucose load 8.5 – 11.0 mmol/l (153-199 mg/dl)

At risk screening

Early diagnosis and good control reduce the risk of costly complications and reduces the deterioration of islet function in T2DM. The following people should therefore be screened with **fasting blood glucose or HbA1c at least yearly** when they visit health facilities:

- Those aged ≥40 years
- Children and adults <40 years who are overweight or obese and who have two or more additional risk factors for diabetes
- Individuals with **HbA1C 5.7-6.4%, FBG 5.6 to 6.9mmol/(IFG),** 2hour **post OGTT 75g BG 7.8 to 11mmol/l(IGT).**
- People on long-term steroids or immunosuppressants
- Women with a history of gestational diabetes mellitus or polycystic ovary syndrome
- All pregnant women at the first antenatal visit if overweight, have had gestational diabetes, babies with birth weight >4 kg, previous stillbirths or neonatal deaths. Screening should be repeated in the second trimester if negative.
- All women during the 2nd or 3rd trimester (for gestational diabetes

Non- Pharmacological Management

For people who have the above risk factors should be guided on diabetes preventive interventions as below.

- Dietary modification (**see Nutrition chapter 24**)
- Physical activity (**see Nutrition chapter 24**)
- Weight reduction
- Medication with metformin.

Goals of diabetes management

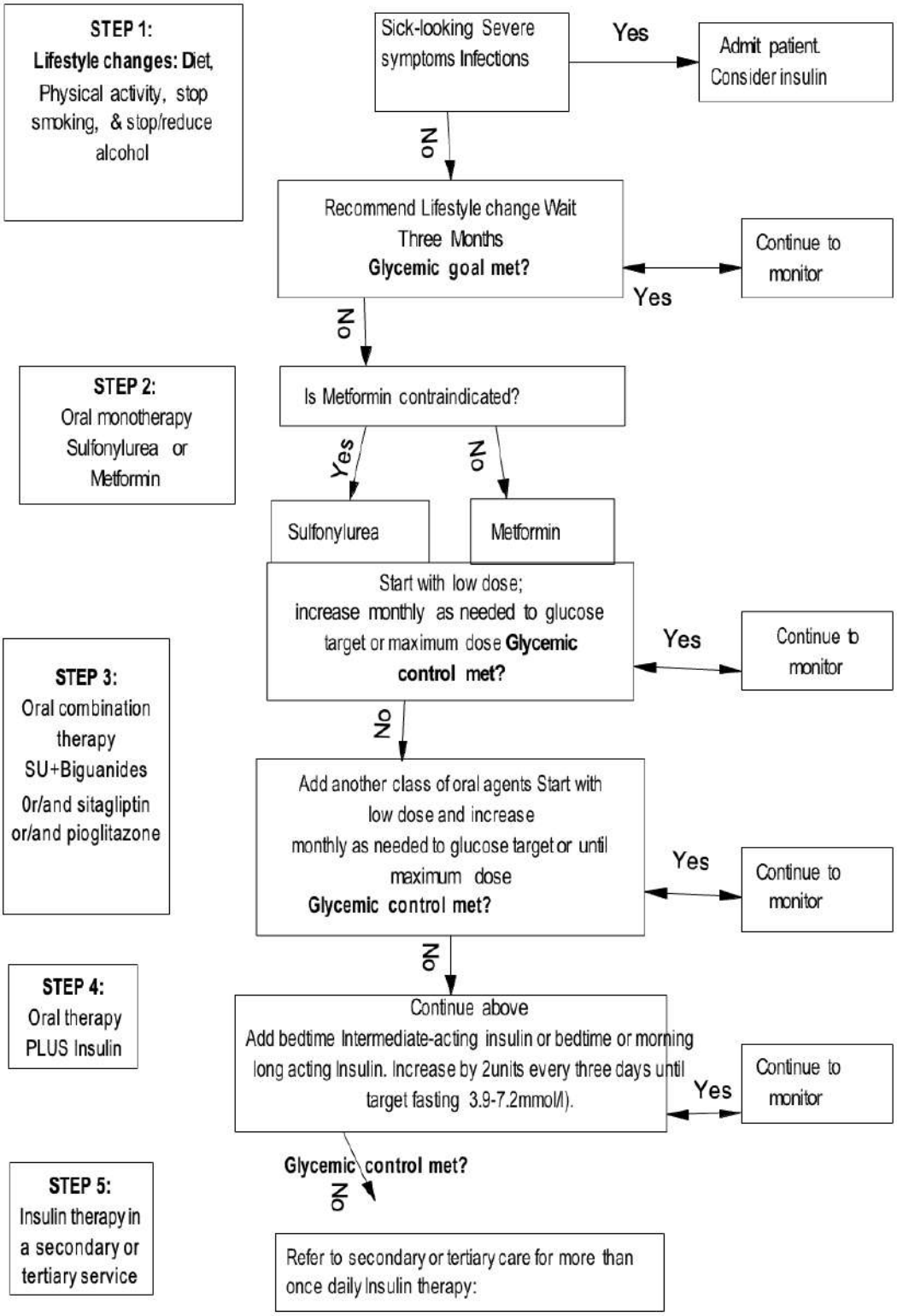
Table 19.1: Goals for Optimum Management of Diabetes

Diet	Advise same as for people without diabetes
Body mass index	Therapeutic goal is 5–10% weight loss for people who are overweight or obese, but aim for BMI<25 kg/m^2
Waist circumference	<102 cm for men, <88 cm for women
Physical activity	At least 30 minutes of moderate physical activity on most days of the week (total ≥150 minutes/week)
Cigarette consumption	0 per day
Alcohol consumption	Not more than 2 standard unit drinks (20 g) per day for men and 1 unit for women
Blood glucose level	Non-pregnant: 4–6 mmol/L fasting; 6–8 mmol/L postprandial Pregnant: ≤5.0 mmol/L fasting, ≤6.7 mmol/L postprandial Self-monitoring of blood glucose is essential to improve outcomes
HbA1c	Target ≤7%. Should be measured every three months until stable, thereafter at least twice a year. For healthy older adults <7.5%. Older adult with multiple coexisting chronic illnesses <8%
Lipids	Total cholesterol: <5.2 mmol/L HDL-C: ≥1.0 mmol/L, LDL-C: <2.6 mmol/L, Triglycerides: <1.7 mmol/L
Blood pressure	Target ≤130/80 mmHg For those with albuminuria/proteinuria, and high CV risk<130/80 mmHg
Urine albumin	Spot collection: <20 mg/L
	Urine albumin-to-creatinine ratio (UACR): women: <3.5 mg/mmol; men: <2.5 mg/mmol

Table:19.2 Healthy Lifestyle Management for Type 2 Diabetes Mellitus (T2DM)

Component	Details
Dietary Control	• Meet requirements for growth, development, physical activity, and maintain desirable body weight (weight reduction in overweight/obese patients). • Achieve and maintain near-normal blood glucose levels to prevent hypo- and hyperglycemia and reduce chronic complications. • Attain optimal lipid and blood pressure control to reduce macrovascular risk.
Dietary Measures	• Each meal should include a variety of foods from core groups: vegetables, fruits, whole grains, proteins (meat/legumes), and dairy. • Distribute food evenly throughout the day with small meals/snacks between main meals.
Food Composition – Protein	• 15–20% of total energy intake (≈1 g/kg/day).
Food Composition – Carbohydrates	• 45–60% of total energy. • Avoid <100 g/day (risk of ketosis). • Synchronize carbohydrate intake with insulin/oral hypoglycemic agents. • Prefer complex carbohydrates (whole grains, cereals, roots, tubers). • Avoid simple sugars, sugar-sweetened beverages, and honey. • Distribute into 3 meals with snacks rather than 1–2 large meals.
Food Composition – Fats	• <30% of total energy intake. • Reduce to ≤20% in obese adults with diabetes.
Salt Intake	• Limit to <1 teaspoon per day.
Physical Activity	• Engage in aerobic exercise (e.g., brisk walking) and muscle-strengthening activities. • Benefits: improved glucose tolerance, energy expenditure, mood, BP, lipid profile, and mobility. • Adjust medication/food intake to prevent hypoglycemia.
Smoking	• Avoid completely.
Alcohol Intake	• Limit to ≤1 drink/day for women and ≤2 drinks/day for men.

Figure 19.1 Algorithm for the Glycemic Management of T2DM



Pharmacological Management

Oral hypoglycemics

- Review the blood glucose at follow-up clinic and adjust medicines as needed until blood glucose is controlled.
- If lifestyle measures on their own fail to achieve blood glucose control or blood glucose levels are persistently high (fasting >11 mmol/l or random >15 mmol/l) initiate:

A: metformin (PO) 500mg 12hourly with or after meals. Increase, as required, until a maximum of 2500mg in 2–3 divided doses.

OR

A: glibenclamide (PO) 2.5–10mg 12hourly

(If Metformin is contraindicated)

OR

A: glimepiride (PO) 1–4mg 12hourly

OR

A: gliclazide (PO) 40–160mg 12hourly

- If the maximum dose of metformin does not result in adequate glycemic control, either one of the above sulphonylureas may be added, starting with the lower dose and increasing until control is achieved or the maximum dose is reached.
- If patient has established atherosclerotic cardiovascular disease, heart failure and chronic kidney disease add SGLT2 inhibitors

S: dapagliflozin (PO) 10mg daily

Other medications that can be used as an add on therapy before insulin

Dipeptidyl Peptidase-4 Inhibitors (DPP4 inhibitors)

May be used as an add-on for patients who need modest additional glucose lowering. They are safe to combine with metformin, thiazolidinedione, insulin, sulfonylurea add SGLT2 inhibitors.

S: sitagliptin (PO) 100mg once a day

Thiazolidinediones

They are commonly prescribed as third line therapy. They offer an advantage in the context of high risk for hypoglycemia, severe insulin resistance (prediabetics), and coexisting nonalcoholic steatohepatitis

D: pioglitazone (PO) 15 - 30mg 24 hourly (max 45/day)

Note

- Activity of sulphonylureas is prolonged in both hepatic and renal failure
- Metformin is contraindicated in those with severe renal, liver and cardiac failure.
- The lower dosage is appropriate when initiating treatment in elderly patients with uncertain meal schedules, or in patients with mild hyperglycemia
- Sulphonylureas are best taken 15 to 30 minutes before meals
- Pioglitazone should be avoided in patients with heart failure, history of fracture or high risk of fracture
- SGLT2 inhibitors have risk for developing euglycemic DKA

If a combination of medicines is still inadequate, then insulin should be added as detailed below in the section on insulin.

Management with Insulin Injection in Type 2 Diabetes

Insulin injections are in T2DM in the following conditions:

- Initial presentation with fasting blood glucose more than 13.9 mmol/random blood glucose >16.7mmol/l, HBA1C>10
- Presentation in hyperglycemic emergency
- Peri-operative period especially major or emergency surgery
- Other medical conditions requiring tight glycemic control
- Organ failure: Renal, liver, heart etc.,
- Diabetes not well controlled with diet or oral drugs
- Latent autoimmune diabetes of adults (LADA)
- Contraindications to oral drugs

Note: The maximum glucose lowering efficacy of oral drugs is usually evident by six months. Therefore, the efficacy of any added therapy must be assessed within six months and an alternative drug instituted in case of failure

Insulin injections should be initiated by a doctor able to fully instruct the patient in its use and how to manage acute changes in plasma glucose. Insulin will be available at lower health facilities for management of stable patients who require prescription refills. Refer to specialist for more than 24 hourly insulin doses.

Table 19.2: Types of Insulin as per WHO Essential Medicine List

Type of Insulin	Name	Basal or short acting
Short acting	**A:** Regular Insulin (human soluble)	Short acting
Intermediate acting	**A:** isophane Insulin	Basal
Pre mixed insulin	**D:**biphasic human insulin regular NPH 30/70	Basal + Short acting
Long-acting insulin	**D:** Long-acting insulin (analogue)	Basal

Insulin as substitution therapy
Oral medicines are discontinued (except metformin if patient is obese, and SGLT2 inhibitors)
D: pre-mixed insulin is introduced at a dosage of 0.2 IU/kg body weight and this is split into:

- ⅔ in the morning and ⅓ in the evening, increase daily dose by 2 to 4 units every two to three days to achieve fasting plasma glucose target (3.9-7.2mmol/l) while avoiding hypoglycemia
- Inject 30 minutes before the morning and the evening meals for human insulin
- Inject 0 to 15minutes before meal for analog insulins.

Basal Bolus Regime:
A: Regular insulin (short acting), should be used as a pre-prandial insulin together with a basal insulin, if glycemic targets are not meet despite adequately titrated basal insulin or when basal insulin dose >0.5units/kg/day.

Insulin as supplemental therapy
Oral medicines are continued (half or stop sulphonylureas dose, monitor blood glucose levels)

A: isophane insulin administered at night before 22:00h at a total daily dose of 0.1–0.2 IU/kg/day. if persistently elevated fasting plasma glucose increase dose by 2 to 4 units every 2 to 3 days to achieve target fasting glucose

D: long-acting insulin (analogue): administered at 10units 24 hourly (morning or bedtime) or 0.1 to 0.2 units/kg 24 hourly. Increase daily dose by 2 to 4 units every two to three days to achieve fasting plasma glucose target.

Self-monitoring in patients with Type 2 Diabetes Mellitus (T2DM)
Self-Monitoring Blood Glucose (SMBG) is usually recommended in the following patients:

- Patients on insulin and glucose lowering agents that can cause hypoglycemia (sulphonylureas)
- When monitoring hyperglycemia arising from illness
- With pregnancy and pre-pregnancy planning
- When changes in treatment, lifestyle or other conditions requires data on glycemic patterns
- When HbA1c estimations are unreliable (e.g. haemoglobinopathies).

19.1.2 Type 1 Diabetes Mellitus (Childhood diabetes)
Type 1 is caused by insulin deficiency following destruction of pancreatic beta cells. One fourth of the cases are diagnosed in adults

Non-Pharmacological Management

- Nutrition (refer to **nutrition chapter 24**)
- Exercise requirements are as for children without diabetes
- Psychological support is important to cope with this chronic illness.
- Hypo-hyper glycemia education needs to be reinforce frequently.

Pharmacological Management

Step 1 Calculate total daily insulin need, generally 0.3 to 1unit/kg/day initially, after honeymoon period its between 0.7-1.5units/kg/day. However individual patient needs should be considered.

Basal -bolus regime

- Basal insulin: Long acting(analogs) or NPH (intermediate acting)
- Bolus insulin: Regular(soluble) or Rapid acting (lispro, aspart, glulisine)
- Estimated dose is adjusted depending on the child's response

Step 2 Calculate basal insulin

- Basal long-acting insulin analog: dose is 40%-50% the TDD, give 24 hourly in the evening
- Basal NPH: two thirds of TDD before breakfast, one third before dinner or at bedtime.

Step 3: Calculate bolus insulin dose
Usually, 50% of the total dose, the dose of insulin given depends on the anticipated carbohydrates, premeal BG as well as exercise activity. Total premeal bolus is the sum of the dose calculated based on ICR plus dose adjusted to correct premeal hyperglycemia. ICR (amount of carbohydrate (grams) covered by 1unit of insulin=450/TDD
Example

- *if TDD is 45units, the I unit of rapid or short acting is estimated to cover 10gram , ICR 1:10, if patient is planned for 40grams of carbs the bolus dose will be 40/10=4units*
- *If the setting is not ideal for this calculation, then the table below can be used for fixed doses and adjustments made according to the child's response.*

Table 19.3: Recommended Insulin Dosage

Time	Type of insulin	Proportion
Break-fast	Short acting or rapid acting	30% of total daily dose
Lunch	Short acting or rapid acting	20% of total daily dose
Supper	Short acting or rapid acting	10% of total daily dose
Bedtime	Long or intermediate acting	40% -50%of total daily dose

Note

- Diabetes in children is often misdiagnosed as some other condition – e.g. as pneumonia or asthma (labored breathing),
- Insulin should be given for life and the dose adjusted according to weight and glucose response
- Self-glucose monitoring by glucometer at home 3-4times/day
- Pre-mixed insulins not advised in children

Clinical monitoring of people with diabetes

Table 19.4: Clinical Monitoring of People with Diabetes

Component	Initial Visit	3-Month Visit	Annual Visit
History & Diagnosis	• Full history and diagnosis	• Relevant interval history	• As per initial visit
Physical Examination	• Height and weight • Waist/hip circumference • Blood pressure • Detailed foot examination • Tooth inspection • Eye examination	• Weight • Blood pressure • Foot inspection	• As per initial visit
Eye Assessment	• Visual acuity + fundoscopy	—	• As per initial visit
Cardiovascular Assessment	• ECG	—	• As per initial visit
Biochemistry	• Blood glucose • HbA1c • Lipid profile (TC, HDLC, LDLC, TG) • Serum creatinine • Urine: glucose, ketones, protein	• Blood glucose • Urine protein • HbA1c every 6 months	• As per initial visit
Education	• Diabetes education	• Reinforce education advice	• Reinforce as per initial visit
Nutrition	• Nutritional advice	• Reinforce nutrition advice	• Reinforce as per initial visit
Medication	• Initiate if needed	• Review and adjust therapy	• Review as per initial visit

TC = Total Cholesterol; HDLC = High-Density Lipoprotein Cholesterol; LDLC = Low-Density Lipoprotein Cholesterol; TG = Triglycerides

Surgery in diabetes General measures

Correct perioperative management depends on type of surgery (major or minor), type of diabetes and recent diabetes control. A perioperative HBA1c, fasting or random blood glucose is recommended to assess glycemic control and identify undiagnosed diabetes

- Surgery should be delayed if possible if HBA1C >9% or blood glucose fasting >10 mmol/l or random glucose > 13 mmol/l.
- Screen for nephropathy, cardiac disease, retinopathy and neuropathy and inform surgical team.
- Optimal glycemic target in the perioperative period should be to maintain blood glucose levels between 7.8-10mmol/l

If diabetes is well controlled and surgery is minor:

- If on oral agent therapy, omit therapy on morning of surgery except SGLTS2 inhibitors which should be stopped 24 to 72hour before surgery and resume therapy when eating normally
- For T1DM, continue with normal basal dose of insulin, the short acting or rapid acting insulins can be given as per correctional scale insulin.
- Decrease the dose of long-acting basal insulin by 20% to 25% the evening before surgery. If they routinely take basal insulin only in the morning, the reduced dose should instead be administered on the morning of surgery.
- In cases of intermediate-acting insulin such as neutral protamine Hagedorn (NPH), the usual dose is administered the evening prior and reduced by 50% on the morning of surgery.
- Patients using premixed insulin (NPH/regular 70/30) should preferably receive long-acting insulin the evening before surgery instead of their premixed formulation. Or reduce the premixed insulin dose by 50%
- Pre-prandial insulin should be stopped; subcutaneous correctional insulin is initiated with blood glucose monitoring every 4 to 6 hours

Table 19.5: Correctional Insulin Scale

BG (mmol/l)	Premeal: Sensitive (BMI <25 or <50 units/d)	Premeal: Average (BMI 25-30 or 50-90 units/d)	Pre-meal: Resistant (BMI >30 or >90 units/d)
7.2- 8.3	0 units	1 unit	2units
8.4-11.1	1 unit	2 units	3units
11.2-13.8	2 units	4 units	6units
13.9-16.0	3 units	6 units	9units

If poor glycemic control or major surgery:

- Use continuous IV insulin infusion, start with half of the patient's usual total daily dose (TDD usually 0.4 to 0.5 U/kg/day) or 1-5 units of regular insulin per hour.
- Monitor blood glucose before, during and after surgery as outlined below: aim for blood glucose levels of 7.8–10 mmol/l.
- Check potassium levels and start potassium infusion as per DKA protocol
- Infuse 0.9% NaCl with D5W IV at 50 mL/hr.

Insulin infusion protocol

Blood glucose (mmol/l)	Initial rate of insulin (unit/hr.)
10-12	1
12.1-14	2
14.1-17	4
>17	5

Adjusting infusion rate according to blood sugar levels, if blood glucose (BG) is:

- < 4mmol/l: stop insulin infusion, administer D50% 50mls iv push stat, continue D 5%infusion at 50ml/hr, monitor blood glucose every 30min, restart insulin at half the initial rate when blood glucose >10mmol/l
- 4.1-6mmol/stop insulin infusion, administer D50% 25mls, continue with D5% at 50ml/hr, monitor sugars every 30min, restart insulin infusion at half the initial rate when BG>10
- 6.1-7.7 continue D5% infusion, decrease insulin infusion to half the initial rate
- 7.8-10 Goal range, no changes, measure BG q1h if three BG are within range then BG q2h.
- 10-15.1 if BG decreases or remains same on check no change in infusion rate, if BG increases on check increase infusion rate by 1unit/hr.
- 15.2-20 if BG decreases or remains unchanged on check, maintain same rate of infusion, if BG is greater than last check increase infusion rate by 2units/hr.
- >20 increase rate by 2units per hour, consider bolus insulin

Continue the infusion until 60 minutes after the first meal. Long acting/intermediate acting insulins can be resumed 2 to 4 hours before stopping the insulin infusion.

19.2 Management of Diabetes during Religious Fasting

There are several types of fasting:

- Normal fast (the common fast): the person abstains from all foods but can take water for a limited time. Or abstain from food and water for a specific number of hours during the day.
- Total fast = total abstinence from both food and water. This should not go beyond a maximum of three days and is not recommended for those people taking insulin secretagogues or insulin.
- Partial fast = abstain from selected foods and drinks, or omit a certain meal each of the fasting days.

19.2.1 Those with very poor glucose control should be discouraged from fasting

- A total fast is not recommended for anyone with high risk. Adequate hydration is important even during the period of fasting.
- For those on insulin, a partial fast is preferred to total or normal forms of fasting.
- Self-blood glucose monitoring is mandatory for people with diabetes who elect to fast.
  - Once-a-day is adequate for patients on diet only or diet with metformin.
  - At least 3 times a day in patients on insulin secretagogues
  - More frequently if hyperglycemia is marked and the urine tested for ketones.
- Consider terminating the fast if frequent hypoglycemia or intercurrent infections.
- Vigorous activity should be avoided during period of fast.
- Ensure ready access to a healthcare provider during the period of fast.

19.2.2. Management of normal fasting for people treated with oral hypoglycemic agents

- Fasting is possible in this situation.
- Usual dietary advice should be followed at this time.
- Patients on metformin, alpha-glucosidase inhibitors and thiazolidinediones can continue taking the usual doses at the time of breaking the fast and before dawn (if they have another meal at that time).
- If on a second or third generation sulphonylureas (glibenclamide, gliclazide, glipizide, glimepiride), this should be taken at the time of breaking the fast and not before dawn.

19.2.3 Management of normal fasting for T2DM patients on insulin

- If on 24 hourly insulin before bed, this can be given as usual
- If on 12 hourly short- and intermediate-acting insulin:
  - Before the dawn meal, give the usual evening dose of short-acting insulin without any intermediate-acting insulin.
  - Before the evening meal give the usual morning dose of short-acting and intermediate-acting insulin.
- If on basal bolus regimen:
  - Usual doses of the short-acting insulin can be given before the dawn and evening meals, and usual doses of the intermediate-acting insulin can still be given at 10pm.
  - Regular SBGM is essential to ensure prevention of hypoglycemia
  - Titration of doses should occur according to SBGM results.
- Neither the insulin injection nor the breaking of the skin for SBGM will break the fast.

Management of other fasting types

Table 19.6: Types of Fasting and Recommended Diabetic Treatment

Treatment regimen	Fasting regimen	When to take antidiabetic agents
Diet only	Total, normal of partial fast	Not applicable
Metformin, Thiazolidinediones	Normal or partial fast	With meals
Insulin secretagogues Sulphonylureas	Partial fast	Before meals
Daily intermediate or long-acting insulin	Partial fast	Before first meal
Multiple insulin doses using intermediate and short acting insulin	Avoid fasting	Not applicable
Long-acting plus bolus fast acting insulin	Avoid fasting or partial fast	Lantus am and analogue with meals

19.3 Hyperglycemia in Pregnancy

Gestational Diabetes Mellitus (GDM) is any degree of glucose intolerance first recognized in pregnancy. Diabetes in pregnancy refers to those with pre-existing diabetes, whether diagnosed or not.

Screening at first antenatal visit

Perform screening in all women at the first antenatal clinic attendance if they have:

- BMI > 30 kg/m2
- Previous history of GDM
- Previous big baby >4000g
- Poor obstetric history
- family history of DM
- Older maternal age>35
- Known impaired glucose tolerance (plasma glucose 7.8-11mmol/l 2hrs after 75 OGTT)
- Impaired fasting glucose (fasting plasma glucose 5.6-6.9mmol/l).
- Grand multipara
- Glycosuria.
- PCOS

Screening later in Pregnancy

- All women with risk factors (see above) should have a 75 g OGTT at 24–28 weeks. Or earlier as per the clinician.
- A fasting plasma glucose at 24–28 weeks is recommended in low-risk women

Non-Pharmacological Management

All diabetic women intending to become pregnant should:

- Be encouraged to achieve excellent glycemic control using glucose monitoring of both fasting and postprandial values
- Be prescribed high-dose (5mg) pre-pregnancy folate supplementation, continuing up to 12 weeks' gestation
- Have an eye exam and be informed of the risk of developing and/or progression of diabetic retinopathy
- Have a kidney assessment (random urine albumin/creatinine ratio and serum creatinine) and referred if urine protein ≥ 1g.
- A combined health-care team (obstetrician, diabetologist or internist, diabetes educator, pediatrician/neonatologist) is required.
- Review SMBG, blood pressure and urine protein and ketones by dipstick at each visit and eye examination in each trimester.
- Target glycaemia:
  - Pre-prandial blood glucose 3.5–5.5mmol/L
  - Postprandial blood glucose 5–7.5mmol/L
- Lifestyle management is the preferred means of managing gestational diabetes.
  - Diet is based on the principles of optimal nutrition and controlled weight gain.
  - Exercise can be helpful in lowering BG levels: the most acceptable form of exercise for most women is walking in their normal daily routine.
- Glucose-lowering therapy should be considered in addition to diet where fasting or two hours glucose levels are above target, for example, where two or more values per fortnight are:
  - Fasting or pre-prandial ≥5.5 mmol/L, or two hours postprandial ≥7 mmol/L at ≤35 weeks
  - Fasting or pre-prandial ≥5.5 mmol/L, or two hours postprandial ≥8 mmol/L at >35 weeks
  - Any postprandial values are >9 mmol/L.
- When pharmacologic treatment of gestational diabetes is indicated, insulin and oral medications are equivalent in efficacy, and either can be an appropriate first-line therapy.

Pharmacological Management

A: metformin (PO) 500mg 12hourly, maximum 2000mg in 2–3 divided doses

OR

A: glibenclamide (PO) 2.5mg 24hourly to a maximum of 10mg daily

Note:

- Oral hypoglycemics (except for metformin and glibenclamide) are contraindicated in pregnancy
- Glibenclamide can cause hypoglycemia for the new born.

S: Insulin

Insulin dose should be tailored to achieve target BG levels, use of human insulins minimizes transplacental transfer of insulin antibodies, but insulin analogs like lispro, aspart, glulisine and glargine have also been deemed safe for use in pregnancy. Insulin regimes are as per adult insulin regimes.

Postnatal Follow Up

- Women with gestational diabetes should be screened at 6–12 weeks postnatal to ensure return to normal glucose tolerance. Thereafter, a 1–2 yearly follow up is recommended.
- Metformin, glibenclamide and insulin may be used even if a woman is breastfeeding. Encourage women to breastfeed.
- If retinopathy, check eyes 1 year postpartum

19.4 Diabetes and HIV

The management of people with both diabetes and HIV need to consider the following:

- ARVs are associated with increased metabolic dysfunction, including insulin resistance, dyslipidemia and lipodystrophy
- Protease inhibitors (PIs) increase insulin resistance and reduce insulin secretion by interfering with GLUT–4 mediated glucose transport
- Standards of treatment and management of diabetes for patients with HIV are generally the same as those for diabetic patients without HIV and patients who acquire HIV may continue to be managed with the same drug therapy as before
- Sulfonylureas may not be effective in the face of severe insulin resistance. In case
- Glycemic control deteriorates, insulin should be initiated, rather than increasing dosage or number of oral medications
- People who are on ARTs need to be screened for diabetes at least once a year and especially if they have other CVD risk factors

19.5 Diabetes and Tuberculosis

Diabetes and tuberculosis are interlinked as follows:

- People attending TB clinics should be screened for diabetes and those attending diabetes clinics should be screened for TB if presenting with symptoms.
- Diabetes may be associated with delayed sputum conversion (>60 days), higher probability of tuberculosis treatment failure, higher recurrence and relapse rates, higher overall mortality, higher rates of multi-drug resistance TB and more atypical presentation in hyperosmolar hyperglycemic nonketotic coma or ketoacidosis
- For both conditions, controlling blood sugar, being more physically active, avoiding chronic stress, getting enough sleep and maintaining ideal weight are recommended.

Review Drug Requirements

- Rifampicin is a potent hepatic enzyme-inducing agent, accelerates the metabolism of oral hypoglycemic agents and shortens the plasma half-life of sulphonylureas
- Isoniazid antagonizes sulphonylureas, impairs insulin release and action and leads to increased requirement of insulin and oral antidiabetic medication
- Therefore, people with diabetes may require an increase in dosage of antidiabetic medication if they develop tuberculosis.

Use Oral Antidiabetic Medicines Carefully in Tuberculosis

- People with diabetes mellitus and tuberculosis should be treated with insulin injection, or in case a diabetic with tuberculosis is on oral hypoglycemic agents, it may be necessary to switch to insulin.
- Tuberculosis affects both the liver and pancreas: oral antidiabetic drugs are contraindicated in hepatic disease, which is a common adverse effect of antituberculosis therapy.
- Metformin produces weight loss, particularly in high doses, and it is also an anorectic.
- Marked weight loss and higher insulin and caloric needs in tuberculosis are other important indications for reviewing oral antidiabetic therapy in diabetes mellitus.

19.6 Hypoglycemia

Hypoglycemia is defined as blood glucose <3.9mmol/L.

Clinical Presentation

- Hunger
- Sweating
- Trembling or shaking
- Anxiety
- Dizziness
- Lightheadedness
- Palpitation
- Numbness around the lips and fingers
- Headache
- Confusion
- Lack of concentration
- Weakness
- Changes in behavior (e.g. irritability, tearfulness, crying), paranesthesia.

Patients may also present with convulsions, seizures or coma due to delayed corrective action or impaired hypoglycemia awareness where the patient loses the ability to detect the early symptoms of hypoglycemia due to repeated episodes of mild hypoglycemia or long duration of diabetes leading to loss of adrenergic and glucagon response, with eventual loss of adrenergic and neuroglycopenic symptoms.

Non-Pharmacological Management

For Conscious Patients, should be advised to
Quickly take a glass of a sugar-rich drink

OR

Eat one table spoon of sugar or honey

AND

Have a meal.

If symptoms persist after 5 minutes repeat the above.

Pharmacological Management

For unconscious Patients:
C: dextrose 50% (IV) (40-50ml) (not for pediatrics)

OR

A: dextrose 10% (IV) (200–300ml).
Repeat if patient is not responsive or if after 15 minutes, the blood glucose is still below 4mmol/l. Followed by 8–10 % glucose infusion.
Use
A: dextrose 5%if the higher concentrations are not available.

OR

S: glucagon (IM or SC) 1mg stat adults, children/adolescents 0.02 -0.03mg/kg/dose may be repeated after 15min

Neonatal hyperinsulinemia hypoglycemia 1mg/dose (SC) stat, continuous IV infusion 1-20mcg/kg/hour. Refer to neonatal chapter for diazoxide

Note: If IV access is impossible, consider nasogastric tube or rectal glucose

On Recovery

- Give long-acting carbohydrate snack e.g. a piece of bread
- Identify the cause of hypoglycemia and correct it
- If hypoglycemia is a result of long acting sulphonylureas, insulin or alcohol, frequently monitor blood glucose (2hourly) and give IV dextrose infusion (5–10%) for 12– 24 hours
- If patient is not responding look for another cause or refer.

19.7 Diabetic Ketoacidosis and Hyperosmolar Hyperglycemic States

These are acute metabolic complications of diabetes mellitus that may lead to severe dehydration, altered level of consciousness and electrolyte imbalance. The presence of acidosis, ketonemia and ketonuria in diabetic ketoacidosis (DKA) differentiates it from hyperglycemic hyperosmolar state (HHS).

Clinical Presentation

- Nausea/vomiting
- Shortness of breath
- Obtundation/drowsiness
- Thirst/polyuria
- Fruity smelling breath
- Confusion
- Abdominal pain
- Fever
- Altered mental function
- Dehydration
- Lethargy
- Coma

Note

- When you suspect DKA, confirm diagnosis immediately
- All patients with confirmed DKA should be admitted to hospital for close monitoring and appropriate management; severe cases require high-dependency or intensive care.

Table: 19.7: Diagnostic Criteria for DKA and HHS

Parameter	Mild DKA	Moderate DKA	Severe DKA	HHS
Blood Glucose	>13.9	>13.9	>13.9	>30
Arterial PH	7.25-7.3	7.00-7.24	<7.00	>7.30
Serum bicarbonate	15-18	10-15	<10	>18
Urine ketones	Positive	Positive	Positive	Small
Serum ketones	Positive	Positive	Positive	Small
Serum osmolality	Variable	Variable	Variable	>320
Alteration in sensorium	Alert	Alert/drowsy	Stupor/coma	Stupor/coma

Investigations

Apart from the ones in the table above, check serum electrolytes, urea and creatinine.

Non-Pharmacological Management

Management of DKA and HHS is similar.

- Frequent monitoring of patients
- Improvement of circulatory volume and tissue perfusion
- Careful search and management of the precipitating causes With proper treatment, the average time to resolution is between 10–18 hours for DKA and 9–11 hours for HHS.

Pharmacological Management

- Replacement of electrolyte losses (potassium)
- Administration of insulin

Fluid management protocol

The first step - infusion of isotonic saline to expand extracellular volume and stabilize cardiovascular status. Fluid replacement alone results in:

- Improvement of hyperglycemia, reduce insulin resistance
- Lowering the plasma osmolality,
- Reducing vasoconstriction and improving perfusion,
- Restores renal perfusion
- Reduce insulin resistance by ↓ stress/counterregulatory hormone levels
- Both DKA and HHS patients have severe volume depletion -- estimated water deficit of 100mls/kg body weight
- Usual initial fluid → isotonic saline (0.9% NaCl)
- Optimal rate of fluid infusion depends on the clinical state of the patient. On average 15 to 20 ml/kg/hour (about 1000 ml/hour) max. <50ml/kg in the first four hours.

When volume deficit is corrected adjust iv isotonic saline to 250 to 500ml/hr. if serum sodium is high switch to half saline.

Electrolyte management protocol

Almost all patients with DKA or HHS have a substantial potassium deficit.

- Acidosis –shift to extracellular
- Urinary losses related to the glucose osmotic diuresis
- Secondary hyperaldosteronism.
- Loss is high 3-10mEq/kg

Despite total body potassium deficit, concentration is usually normal or elevated due to

- Insulin deficiency and hyperosmolality
- Both result in potassium movement out of the cells
- Insulin treatment reverse distribution

Establish adequate kidney function urine output>50ml/hr. If Patient is oliguric give KCL when K <4 or ECG signs of hypokalemia (U wave)

Table 19.8: Potassium Repletion in DKA and HHS

K^+>5.2 mEq/L	Do not give K^+ initially, but check serum K^+ with basic metabolic profile every 2 hours
K^+<3.3 mEq/L	Hold insulin and give K^+ 20-30 mEq/hr until K^+>3.3 mEq/L
K^+ = 3.3-5.2 mEq/L	Give 20-30 mEq K^+ in each L of IV fluid to maintain serum K^+ 4-5 mEq/L

Insulin therapy management protocol

Continuous IV infusion of regular insulin is the treatment of choice

- Correct hypovolemic shock and hypokalemia if present, before starting insulin

Insulin therapy

- Lowers serum glucose concentration (↓ hepatic glucose production>> ↑ peripheral utilization)
- Diminishes ketone production (reducing both lipolysis and glucagon secretion)
- Augment ketone utilization.

Conventional Insulin Guidelines

Both HHS and moderate to severe DKA

- IV bolus of regular insulin (0.1 U/kg body weight) followed by a continuous infusion of regular insulin of 0.1 U/Kg/hour = 7 U/hour in a 70 kg patient
- Alternatively, omit bolus dose →continuous IV infusion of regular insulin at a rate of 0.14 U/kg per hour (equivalent to 10 U/hour in a 70 kg patient), Reduce rate to 0.05units/kg/hr when SBG<13.9mmol/l
- bolus insulin is a priming dose, saturates insulin receptors before continuous insulin, avoid lag time in achieving steady state insulin levels
  - In practice -100iu in 100mls of NS titrate in 5-7cc/h in the first 24hours

    OR
  - 60iu in 60mls of NS titrate 6-7cc/hour in 24hours
- Insulin dosing is the same in DKA and HHS
- If plasma glucose does not decrease by 2.8-4.2mmol/l in the first hour, increase the infusion rate of insulin by 50% to 100%
- Optimal rate of glucose declines 5.5mmol/l/hour
- Keep serum glucose. Between 8.3 to 11.1mmol/l until resolution of DKA
- It takes 12-24 hours to clear ketones from circulation after hyperglycemia is controlled

Resolution criteria

Venous ph.>7.3, serum bicarbonate >18mmol/serum glucose <11.1mmol/l

For children

Detailed management of DKA is presented in the algorithm for management of pediatric diabetic ketoacidosis in low resource center below. Further details can also be found in chapter 1(Emergency Medicine)

Severity of DKA

- Mild: pH 7.2-7.3, bicarbonate 10 to 18mEq/l
- Moderate: pH 7.1 to7.2, bicarbonate 5 to 10mEq/L
- Severe: pH <7.1, bicarbonate <5mEq/l
  - Average fluid deficit is approximately 7% i.e. 70ml/kg(range 30 to 100ml/kg)
  - Give NS or RL 10ml/kg (mild DKA)-20ml/kg (moderate/severe DKA) as an I.V infusion over 20 to 30min.Give additional boluses, if necessary, based on the cardiovascular status. If glucose <13.9-16.7mmol/l change fluid to 5%dexstrose.
  - Fluid Requirements = DEFICIT + 48 hours' maintenance

Table: 19.9: Maintenance Fluid

Age (years)	Weight (kg)	Maintenance fluid (ml/kg/day)
<1	3-9	80
1-5	10-19	70
6-9	20-29	60
10-14	30-50	50
>15	>50	30

Electrolytes:

Sodium levels are generally low due to hyperglycemia; it should rise as hyperglycemia corrected. high levels may be due to water loss.

Potassium: (Infusion rate 0.5mEq/kg/hr)

- o <3.5mEq/L add 40mEq/L of KCL to 1L saline, delay insulin therapy.
- o 3.5 to 4.5mEq/l add 40mEq/l of KCLto 1L saline when insulin therapy is started.
- o >4.5mEq/L-monitor every hour and begin potassium as above

Serum electrolytes should be monitored q2h initially, then 4 to 6 hourly later)

Insulin:
After the initial fluid bolus start insulin (rapid or regular) infusion at (0.05-0.1units/kg/hour.1ml of saline should contain 1unit of insulin. If iv insulin is not available Sc insulin regime (0.1 unit's/kg rapid acting every one to two hours, regular insulin every three to four hrs.) can be used.

Cerebral injury
Monitor neurological status first 12 to 24, suspicious symptoms include changes in mental status, new or worsening headache, recurrence of vomiting and age-inappropriate incontinence. Initiate treatment promptly with 0.5 to 1g/kg of mannitol if cerebral injury is suspected. CT when stable.

19.8 Diabetes and Cardiovascular Diseases

Diabetic patients are 2–4 times likely to develop cardiovascular diseases mainly due to atherosclerosis and hypertension.

The clinical spectrum of cardiovascular diseases includes:

- Coronary heart disease
- Angina (which may be silent)
- Acute coronary artery syndrome
- Congestive cardiac failure
- Sudden death
- Cerebral vascular accident (stroke, transient ischaemic attacks and dementia)
- Peripheral vascular disease (intermittent claudication, foot ulcer and gangrene).

Assessment (annual)

- ECG, Chest X-Ray, if with symptoms/signs of heart failure.
- Peripheral vascular disease evaluation includes doppler and angiography of lower limbs.

Pharmacological Management
Acute coronary syndrome
All adults with T2DM and recent acute coronary syndrome and/or coronary stent should receive dual anti-platelet therapy for 12 months after the event or procedure:

A: acetylsalicylic acid (PO) 75–100mg 24hourly
AND
D: clopidogrel (PO) 75mg 24hourly

Note:

- Acetylsalicylic acid is also indicated for primary prevention for people with T2DM >40years with family history of ischemic heart disease (IHD), cigarette smoking, obesity, proteinuria, or dyslipidemia.
- It is contraindicated in peptic/duodenal ulcer, dyspepsia, heartburn, malignant hypertension, hemorrhagic stroke.

Hyperlipidemia

Statin therapy results in a significant decrease in CVD morbidity and mortality in T2DM and are indicated in Type 2 diabetics > 40 years of age, or diabetes for > 10years

B: atorvastatin (PO) 10mg 24hourly. Dose may be increased to 80mg daily if required.
OR
S: rosuvastatin (PO) 10mg 24hourly. Dose may be increased to 40mg daily if required

- Fenofibrate reduces incidence of retinopathy and need for laser surgery, peripheral neuropathy, and improvement in proteinuria, suggesting a more generalized effect on microvascular disease independent of dyslipidemia.
- Fibrates:
    - o Should be used in mixed hyperlipidemias which have not responded adequately to diet or other therapy.
    - o Are more effective in lowering triglycerides and increasing HDL, but less effective in lowering cholesterol.
    - o Should be used with caution in combination with statins.
    - o Can enhance the effects of warfarin and antidiabetic agents
    - o Are contraindicated in patients taking Orlistat.

D: fenofibrate (PO) 67–267mg 24hourly

Hypertension
In people with T2DM, antihypertensive therapy with an angiotensin receptor blockers (ARB) or angiotensin-converting enzyme inhibitors (ACEI) decreases the rate of progression of albuminuria, promotes regression to normal albuminuria and may reduce the risk of decline in renal function.

Therefore:
BP-lowering therapy in people with diabetes should preferentially include an angiotensin converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB) e.g.

C: enalapril (PO) 10 – 40mg 24hourly, taken either as a single dose or two divided doses (enalapril (PO) 5 mg–10mg 12hourly)

OR

C: lisinopril (PO) 5-10mg 24hourly

Alternatively

B: losartan (PO) initial dose 50mg stat. Maintenance dose; losartan (PO) 50–100mg 24 hourly in single or 2 divided doses.

OR

S: candesartan (PO) 8-16mg 24hourly

- It is reasonable to target BP levels of <130/80 mmHg for people with diabetes.
- Combining an ARB and an ACEI is not recommended.
- If monotherapy does not sufficiently reduce blood pressure review management of hypertension in cardiac chapter 20 to add other medications.

19.9 Diabetic Peripheral Neuropathy

All patients should be screened for distal symmetric polyneuropathy starting at diagnosis of T2DM and at least annually thereafter.

Clinical Presentation

- A combination of typical symptoms with typical signs as outlined in the table below, particularly symmetric distal sensory loss.
- Typical signs on examination in the absence of symptoms or with only presence of painless foot ulcer

Table 19.10: Clinical Features of Large Vs Small Nerve Fiber Neuropathy

Component	Large Myelinated Nerve Fibers	Small Myelinated Nerve Fibers
Function	• Pressure sensation • Vibration • Proprioception (balance)	• Nociception (pain) • Temperature sensation • Protective sensation
Symptoms	• Numbness • Tingling • Poor balance / unsteady gait	• Pain (burning) • Electric shock–like sensations • Stabbing pain
Clinical Examination	• Ankle reflexes: reduced/absent • Vibration perception: reduced/absent • 10 g monofilament: reduced/absent • Proprioception: reduced/absent	• Thermal (cold/hot) discrimination: reduced/absent • Pinprick sensation: decreased or absent

Pharmacological Management

It is difficult to treat. Some of the drugs used include:

D: pregabalin (PO) 75-150mg (24hourly–12hourly) for 4weeks, increase based on response and tolerability max 600mg.

OR

D: gabapentin (PO) 100-300mg (24hourly – 8hourly), increase dose as per response and tolerability max 3.6g

Tricyclic antidepressants may help

A: amitriptyline (PO) 25-75mg 24hourly

OR

C: imipramine (PO) 100mg 24hourly

Gastroparesis

Due to autonomic neuropathy

B: metoclopramide (PO) 10mg 8hourly

OR

D: domperidone (PO) 10mg 8hourly

Diabetic Foot:

Give foot care education and advice on appropriate footwear.

19.10 Diabetic Nephropathy

It is one of the most important causes of chronic renal failure. Persistent microalbuminuria is both a marker for the development of overt nephropathy and cardiovascular risk. Patients with microalbuminuria who progress to macroalbuminuria (>300 mg/24 h.) are likely to progress to end– stage renal disease over a period of years. Patients with diabetes and chronic kidney disease (CKD) should be treated with a comprehensive strategy to reduce risks of kidney disease progression and cardiovascular disease.

Non-Pharmacological Management
Patients with diabetes and CKD should be advised to Intensify management of modifiable risk factors that include :-

- Stop smoking.
- Treat urinary infection aggressively.
- Avoid drugs toxic to the kidney.
- Consume an individualized diet high in vegetables, fruits, whole grains, fiber, legumes, plant- based proteins, unsaturated fats, and nuts; and lower in processed meats, refined carbohydrates, and sweetened beverages
- Undertake moderate-intensity physical activity for a cumulative duration of at least 150 minutes per week, or to a level compatible with their cardiovascular and physical tolerance

Pharmacological Management
Renin–angiotensin system (RAS) inhibition is recommended for patients with albuminuria and hypertension

- Most patients with T2D, CKD, and eGFR => 30 ml/min per 1.73 m2 would benefit from treatment with both metformin and an SGLT2i.
- Patient preferences, comorbidities, eGFR, and cost should guide selection of additional drugs to manage glycemia, when needed, with glucagon-like peptide-1 receptor agonist (GLP-1 RA) generally preferred.

A: metformin (PO) 500mg or 850mg (12hourly – 24 hourly); usual maintenance dose: 1g 12hourly

SGLT-2 Inhibitors
S: dapagliflozin (PO) 10mg 24hourly
OR
DPP4 Inhibitors are also safe for use,
S: sitagliptin (PO) 100mg 24hourly:
eGFR 30-45 50mg 24hourly eGFR<30 25mg 24 hourly

If very poor sugar controls, then insulin should be initiated but with caution due to poor insulin clearance in CKD. Insulin regime refers to previously outlined recommendation.

- Monitor serum creatinine and potassium annually and more frequently if there is evidence of renal impairment.
- Hyperkalemia associated with the use of an ACEI or ARB can often be managed by measures to reduce serum potassium levels rather than decreasing the dose or stopping the ACEI or ARB immediately
  > Avoid potassium-containing salt substitute or food products containing the salt substitute.
  > Avoid drugs that can impair kidney excretion of potassium: over-the-counter nonsteroidal anti-inflammatory drugs, supplements, and herbal treatments
  > Avoid constipation by ensuring enough fluid intake and exercise.
  > Consider diuretics treatment to enhance the excretion of potassium in the kidneys especially when there is concomitant volume overload or hypertension.
  > Consider oral sodium bicarbonate especially in patients with CKD and metabolic acidosis.
- Metformin should not be used once the eGFR<30
- Treat blood pressure aggressively with target of <130/80 mmHg.
- Add diuretics if necessary (but in large doses inhibit insulin release

19.11 Diabetic Retinopathy

It is one of the major causes of blindness. Poor glycemic control, nephropathy, hypertension and pregnancy, long duration of diabetes are among the risk factors. It is preventable and its progression retarded by improved glycemic control and blood pressure. Screening for early detection and laser therapy can prevent blindness

Screening for Diabetic Retinopathy
For all people with diabetes, yearly screening is necessary for early detection of ocular complications. The screening should begin:

- Comprehensive eye examination in woman planning pregnancy, and during the first trimester, preferably at booking of antenatal clinic (ANC). Further screening should be determined by the degree of retinopathy detected at the initial appointment.
- Five years after the diagnosis of diabetes for individuals with Type 1 diabetes diagnosed after puberty (around 14years).
- At puberty for individuals diagnosed with type 1 diabetes before puberty
- At the time of diagnosis of diabetes for individuals with type 2 diabetes

For each of the scheduled screening visits, detailed patient's assessment should include a complete ophthalmic examination in the following steps:

- Take visual acuity (VA) without and with spectacles
- If VA less than 6/9 take VA with pin hole
- Dilate the pupil by using the mydriatic agents (Tropicamide)
- Identify presence of cataract or other causes of media opacification.
- Perform retinal evaluation by direct or indirect Ophthalmoscope or Fundus Photography
- Identify retinal changes, document and if applicable grade the diabetic retinopathy and maculopathy as shown in **Table 19.11**
- Explain the results of screening to the patient and schedule rescreening (**Table 19.11)**

Table 19.11: Classification and Management of Diabetic Retinopathy

Grade	Features	Outcome / Action
R0	No disease	Rescreen in 12 months
R1	Mild background DR: • Microaneurysms • Flame hemorrhages/exudates • >4 blot hemorrhages in one or both hemifields • Cotton wool spots	Rescreen in 12 months
R2	Moderate background DR: • >4 blot hemorrhages in one hemifield	Rescreen in 6 months
R3	Severe non-proliferative (pre-proliferative) DR: • >4 blot hemorrhages in both hemifields • Intraretinal microvascular anomalies (IRMA) • Venous beading	Refer to Eye Clinic
R4	Proliferative DR: • Neovascularization of the disc (NVD) • Neovascularization elsewhere (NVE) • Vitreous hemorrhage • Retinal detachment	Refer to Eye Clinic
M0	No macular involvement	Rescreen in 12 months
M1	Hard exudates within 1–2 disc diameters of fovea	Rescreen in 6 months
M2	Blot hemorrhage or hard exudates within 1 disc diameter of fovea	Refer to Eye Clinic
P0	No previous photocoagulation (laser absent)	Refer to Eye Clinic
P1	Photocoagulation present or absent (evidence of PRP or grid laser)	Refer to Eye Clinic
U	Unclassifiable: • Cataract • Small pupil • Vitreous hemorrhage • Tractional retinal detachment • Corneal opacity	Refer to Eye Clinic

Key: R=Retinopathy; **M**=Maculopathy; **P**=Photocoagulation, **U**=Unclassified, At all times, remind patients to stop smoking and intensify blood pressure, lipids and glycemic control.

19.12 Thyroid Disorders

Thyroid disorders are conditions that affect the thyroid gland. There are specific kinds of thyroid disorders that includes hypothyroidism, hyperthyroidism, goiter, thyroid nodules and thyroid cancer.

19.12.1 Hypothyroidism

Hypothyroidism is a condition in which a person's thyroid hormone production is below normal. Common causes of the disease are chronic autoimmune thyroiditis, post-surgery and post radioactive iodine. For neonatal hypothyroidism refer to neonatal chapter.

Clinical Presentation

- Increased cholesterol levels,
- Depression
- Fatigue
- Hair loss
- Memory loss
- Dry, rough skin
- Constipation
- Hoarse voice

Investigations

- TSH should not typically be measured in seriously ill patients unless there is a strong suspicion of thyroid dysfunction. If TSH is elevated, it should be repeated together with free thyroxine (FT4) for confirmation.
- If TSH high, FT4 is low-overt hypothyroidism
- TSH high, normal Ft4-sublinical hypothyroidism

Indications for Treatment

All patients with overt hypothyroidism should be treated regardless of symptoms, unless the hypothyroidism is transient (painless thyroiditis or subacute thyroiditis.

- TSH level persistently >10mU/L; treat all patients due to, increased likelihood of progression to overt disease and a higher risk of congestive heart failure, cardiovascular disease and mortality.
- TSH levels (4.5–10mU/L); consider, treatment in patients younger than 65 with increased cardiovascular risk (e.g., previous cardiovascular disease, hypertension, documented diastolic dysfunction, atherosclerotic risk factors (dyslipidemia, diabetes mellitus, smoker), goiter, positive antithyroid peroxidase antibodies, evidence of autoimmune thyroiditis by ultrasound, pregnancy, or infertility), particularly when TSH level is persistently >7mU/L.
- Levothyroxine therapy could be considered also for symptomatic middle-aged patients for a short period of time. If a clear beneficial effect is observed, levothyroxine therapy could be maintained.
- Persistently mildly increased TSH levels (>4.5–10mU/L) with positive Thyroid Antibody and thyroid sonographic findings typical of autoimmune thyroiditis.

Pharmacological Management
Initial dose:
Clinical hypothyroidism
D: levothyroxine (PO) 1.6–1.8µg/kg ideal body weight 24hourly

Subclinical hypothyroidism
D: levothyroxine (PO) 1.1–1.2µg/kg is recommended 24hourly

- Take at least after 2hours fast, 30minutes before food intake. Alternatively, at bedtime (3 or more hours after the evening meal).
- When initiating therapy in young healthy adults with overt hypothyroidism, consider beginning treatment with full replacement doses
- Routine use of combined therapy with levothyroxine and triiodothyronine for hypothyroid patients is not recommended
- Assess TSH and adjust dosage when there are large changes in body weight, with aging, and with pregnancy.
- There is no convincing evidence to support routine use of thyroid extracts, L-T3 monotherapy, compounded thyroid hormones, iodine containing preparations, dietary supplementation, and over the counter preparations in the management of hypothyroidism.

Monitoring
- TSH monitoring 6–8weeks after any levothyroxine dose change, and yearly life–long monitoring once euthyroid is achieved (target TSH 0.2–4.0um/l). FT4 can be measured in early stages of treatment.
- In patients with central hypothyroidism, assessments of serum free T4 should guide therapy and targeted to exceed the mid normal range value for the assay being used.
- Wait for TSH equilibration–TSH equilibration requires eight to 12 weeks after any thyroxine dosage change. Once a stable dose is achieved–yearly TSH is sufficient.

In Pregnancy
When the elevation of the TSH level is confirmed, free T4 should be measured in order to classify the hypothyroidism as clinical or overt (OH) and subclinical (SH).
- TSH > 2.5–4.0mU/L or with normal free T4: SH.
- TSH > 2.5 –4.0mU/L with low levels of free T4: OH.
- TSH =10.0mU/L, despite the level of free T4: OH

Women in reproductive period should be euthyroid before conceiving, as the hypothyroidism is associated with neural development. Dose may be doubled during pregnancy and returned to normal dose after deliver

19.12.2 Hyperthyroidism

Hyperthyroidism is a condition in which an overactive thyroid gland is producing an excessive amount of thyroid hormones that circulate in the blood. Graves' disease, multinodular goiter (TMNG), inflammation of the thyroid gland (thyroiditis) and excessive iodine intake are the most common cause of hyperthyroidism.

Clinical Presentation
- Tremors
- Excessive sweating
- Smooth velvety skin
- Fine hair
- A rapid heart rate
- An enlarged thyroid gland
- Frequent bowel movements

Investigations
- Baseline complete blood count, including white count with differential, and a liver profile (bilirubin and transaminases)
- Differential white blood cell count should be obtained during febrile illness and at the onset of pharyngitis in all patients taking antithyroid medication. Routine monitoring of white blood counts is not recommended
- Test for THS and T4
- When thyrotoxicosis is confirmed, if cause is not known request thyroid uptake scan

Note: Management of hyperthyroidism depends on the cause

19.12.3 Toxic Multinodular Goiter or Thyroid Antibody Positive

Patients with overtly Toxic multinodular goiter or Thyroid antibody are treated with either:

Non-Pharmacological Management
S: Radio iodine (131-I) therapy
OR
S: Thyroidectomy

Note: Long term, low-dose carbimazole should not be used for either condition except in some elderly

Surgery

- Patients with overt hyperthyroidism should be rendered euthyroid prior to the procedure with carbimazole pre-treatment (15–40mg daily, divided into 2–3doses a day for 4–8 weeks then a maintenance dose of 5–15mg, taken 24 hourly) with or without beta–adrenergic blockade (e.g. propranolol 1—40mg 6hourly). Preoperative iodine should not be used in this setting.
- Following thyroidectomy for Toxic multinodular goiter, it is suggested that serum calcium or intact parathyroid hormone levels be measured, and that calcitriol and oral calcium supplementation (maximum 1,200mg of calcium per day in two divided doses) be administered based on these results.
- Following surgery for Toxic multinodular goiter, thyroid hormone replacement should be started at a dose appropriate for the patient's weight (0.8µg/lb. or 1.7µg/kg) and age, with elderly patients needing somewhat less. TSH should be measured every 1–2months until stable, and then annually.

Radioiodine

Radioactive iodine therapy should be used for retreatment of persistent or recurrent hyperthyroidism following inadequate surgery for Toxic multinodular goiter or Thyroid antibody.

19.12.4 Grave's Hyperthyroidism

Pharmacological Management

Medicine	Initial Therapy (4–6 weeks)	Maintenance Therapy (Gradual reduction over 3–6 months)	Duration / Notes
C: carbimazole	10–60 mg/day in 2–3 divided doses	5–10 mg/day	Continue for 12–18 months; taper or discontinue if TSH is normal

Beta Blockers are used for excessive sympathetic symptoms.

A: propranolol (PO) 40 to 120mg (24hourly or 12hourly)

OR

B: atenolol (PO) 50–100mg 12hourly

Factors which favor use of antithyroid medicines

- High likelihood of remission (patients, especially females, with mild disease, small goiters, and negative or low-titer TSH-receptor antibody)
- Elderly or others with comorbidities increasing surgical risk or with limited life expectancy or unable to follow radiation safety regulations
- Previously operated or irradiated necks
- Moderate to severe active Graves' ophthalmopathy

Radioactive Iodine

Potassium iodide **(B)** should be given in the immediate preoperative period as 5–7drops (0.25– 0.35 mL) Lugol's solution (8 mg iodide/drop) or 1–2 drops (0.05–0.1 mL) saturated solution of potassium iodide (50 mg iodide/drop) three times daily mixed in water or juice for 10 days before surgery

Factors which favor use of radioiodine

- Individuals with comorbidities increasing surgical risk
- Patients with previously operated or externally irradiated necks
- Lack of access to a high-volume thyroid surgeon
- Contraindications to antithyroid medicines use
- Females who are not pregnant and are not planning a pregnancy in the future (4–6months) following radioiodine therapy

Surgery

Consider the following factors

- Symptomatic compression or large goiters
- Low uptake of radioactive iodine
- Thyroid malignancy is documented or suspected or large non-functioning nodule
- Coexisting hyperparathyroidism requiring surgery
- Females planning a pregnancy in <4–6months
- Patients with moderate to severe active Graves' ophthalmopathy
- If a patient with Grave's disease becomes hyperthyroid after completing a course of carbimazole, consideration should be given to treatment with radioactive iodine or thyroidectomy. Low-dose carbimazole treatment for longer than 12–18months may be considered in patients not in remission who prefer this approach but evidence is that remission rate in adults is not improved by a course of medicines longer than 18 months
- Whenever possible, patients with Grave's disease undergoing thyroidectomy should be rendered euthyroid with carbimazole.

19.12.5 Thyroid Storm (Crisis)

Thyroid storm is one of the most life-threatening endocrine emergencies, resulting from exacerbation of manifestations of thyrotoxicosis.

Triggers of thyroid storm include:

- Antithyroid withdraw
- Acute infections
- Thyroidal or nonthyroidal surgeries
- Iodinated contrast dyes
- External beam radiation therapy.
- It should be considered in very sick patients if they present with recent history of thyrotoxicosis and a recent history of precipitating factor.

Patients with thyroid storm (tachycardia, arrhythmias, congestive heart failure, hypotension, hyperpyrexia, agitation, delirium, psychosis, stupor and coma, as well as nausea, vomiting, diarrhea, and hepatic failure) should receive a multimodal treatment including:

- Beta-adrenergic blockade
- Antithyroid medicine therapy
- Inorganic iodide
- Corticosteroid therapy
- Aggressive cooling with paracetamol and cooling blankets
- Volume resuscitation
- Respiratory support
- Monitoring in an intensive care unit.

Thyroid storm is not a matter of thyroid levels increased beyond those of uncomplicated thyrotoxicosis, but the systemic decompensation that occurs.

Table 19.12: Pharmacological Management

Medicine	Dosing	Comments
D: propylthiouracil	500–1000 mg (IV) loading dose, then 250 mg every 4 hours	• Blocks new thyroid hormone synthesis • Inhibits peripheral conversion of T4 to T3
C: carbimazole	40–60 mg (PO) 24 hourly	• Blocks new thyroid hormone synthesis
A: propranolol	60–80 mg (PO) every 4 hours	• Controls adrenergic symptoms • Blocks T4 to T3 conversion at high doses • Use caution and consider invasive monitoring in heart failure • Alternative: Esmolol infusion
C: potassium iodide (SSKI)	5 drops (0.25 mL ≈ 250 mg) (PO) every 6 hours	• Do NOT start until at least 1 hour after antithyroid drugs • Blocks thyroid hormone release • Also reduces hormone synthesis
A: hydrocortisone	300 mg (IV) loading dose, then 100 mg every 8 hours	• May reduce T4 to T3 conversion • Prevents relative adrenal insufficiency • Alternative: Dexamethasone

Note: In thyroid storm, propylthiouracil is preferred to carbimazole

19.13 Cushing's Syndrome

Cushing syndrome is a clinical condition resulting from prolonged exposure to excessive glucocorticoids from either endogenous or exogenous sources. The most common cause of Cushing's syndrome is from the administration of exogenous sources.

Table:19.13 Classification of Cushing Syndrome

Category	Subcategory / Cause	Details
ACTH-Dependent	Pituitary adenoma (Cushing's disease)	• Accounts for ~90–95% of ACTH-dependent cases
	Ectopic ACTH syndrome	• Non-pituitary tumors producing ACTH
ACTH-Independent	Adrenal adenoma	• Autonomous cortisol secretion
	Adrenal carcinoma	• Malignant cortisol-secreting tumor
Exogenous Causes	Glucocorticoid therapy	• Most common overall cause of Cushing syndrome
Pseudo-Cushing States	Depression	• Functional hypercortisolism without true Cushing syndrome
Other Conditions	Alcoholism	• Reversible cortisol excess state
	High cortisol secretion without typical features	• Biochemical hypercortisolism without clear clinical signs
	Pregnancy	• Physiological increase in cortisol levels

Clinical Presentation

The symptoms and signs of Cushing's syndrome result directly from chronic exposure to excess glucocorticoid. Establishing the diagnosis is often difficult because none of the symptoms or signs are pathognomonic of the syndrome. An important clinical

clue to the presence of glucocorticoid excess is the simultaneous development and increasing severity of several of these symptoms Common presenting symptoms include; -

- Central obesity
- Facial plethora
- Weakness of the proximal muscles
- Easily bruises and striae
- Hirsutism
- Glucose intolerance

Investigations

At least two first-line tests should be abnormal to establish the diagnosis of Cushing's syndrome

- The low-dose dexamethasone suppression tests
- 24hrs urinary cortisol,
- Late night salivary cortisol
- Differential Diagnostic Testing to established, the cause of Cushing's syndrome
  - Morning serum ACTH
  - High dose dexamethasone suppression test
- Pituitary CT - sensitivity of about 50% for identifying microadenomas
- MRI pituitary sensitivity up to 100%
- Adrenal ultrasonography/CT for suspected Adrenal source

Table:19.14 Management of Cushing Syndrome

Component	Details
General Considerations	• Without treatment, Cushing syndrome is often fatal. • Mortality is commonly due to cardiovascular disease, hypertension, or infections. • With appropriate therapy, symptoms improve within 2–12 months.
Definitive Therapy (Preferred)	Surgery according to source: • Adrenal source → Adrenalectomy • Pituitary source → Transsphenoidal resection • Ectopic source → Tumor resection
Pharmacological Management	**S:** metyrapone 30 mg/kg (PO), maximum 3,000 mg • Administration: Usually given at midnight with a snack

19.14 Prolactinoma

Are prolactin – secreting pituitary tumors

Classification

May present as Macroprolactinomas (<10mm) or Macroprolactinomas (>10mm)

Clinical Presentation

Symptoms are due to hyperprolactinemia which include galactorrhea, oligo/amenorrhea, infertility, reduced libido, impotence and gynecomastia in male, headache and visual abnormality in large adenomas.

Investigations

Serum prolactin levels

- <100ng/ml possible prolactinoma 100-200ng/ml likely prolactinoma
- >200 ng/ml –diagnostic of prolactinoma

Pharmacological Management

Prolactinomas are unique among pituitary tumors in that first line treatment is medical not surgical. The mainstays of management for prolactinomas are the dopamine agonist which are:

S: cabergoline (PO) 0.25-1mg (twice a week)

OR

C: bromocriptine (PO) 2.5-20mg (24hourly or 12hourly)

19.15 Diabetic Insipidus (DI)

DI is a disorder of water balance caused by non-osmotic renal loss of water leading to excretion of large volume of dilute urine

Classification

Central DI: Is caused by either complete or partial deficiency of antidiuretic hormone (ADH) secretion from the posterior pituitary gland

Nephrogenic DI: Is caused by end organ unresponsiveness of the kidney to ADH

Dipsogenic DI: Is caused by excessive and inappropriate fluid intake due to a defective in thirsty mechanism

Clinical Presentation
Polyuria especially nocturnal

Investigations
- Polyuria and urine osmolality of <300 for a given plasma osmolality
- Volume depletion and orthostatic hypotension may be found
- Plasma Sodium may be normal or elevated

Pharmacological Management
In case of water deficit - water replacement. Treating of the underlying defect Central DI:
S: desmopressin (IV) 2-4 µg/day divided 12hourly
OR
S: desmopressin (PO) Initial dose 0.05mg 12hourly; effective range: 0.1-1.2mg divided 8- 12hourly
OR
S: desmopressin (Intranasal) 10-40µg (0.1-0.4mL) 24hourly, either as a single dose or divided into 2 or 3doses; usual dose is 20µg (0.2mL) 24hourly in 2divided doses

Nephrogenic DI: Treat the underlying cause
A: bendroflumethiazide (PO) 5mg 24hourly
OR
D: hydrochlorothiazide 12.5- 25mg 24hourly)

19.16 Pheochromocytoma

Pheochromocytoma are neuroendocrine tumors arising from catecholamine producing chromaffin cells of the adrenal medullar but about 15–20% are extra-adrenal in origin

Clinical Presentation
The classic symptoms of pheochromocytoma are due to episodic release of excess catecholamines into circulation (Norepinephrine and Epinephrine) which include; -
- Headaches
- Palpitations
- Anxiety and diaphoresis
- Hypertension which can be paroxysmal (~48%) or persistent (~29%).

Investigations
Table:19.15 Biochemical Tests Comparisons

Test	Sensitivity (%)	Specificity (%)
Urine catecholamines	83	88
Urine total metanephrines	76	94
Urine catecholamines + metanephrines	90	98
Urine VMA (vanillylmandelic acid)	63	94
Plasma catecholamines	85	80
Plasma metanephrines	99	89

Tumor Localization
- Anatomic localization of a catecholamine-secreting tumor should be performed only after biochemical diagnosis has been confirmed
- Approximately 85% of catecholamine-secreting tumors are found in the adrenal glands, and 95% are found in the abdomen and pelvis
- Either CT or MRI are effective for localization of catecholamine-secreting tumors -sensitivity 89 vs 98% resp.

Table 19.16: Management of Pheochromocytoma

Component	Details
Definitive Therapy	• Surgical resection of the tumor is the mainstay of treatment after confirmation of diagnosis
Pre-operative Management	• Control effects of excess catecholamines to prevent perioperative complications • Use α-adrenergic blockade before surgery
Non-selective α-blocker	• Initial dose: **S:** phenoxybenzamine 10 mg (PO) every 12 hours •Titrate to 20–40 mg every 8–12 hours
Selective α-blocker	**S:** doxazosin 1–2 mg (PO) 24 hourly
Additional Therapy	• Combined α + β blockade may be required (β-blocker added only after adequate α-blockade)

Table19.17: Causes of Adrenal Insufficiency

Type	Cause Category	Specific Causes
Primary (Addison's disease)	Autoimmune	• Autoimmune adrenalitis (most common)
	Infections	• Tuberculosis • HIV • Fungal infections
	Infiltrative diseases	• Metastatic cancer • Amyloidosis • Sarcoidosis
	Genetic	• Congenital adrenal hyperplasia • Adrenoleukodystrophy
	Vascular	• Adrenal hemorrhage (e.g., sepsis, anticoagulation)
Secondary	Pituitary disorders	• Pituitary tumors • Pituitary surgery • Irradiation
	Hormonal deficiency	• Isolated ACTH deficiency
Tertiary	Drug-induced	• Chronic glucocorticoid therapy → suppression of hypothalamic CRH
	Hypothalamic causes	• Hypothalamic tumors • Trauma

Table 19.18: Investigations for Adrenal Insufficiency

Category	Test	Findings / Purpose
Baseline Tests	Serum electrolytes	• Hyponatremia • Hyperkalemia (especially in primary adrenal insufficiency)
	Blood glucose	• Hypoglycemia common
	Complete blood count	• May show anemia • Eosinophilia
Hormonal Assays	Morning serum cortisol	• Low levels suggest adrenal insufficiency
	Plasma ACTH	• Elevated in primary • Low/normal in secondary/tertiary
	Renin and aldosterone	• High renin with low aldosterone (primary adrenal insufficiency)
Dynamic Testing	Short Synacthen (ACTH stimulation) test	• Failure of cortisol rise confirms diagnosis
	Insulin tolerance test	• Assesses secondary/tertiary causes (if safe to perform)
Imaging	Adrenal CT/MRI	• Detect infections, hemorrhage, tumors, calcification
	Pituitary MRI	• Indicated if secondary adrenal insufficiency suspected
Autoimmune Markers	Anti-21 hydroxylase antibodies	• Suggest autoimmune Addison's disease
Additional Tests	Thyroid function tests	• Assess for polyglandular autoimmune syndromes
	HIV testing, TB screening	• Performed when clinically indicated

Non Pharmacological Management

- Patient education: lifelong condition, recognition of adrenal crisis, emergency instructions.
- Lifestyle: balanced diet, adequate salt intake (especially in hot climates or during exercise).
- Medical alert identification: steroid card/bracelet.
- Vaccination & infection prevention: prompt treatment of infections.
- Stress management: patients must understand need for dose adjustment during illness, surgery, or trauma.

Pharmacological Management

Glucocorticoid Replacement

D: hydrocortisone: 15–25 mg/day orally in 2–3 divided doses (main dose in morning).

OR

B: prednisolone (alternative): 3–5 mg/day orally 24 hourly.

Mineralocorticoid Replacement (not secondary/tertiary).

D: fludrocortisone: 50–200 µg/day orally 24 hourly.

Adrenal Crisis (Medical Emergency)

Causes

- Infection,
- Trauma,
- Surgery,
- Abrupt steroid withdrawal,
- Dehydration.

Clinical Presentation
Severe hypotension, shock, vomiting, abdominal pain, confusion, hypoglycemia, hyponatremia, hyperkalemia.

Pharmacological Management
B: hydrocortisone (IV)100 mg bolus, then 200 mg/24h (continuous infusion or 50 mg every 6 hours).
A: sodium chloride 0.9% ± dextrose 5%. (IV) fluids: rapid

Note: Correct electrolytes hyponatremia, hyperkalemia, hypercalcemia if present

19.17 Disorder of Sexual Development (DSD)

DSD formerly known as intersex conditions are classified on the basis of genetics and the state of gonads. They may be caused by virilization 64XX or under virilization 46XY. As well as (streak Ovary, Ovotestis, dysgenetic testis). The most common DSD is Congenital Adrenal Hyperplasia (CAH).

Clinical Presentation
- Infant born with ambiguous or abnormal genitalia
- Infant with undescended testis, unilateral or bilateral
- Infant with hypospadias

Investigations
- Serum electrolytes
- Chromosomal analysis
- Karyotyping in a male looking male with undescended testis and/or hypospadias whether the genitalia appear normal or not
- Endocrine screening
- Anti-Müllerian Hormone (AMH)

Non-Pharmacological Management
- Counseling of the parents on
- The condition
- Naming of a child and
- Gender assignment

Pharmacological Management
Depends on type of the DSD it is either CAH or other forms of DSD (non-CAH DSD)
CAH DSD
Salt losing in crisis-
- Bolus normal saline (0.9% NaCl) and maintenance,
- Hypoglycemic 2-4 ml of 10% dextrose

Long-term treatment
D: hydrocortisone infants 2.5 to 5mg/dose, children 5-10mg 3times daily, adolescents &adults 15 to 30mg/day 2-3 divided doses
Non-CAH DSD
D: testosterone 50-400mg monthly for 3cycles, then asses +/- D: testosterone cream

19.18 Obesity (Adiposity Based Chronic Disease) in adults

Table19.19: Diagnosis and Assessment of Obesity

Component	Assessment/Criteria
Initial Screening	Body Mass Index (BMI) = Weight (kg) ÷ Height² (m²); remains the first step for screening overweight/obesity.
Assessment of Adiposity Distribution (for BMI ≥25 kg/m²)	• Waist circumference: ≥94 cm in men, ≥80 cm in women indicates increased risk. • Waist-to-height ratio: >0.5 suggests central adiposity. • Waist-to-hip ratio: >0.90 in men, >0.85 in women indicates abdominal adiposity.
Clinical Significance of Abdominal Adiposity	Provides independent risk information beyond BMI and is strongly associated with cardiometabolic diseases and adiposity-related comorbidities.
Clinical Staging of Adiposity	**Stage 0:** Adiposity without complications. **Stage 1:** Adiposity with mild/moderate complications (e.g., prediabetes, mild hypertension). **Stage 2:** Adiposity with severe complications (e.g., Type 2 Diabetes, advanced cardiovascular disease, Obstructive Sleep Apnea).
Functional Assessment	**Evaluate:** • Physical limitations • Sleep disorders (e.g., sleep apnea) • Mood disorders • Quality of life impact

Component	Assessment/Criteria
Laboratory Evaluation	• Fasting blood glucose • HbA1c • Lipid profile (total cholesterol, LDL, HDL, triglycerides) • Liver function tests (for Metabolic dysfunction-associated steatotic liver disease) • Thyroid function tests (if secondary causes suspected)
Medication Review	**Assess for medicines associated with weight gain:** • Corticosteroids • Antipsychotics • Insulin • Certain antihypertensives
Risk Stratification	**Assess for cardiometabolic risk factors:** • Hypertension • Hyperlipidemia • Hyperglycemia • Elevated liver enzymes • Family history of premature cardiovascular disease
Complications of Overweight/Obesity	**Increased risk of:** • Cardiovascular disease • Type 2 Diabetes • Pulmonary Embolism • Gallbladder disease • Colorectal Cancer • Osteoarthritis • Chronic back pain • Increased all-cause mortality
Psychosocial Assessment	Individuals living with obesity may experience stigma, shame, depression, and anxiety; psychosocial support should be considered.

Hospitals and health professionals as role models

- An overweight/obese health worker is less likely to counsel patients with obesity
- Provide healthy food choices for patients, employers, visitors, and communities, with pricing incentives
- Label drinks sold in hospital cafeterias as red, yellow, or green to shift consumption towards healthier beverages
- Prohibit fast food outlets in hospital premises

Table 19.20: Non-Pharmacological Management

Component	Recommendations
Weight Loss Goal	• Modest sustained weight loss of 3–5% improves triglycerides, blood glucose, HbA1c, and reduces risk of Type 2 Diabetes.
Nutritional Management	• Provide dietary counseling (refer to nutrition chapter).
Tailored Physical Activity Program	• Start with 30 minutes of moderate-intensity activity 3–5 times/week. • Progress to ≥60 minutes on most days. • Include muscle-strengthening activities ≥2 days/week. • Physical activity equivalent to 60 minutes of brisk walking daily helps prevent weight regain.
Behavioral Support	• Identify triggers for overeating/inactivity and modify behaviors. • Encourage goal-setting. • Maintain food/activity records. • Promote consistent eating patterns. • Encourage family support.
Structured Lifestyle Programs	• Participate in structured programs combining diet and exercise for ≥6 months.
Weight Maintenance	• Provide ongoing support (monthly or more frequent). • Encourage 200–300 minutes/week of physical activity. • Weekly weight monitoring. • Continue reduced-calorie diet.
Bariatric surgery	Consider for: • BMI ≥40 kg/m², or • BMI ≥35 kg/m² with comorbidities when lifestyle modification/pharmacotherapy fails.
Medication Monitoring	• Review and adjust antihypertensive and antidiabetic medications as weight loss progresses.

Table 19.21: Innovative Strategies for Obesity Prevention and Management

Component	Recommendations
Primary Care Strengthening	• Use patient registries. • Implement electronic health records. • Promote multidisciplinary care teams.
Digital Health Tools	• Text messaging support • Remote monitoring (BP, glucose, smart scales) • Mobile applications • Telehealth support
Healthy Healthcare Environments	• Provide healthy food choices with pricing incentives. • Use beverage labeling (red/yellow/green). • Restrict fast food outlets within hospital premises.

Table 19.22: Physical Activity Recommendations

Component	Details
General Benefits	• Physical fitness requires proper nutrition, moderate-to-vigorous activity, and adequate rest. • Improves insulin resistance, lowers HbA1c (~0.7% in Type 2 Diabetes), improves lipid profile, lowers blood pressure, and supports weight control.
Types of Activities	• Occupational: walking, lifting, farming. • Leisure: exercise, sports, gardening, dancing.
Aerobic Activities	• Improve body composition and cardiorespiratory fitness. • Examples: brisk walking, cycling, swimming, jogging, sports. • Moderate intensity: able to talk but not sing. • Vigorous intensity: only a few words before pausing for breath. • Recommended ≥30 minutes/day, ≥5 days/week.
Muscle-Strengthening Activities	• Improve muscle mass, strength, and endurance. • Examples: push-ups, pull-ups, crunches, heavy gardening. • Perform ≥8 repetitions, ≥2 days/week.
Stretching Activities	• Improve flexibility and range of motion. • Examples: neck flexion, arm rotations, trunk rotations.
Coordination Activities	• Improve balance, agility, and proprioception (important for fall prevention in older adults). • Example: standing on one leg/toes.
Improving Exercise Adoption	• Assess physical activity levels in all patients. • Provide brief advice on recommended activity levels during routine care.

Pharmacological Management

Indicated for BMI ≥30 kg/m², or ≥27 kg/m² with comorbidities, or if lifestyle changes fail to achieve ≥0.5 kg/week weight loss after 3–6 months.

Note: medications are used as an adjunct to diet and physical exercise

S: orlistat: 120 mg orally every 8 hours with meals containing fat, avoid if not having meals; reduces fat absorption by ~30%.

GLP-1 and GIP/GLP-1 receptor agonists are now strongly recommended for adiposity related chronic disease management and their metabolic complications.

Continue pharmacotherapy beyond 12 weeks only if ≥5% initial body weight loss is achieved after three months.

CHAPTER TWENTY

CARDIOVASCULAR DISEASE CONDITIONS

20.1 Prevention of Cardiovascular diseases

Cardiovascular disease (CVD) prevention is a coordinated set of actions, at the population level or targeted at an individual at risk of developing cardiovascular disease, that are aimed at eliminating or minimizing the impact of CVDs and their related disabilities.

Diagnostic/screening Criteria

Major risk factors for ischaemic cardiovascular and cerebrovascular disease are:

- Diabetes mellitus
- Hypertension
- Central obesity: waist circumference ≥ 94cm (men) and ≥ 80cm (women)
- Dyslipidemia (fasting levels): Total cholesterol > 5 mmol/L, or LDL> 3mmol/L, or HDL< 1 mmol/L in men and < 1.2mmol/L in women
- Smoking
- Age: Men >50 years, Women >60 years
- Family history of early onset cardiovascular disease; Male relatives <55 years and Female relatives <65 year

Estimation of total cardiovascular risk is important for prevention of CVD in an individual, should be adapted to his or her total CV risk: the higher the risk, the more intense the management should be (See Table 20.1).

Table 20.1: Cardiovascular Disease Risk Classification and WHO Risk estimation

Risk Category	Criteria
Very High Risk	**Subjects with any of the following:** • Documented Cardiovascular Disease (clinical or unequivocal on imaging), including: - Previous Acute Myocardial Infarction - Acute Coronary Syndrome - Coronary revascularization or other arterial revascularization procedures - Stroke - Transient Ischemic Attack - Aortic aneurysm - Peripheral Artery Disease • Unequivocal imaging evidence of CVD (e.g., plaque on coronary angiography or carotid ultrasound). *Does not include increased carotid intima-media thickness alone.* • Diabetes Mellitus with target organ damage (e.g., proteinuria) or major risk factors such as smoking, marked hypercholesterolemia, or marked hypertension. • Severe Chronic Kidney Disease (GFR <30 mL/min/1.73 m²). • Calculated CVD risk score ≥10%.
High Risk	**Subjects with:** • Markedly elevated single risk factors: - Cholesterol >8 mmol/L (>310 mg/dL), e.g., familial hypercholesterolemia - Blood pressure ≥180/110 mmHg • Most other patients with Diabetes Mellitus (except young people with type 1 DM without major risk factors). • Moderate Chronic Kidney Disease (GFR 30–59 mL/min/1.73 m²). • Calculated CVD risk score ≥5% and <10%.
Moderate Risk	• Calculated CVD risk score ≥1% and <5% over 10 years. • Many middle-aged individuals fall into this category.
Low Risk	• Calculated CVD risk score <1%.

Non-pharmacological Treatment

Table 20.2: General measures for Lifestyle modification

Risk Factor	Target Goal / Recommended Level
Smoking	• No exposure to tobacco in any form.
Diet	• Reduce dietary sodium intake to ≤2.4 g sodium/day (≈6 g sodium chloride/day). • Diet low in saturated fats. • Emphasize whole grains, vegetables, fruits, and fish. • Limit alcohol intake to: – Men: ≤2 units/day – Women: ≤1 unit/day • Alcohol consumption should not exceed 5 days/week. • 1 unit of alcohol = 25 mL spirits, 125 mL wine, 340 mL beer/sorghum beer, or 60 mL sherry.
Physical Activity	• At least 150 minutes/week of moderate-intensity aerobic exercise (e.g., 30 minutes/day for 5 days/week), OR • 75 minutes/week of vigorous-intensity aerobic exercise (e.g., 15 minutes/day for 5 days/week), OR • An equivalent combination of moderate and vigorous activity.
Body Weight	• Maintain BMI 18.5–24.9 kg/m²

Risk Factor	Target Goal / Recommended Level
Waist Circumference	• Men: <94 cm • Women: <80 cm
Blood Pressure	• Target: <140/90 mmHg
LDL-Cholesterol (Primary Lipid Target)	**Very high risk:** <1.8 mmol/L (<70 mg/dL) or ≥50% reduction if baseline is 1.8–3.5 mmol/L. **High risk:**<2.6 mmol/L (<100 mg/dL) or ≥50% reduction if baseline is 2.6–5.1 mmol/L. **Low–moderate risk**:<3.0 mmol/L (<115 mg/dL).
HDL-Cholesterol	• No specific treatment target. • Lower risk associated with: – Men: >1.0 mmol/L (>40 mg/dL) – Women: >1.2 mmol/L (>45 mg/dL)
Triglycerides	• No specific treatment target. • <1.7 mmol/L (<150 mg/dL) indicates lower risk. • Higher levels warrant assessment of other risk factors.
Diabetes Mellitus	• Target HbA1c: <7%

Recommended to repeat CV risk assessment every 5years, and more often for individuals with risks close to thresholds mandating treatment.

For specific pharmacological treatment for hypertension, diabetes, dyslipidemia refer specific sections, respectively.

20.2 Management of Dyslipidemias

Lowering blood cholesterol levels using statins is recommended to reduce the impact of cardiovascular morbidity and mortality

Clinical indication for lipid lowering medicine therapy

- Established atherosclerotic disease
- Ischemic heart disease
- Peripheral vascular disease
- Atherothrombotic stroke

Note

Lipid lowering medicines should be administered in this setting even if the level of cholesterol is normal

- Type 2 diabetics >40 years of age, or diabetes for >10 years,
- Existing cardiovascular disease,
- Chronic kidney disease (eGFR < 60mL/min).
- CV risks of more than >20% in 10years Such high-risk patients will benefit from lipid lowering (statin) therapy irrespective of their baseline LDL levels.

Pharmacological Management

B: atorvastatin (PO) 20mg to 80mg 24hourly

OR

S: rosuvastatin (PO) 10mg-40mg 24hourly

AND

D: fenofibrate (PO) 120mg /160mg /200mg 24hourly

Note

- Criteria for initiating lipid lowering therapy are the same as for HIV uninfected patients. Fasting lipid levels should be done 3months after starting lopinavir/ritonavir and atazanavir/ritonavir.
- Patients at high risk (>20% risk of developing a CVS event in 10years) should switch to atazanavir/ritonavir and repeat the fasting lipid profile in 3 months.
- Concomitant use of Ezetimibe and Atorvastatin can lead to liver damage and rhabdomyolysis.
- Fenofibrate indicated Hypertriglyceridemia, in which statin alone is not enough to treat & lower the hypertriglyceridemia.

20.3 Chronic Stable Coronary Artery Disease (CSCAD) / ISCHAEMIC Heart Disease (IHD)

Clinical history is characterized by chest pain due to myocardial ischemia usually inducible by exercise, emotion, or other stress and reproducible, relieved by rest but may occur spontaneously and stable in nature, occurs in high-risk patient.

Non-Pharmacological Management

General Measures

- Lifestyle modification (**refer to table 20.2**).
- Annual control of lipids, glucose metabolism and creatinine are recommended in all patients with known IHD.
- A resting ECG is recommended in all patients at presentation and immediately after an episode of chest pain suspected to indicate clinical instability of CAD, Consider immediate referral.
- A resting transthoracic echocardiogram is recommended in some patients for:
  > exclusion of alternative causes of angina
  > regional wall motion abnormalities suggestive of CAD
  > measurement of LVEF for risk stratification purpose
  > evaluation of diastolic function.

Consider referral if no echocardiogram available or unavailability of skilled personnel to perform transthoracic.

- Stress ECG
- Stress Echocardiography; a) Physical (Exercise) Stress Echo; b) Dobutamine (Pharmacological) Stress Echo performed to Orthopedic related disorders pt who cannot walk on the Treadmill machine).

Pharmacological Management

A: acetylsalicylic acid soluble (PO) 75–150mg 24hourly

OR

D: clopidogrel 75mg (PO) 24 hourly (in patients allergic to aspirin)

AND

C: isosorbide dinitrate (PO) 20mg-40mg 12hourly

If nitrates cannot be tolerated, consider stepwise approach below.

Step 1: add ß-blocker if not contraindicated:

B: atenolol (PO) 12.5/25mg 24hourly

OR

C: metoprolol succinate (SR) (PO) 25–200mg 24hourly

OR

S: metoprolol tartrate (IV) 5mg 2min for max 3doses, then (PO) 50-100mg 12hourly

OR

S: bisoprolol (PO) 2.5mg /10mg 24hourly

Step 2: Consider long-acting calcium channel blocker or I(f) current inhibitor, if a ß-blocker cannot be tolerated or contraindicated.

D: diltiazem (PO) 60mg 6 to 8hourlydaily; if suspects Prinzmetal Angina.

OR

S: verapamil (PO) 60mg -120mg 8hourly 24hourly

OR

S: ivabradine (PO) 2.5mg /5mg 24hourly

Step 3: Add low inward sodium current blocker anti-anginal

S: ranolazine (PO) 375-1000 mg/kg 12hourly

Note:

- All patients with chronic stable angina are high-risk for cardiovascular events, lipid lowering medicines should be initiated (See Section 20.2).
- Consider immediate referral to high level of care where there are adequate resources for case management.

Indications for Referral

- Angina or chest pain suspected to indicate clinical instability of CAD
- When diagnosis is in doubt/ failed medical therapy; no echocardiogram available or unavailability of skilled personnel to perform transthoracic echocardiogram.

Before referring to the high facility there is likelihood of clinical instability of stable CAD consider giving:

A: acetylsalicylic acid (PO) 300mg stat.

AND

B: atorvastatin (PO) 80mg stat

AND

D: clopidogrel (PO) 300mg stat

20.4 Acute Coronary Syndrome

20.4.1 Unstable Angina (UA)

Unstable angina is a medical emergency and if untreated can progress to Non-ST Elevation Myocardial Infarction (NSTEMI)

Diagnostic Criteria

Presents as chest pain or discomfort like stable angina but with the following additional characteristics:

- Angina at rest or minimal effort, occurring for the first time, particularly at rest and prolonged >10minutes, not relieved by sublingual nitrates.
- The pattern of angina accelerates and gets worse.
- The chest pain may be associated with ST segment depression or T wave inversion or normal ECG without rise in cardiac enzymes (biomarkers i.e. Total Creatinine, Creatine - MB and Troponin)

20.4.2 Non-ST Elevation Myocardial Infarction (NSTEMI)

Non-ST Elevation Myocardial Infarction is a medical emergency characterized with chest pain that is increasing in frequency and/or severity or occurring at rest, associated with elevated cardiac enzymes and ST segment depression or T wave inversion or normal ECG.

Diagnostic Criteria

Presents with typical chest pain with the following additional characteristics.

- Electrocardiogram (ECG) may show ST segment depression or transient ST segment elevation, or normal ECG does not exclude the diagnosis (serial ECG is important).
- Raised Cardiac Biomarker's – Total Creatine Kinase (Total-CK), Creatine Kinase - MB (CK- MB) and standard/highly sensitive Troponin I or T.

Non-Pharmacological Management

Both UA and NSTEMI are medical emergencies with the same pathophysiological progressive instability of CAD, which share similar management approach.

Supportive Therapy

- Admit patient into high dependent ward/ICU/CCU for hemodynamic monitoring, bed rest in Fowler's position and reassurance.
- Oxygen via nasal blog cannula or face mask if saturation < 92%.
- Establish Peripheral Intravenous line for intravenous fluid or drug administration.
- Hemodynamics blood pressure, heart rate and electrocardiogram rhythm monito

Pharmacological Management

Adjunctive therapy, Control cardiac pain.

C: glyceryl trinitrate (Nitroglycerin) sub–lingual/ spray 0.5mg (make sure patient has not taken phosphodiesterase–5 inhibitor).

For persistent pain and if oral therapy is insufficient.

S: glyceryl Trinitrate (Nitroglycerin) (IV), 1–2µg/kg/min titrated with chest pain over 8– 24hours.

OR

C: morphine (IV)1–2mg/minute dilute 10mg up to 10mL with sodium chloride solution 0.9%. Total maximum dose10 mg, repeat after 4hours if necessary

> **Note:** If pain is not responsive to this dose, it is suggestive for ongoing unresolved ischemia. This requires immediate referral to high level of care where resources available to manage Acute Coronary Syndrome or to exclude differential diagnosis.

Antiplatelet Therapy

A: acetylsalicylic acid (PO) 300mg stat then followed by 75mg/100mg 24hourly

AND

D: clopidogrel (PO) 300mg /600mg start then followed by 75mg 24hourly

OR

S: ticagrelor (PO) 180mg stat followed by 90mg 12 hourly

For first year following ACS event: 90 mg 12hourly. After 1year of maintenance: 60mg 12hourly.

OR

S: prasugrel (PO) 60mg stat then followed by 10mg 24 hourly

Statin high dose

B: atorvastatin (PO) 80mg stat then 40mg 24hourly

OR

S: rosuvastatin (PO) 10mg-40mg 24hourly

Anticoagulant

C: unfractionated Heparin (IV) 70–100U/Kg body weight 24hourly

OR

D: low molecular weight heparin (SC) 1mg/kg body weight 12hourly

Beta blocker (ß –blockers)

In case of LV dysfunction

C: carvedilol initial dose (PO) 6.25mg 12hourly preferred, titrate the dose upward. Max. Dose 25mg 12hourly

OR

In the settings of normal LV systolic function

B: atenolol 25–50mg (PO) 24hourly,

OR

C: metoprolol succinate (SR) (PO) 25 – 200mg 24hourly.

OR

S: metoprolol tartrate 5mg (IV) 2min for maximum of 3 doses, then (PO) 50-100mg 12hourly

OR

S: bisoprolol (PO) 2.5mg – 10mg 24hourly

Angiotensin Converting Enzyme Inhibitors (ACEIs)
B: captopril (PO) 6.25mg–25mg 8hourly
OR
C: enalapril (PO) 10mg 12 hourly
OR
C: lisinopril (PO) 5mg /10mg 24hourly

If ACEI'S are not well tolerated, consider ARB's
B: losartan (PO) 25mg/50mg 24hourly
OR
S: candesartan (PO) 8mg/16mg 24hourly
OR
S: telmisartan (PO) 40mg / 80mg 24hourly
OR
S: irbesartan (PO) 150mg / 300mg 24hourly

Referral
High suspicion index of acute coronary syndrome immediate consider referral to high level of care where resources are available to manage. In acute settings before referral from low to high level of care if available consider giving the following **urgently:**
C: glyceryl trinitrate (Nitroglycerin) sub-lingual 0.5mg spray prn for intolerable chest pain
AND
A: acetylsalicylic acid (PO)300mg stat (chew)
AND
D: clopidogrel (PO) 300mg/600mg stat
AND
S: rosuvastatin (PO) 10mg-40mg stat (High dose)
OR
B: atorvastatin (PO) 80mg stat (High dose)

20.4.3 ST Elevation Myocardial Infarction (STEMI)

STEMI is a medical emergency caused by the complete or partial occlusion of a coronary artery and requires prompt hospitalization and intensive care intervention management

Clinical Presentation
Severe chest pain with the following characteristics
- Site: retrosternal or epigastric, quality: crushing, constricting, or burning pain or discomfort.
- Radiation to the neck and/or down the inner part of the left arm.
- Duration: at least 20 minutes and often not responding to sublingual nitrates.
- Occurrence: at rest. May be associated with pulmonary oedema sweating, hypotension or hypertension, arrhythmias.

Diagnostic Criteria
Simple recognition triage: Two out of three points most likely point to STEMI diagnosis
- Symptoms - typical/atypical chest pain
- ECG – ST elevation in in two contiguous leads ≥0.1mV
- Raised cardiac biomarkers– Total Creatine Kinase (Total-CK), Creatine Kinase -MB (CK-MB) and Standard/Highly Sensitive Troponin I or T

Non-Pharmacological Management
Supportive therapy
- Consider cardio-pulmonary resuscitation, if necessary, before transfer (cardiac arrest– cardiopulmonary resuscitation).
- Oxygen 40% via facemask, if saturation < 92% or if in distress
- See section 20.4.2 above on supportive therapy for NSTEMI

Pharmacological Management
Adjunctive therapy Control cardiac pain
C: glyceryl trinitrate sub-lingual/ spray 0.5mg (make sure patient hasn't taken phosphodiesterase-5 inhibitor).

For persistent pain and if oral therapy is insufficient
S: glyceryl Trinitrate (IV) 1–2 µg/kg/min titrated with chest pain over 8–24 hours.
OR
C: morphine (IV) 1–2 mg/minute dilute 10 mg up to 10 mL with sodium chloride solution 0.9%. Total maximum dose: 10 mg, repeat after 4 hours if necessary.

Anti-platelets therapy
A: acetylsalicylic (PO) 300mg stat then followed by 75mg/100mg (PO) 24hourly
AND
D: clopidogrel (PO) 300mg/600mg stat then followed by 75mg 24hourly
OR
S: prasugrel (PO) 60mg stat, given after defining coronary anatomy prior to onset of PCI, then 10mg as maintenance dosage.
OR
S: ticagrelor (PO) 180mg stat followed by 90mg 12hourly

Statin high dose
B: atorvastatin (PO) 80mg start then 40mg 24hourly
OR
S: rosuvastatin (PO) 10mg-40mg 24hourly

Anticoagulant
C: unfractionated Heparin (IV) 70–100U/Kg 24hourly
OR
D: low molecular weight heparin (SC) 1mg/kg 12hourly, Reduce dose in renal failure patient to 0.5mg/kg

Beta blocker (ß –blockers) In case of LV dysfunction
C: carvedilol (PO) initial dose 6.25mg 12hourly daily preferred, titrate dose upward to maximum dose 25mg hourly daily

In the settings of normal systolic function
B: atenolol (PO) 12.5mg or 25mg or 50mg 24hourly
OR
C: metoprolol succinate (SR) (PO) 25 – 200mg 24hourly
OR
S: metoprolol tartrate (IV) 5mg 2min for max 3doses, then (PO) 50-100 mg 12hourly
OR
S: bisoprolol (PO) 2.5mg – 10mg 24hourly
OR
S: verapamil SR (PO) 240 mg – 480 mg daily in 1-2 divided doses

Note: Verapamil SR should be initiated from 7 days' post myocardial infarction; any single dose should not exceed 240mg as secondary prevention of myocardial infarction.

Angiotensin-Converting Enzyme Inhibitors (ACEIs)
B: captopril (PO) 6.25mg or 12.5mg 8hourly
OR
C: enalapril (PO) 10mg 12hourly
OR
C: lisinopril (PO) 5mg-10mg 24hourly

If ACEI'S are not well tolerated, consider ARB's
B: losartan (PO) 25mg/50mg 24hourly
OR
S: candesartan (PO) 8mg/16mg 24hourly
OR
S: telmisartan (PO) 40mg / 80mg 24hourly
OR
S: irbesartan (PO) 150mg / 300mg 24hourly

Definitive management of STEMI – Reperfusion therapy (Myocardial reperfusion)
Myocardial reperfusion with rapid recanalization of infarct related artery is the key to success in the management of ST Elevation Myocardial Infarction (STEMI). Timely reperfusion is crucial for minimization of infarct size and thereby for preservation of left ventricular function and reduction in mortality in STEMI patients. The two main reperfusion strategies for STEMI patients are;

- Thrombolytic/Fibrinolytic therapy (preferably chest pain duration less 12 hrs.)
- Primary percutaneous coronary intervention (PPCI) (preferably less than 90 mins of Door to Needle Time)

Thrombolytic agents

S: streptokinase (IV) 1.5 million units diluted in 100 mL sodium chloride 0.9%, infused over 30–60minutes

OR

S: alteplase (TPA) (IV) 15mg as bolus, 0.75mg/kg over 30min, then 0.5mg/kg over 60min

OR

S: tenecteplase (same recanalization)0.25-0.5/mg/kg IV bolus

Absolute contraindication for Thrombolytics

- Previous allergy to streptokinase or used within the last year for streptokinase only.
- Stroke CVA within the last 3 months
- History of recent major trauma
- Bleeding within the last month
- Aneurysms
- Brain or spinal surgery or head injury within the preceding month
- Active bleeding or known bleeding disorder.

- Relative contraindication for Thrombolytics
- Refractory hypertension
- TIA in the preceding 6 months,
- Subclavian central venous catheter
- Warfarin therapy
- Pregnancy
- Traumatic resuscitation
- Recent retinal laser treatment

Referral is urgent for all suspected or diagnosed cases to high level care equipped with cardiac catheterization laboratory for Coronary angiogram (CAG) followed by Percutaneous Coronary Intervention (PCI). In case of triple vessel or multivessel disease, or left main disease consider Coronary artery bypass graft (CABG), especially in patients with diabetes mellitus, high syntax score

20.5 Hypertension

Hypertension is elevation of Blood Pressure SBP ≥ 140 mmHg and DBP ≥90 mmHg measured at least three separate occasions. Hypertension is a major independent risk factor for the development of CAD, stroke, and renal failure.

Diagnostic Criteria

Blood Pressure should be measured on three separate occasions, a minimum of 2 days apart and/or taken over for a period of two months. Minimum of 3 blood pressure readings must be taken at the first visit to confirm hypertension. Ambulatory Blood Pressure monitoring should be done to exclude Masked or white coat hypertension and monitoring of Blood Pressure response to anti-hypertensives.

Table 20.3: Classification of Hypertension and Confirmation of Diagnosis

Class of Hypertension	SBP (mmHg)	DBP (mmHg)	Confirmation of Diagnosis
Grade 1	140–159	90–99	Confirm after 3 months of lifestyle modification
Grade 2	160–179	100–109	Confirm during the same visit
Grade 3	≥180	≥110	Confirm during the same visit

Consider secondary hypertension with identifiable cause in young patients < 40 years or elderly patient > 60 years presenting for first time with hypertension.

Note

- Recommend an alternative contraceptive method for women using oestrogen containing oral contraceptive.
- Evidence of end organ damage, i.e. cardiomegaly, proteinuria or uremia, retinopathy or evidence of stroke, dictates immediate treatment.

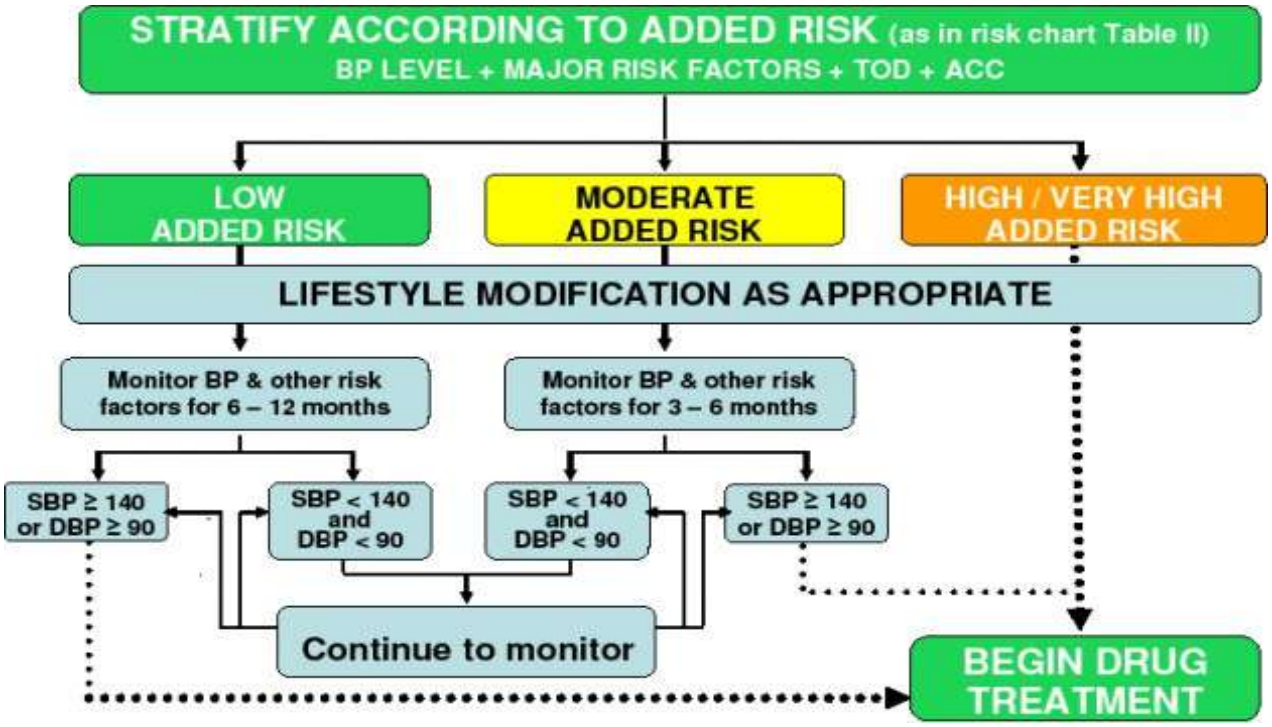
Treatment goal of Hypertension

- In patients aged 18 - 59 years without major comorbidities, and in patients 60 years or older who have diabetes, chronic kidney disease (CKD), or both conditions, the blood pressure goal level should be <140/90 mm Hg.
- In patients aged 60 years or older who do not have diabetes or chronic kidney disease, the blood pressure goal level should be <150/90 mm Hg.

Non-Pharmacological Management

- Lifestyle modification: (**refer to table 20.2**)
- Assess or stratify according to risk factors and target organ damage see **figure 20.1** below.

Figure 20.1: Stratification according to added risk



Pharmacological Management

First-line treatment without compelling indications, Thiazide diuretics should be initiated. Combination therapy may be considered if SBP >20mmHg or DBP> 10mmHg above target.

Refer Figure 20.2, **Algorithm II and Table 20.4 below** show choice of anti-hypertensives.

Figure 20.2: Approach of Pharmacological Management of hypertension in Primary Healthcare Facility.

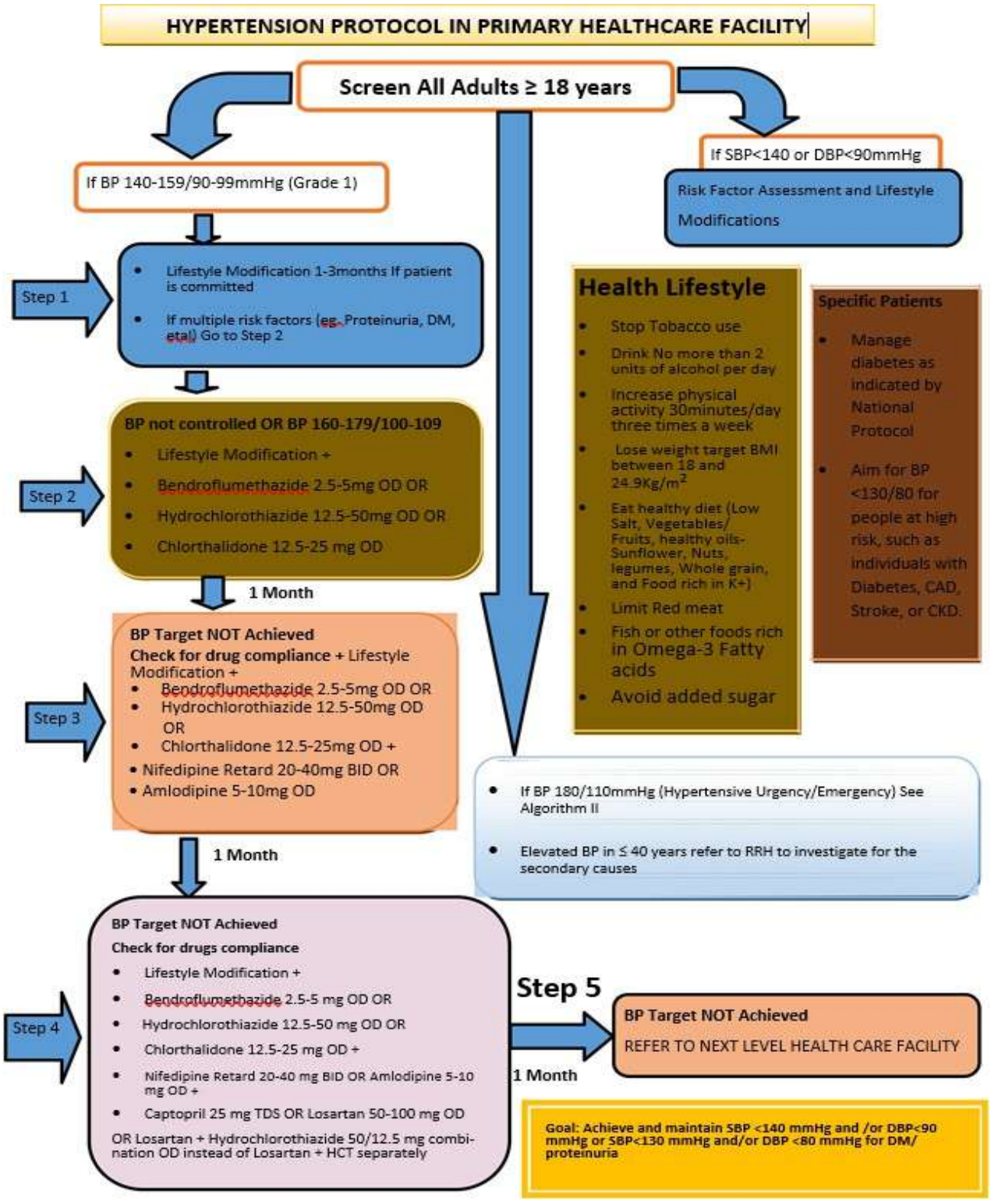


Figure 20.3: Approach of Pharmacological Management in Hypertensive Emergency and Hypertensive Urgency.

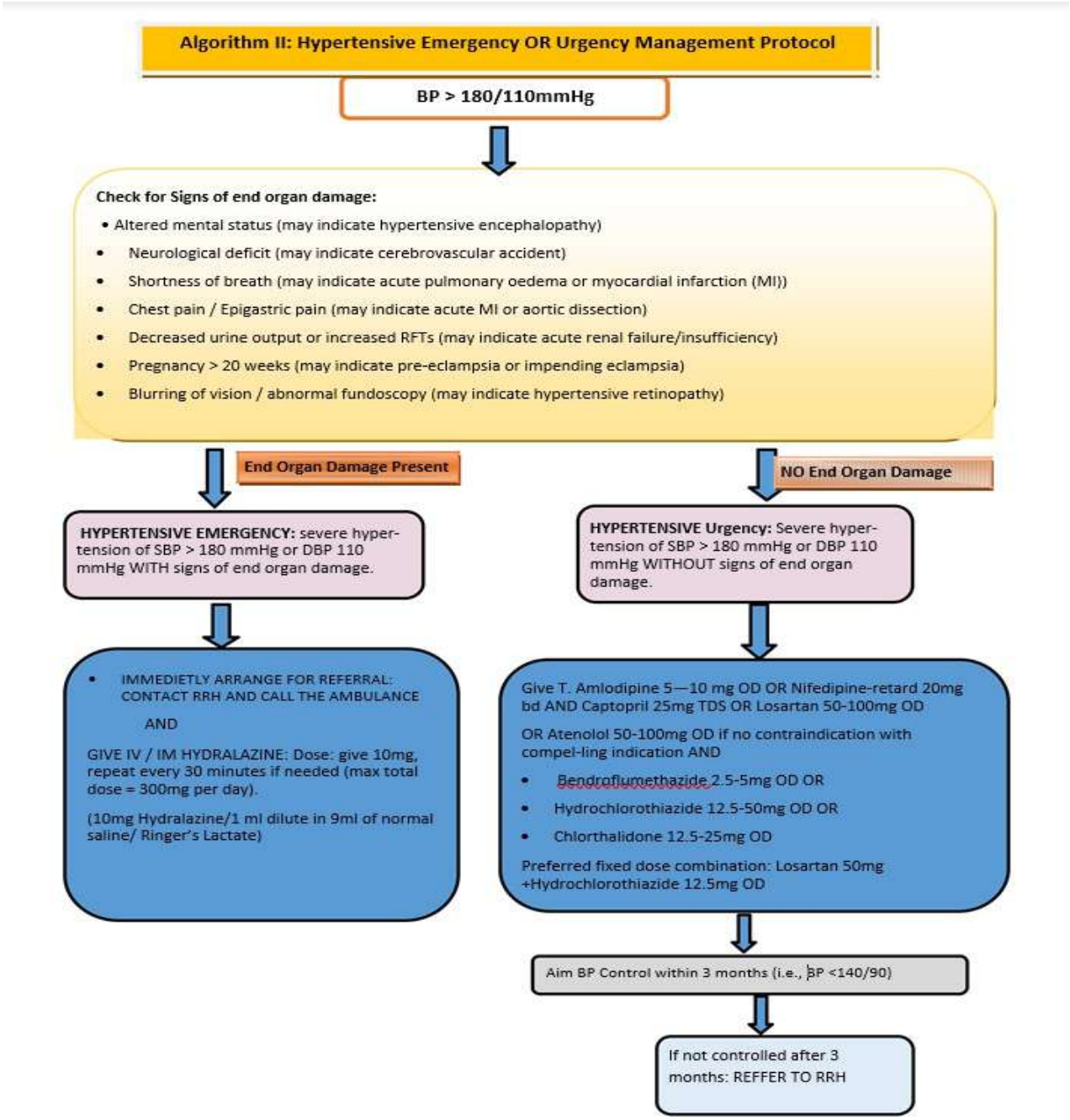


Table 20.4: Compelling Indications and Anti-Hypertensive Drug Combination

Compelling Indication	Preferred Drug Class / Treatment
Angina Pectoris / Prior or Post-Myocardial Infarction	• β-blocker or long-acting calcium channel blocker • β-blocker + ACE inhibitors • Use Angiotensin II receptor blockers if ACE inhibitor intolerance occurs • If β-blockers are contraindicated: long-acting Verapamil sustained release or Diltiazem extended release
Heart Failure / Volume Overload	• ACE inhibitor + β-blocker (e.g., Carvedilol) • Loop diuretics (e.g., Furosemide) and/or Spironolactone* Exclude renal failure before adding spironolactone
Left Ventricular Hypertrophy **(confirmed by ECG/Echocardiography)**	• ACE inhibitor • ARB if ACE inhibitor intolerance occurs
Stroke (Secondary Prevention)	• Hydrochlorothiazide + ACE inhibitor
Diabetes Mellitus	• ACE inhibitor or ARB, usually combined with a diuretic
Chronic Kidney Disease	• ACE inhibitor, usually combined with a diuretic
Isolated Systolic Hypertension	• Hydrochlorothiazide • Long-acting calcium channel blocker
Pregnancy	• Labetalol • Nifedipine • Methyldopa • Hydralazine • Avoid ACE inhibitors/ARBs due to teratogenicity
Prostatism	• α-blockers
Elderly Patients	• Calcium channel blockers

Anti-hypertension therapy:

Thiazide diuretics: Refer Figure 20.2, Step2 above

Loop diuretics
A: furosemide initial dose (PO) 40mg 12hourly
OR
S: torsemide (PO) 2.5mg /5mg/10mg 24hourly

Dose can be up scaled depending on congestive status to maximum dose

Mineralocorticoid (Aldosterone) Receptor antagonist
C: spironolactone (PO) 25mg 24hourly
OR
S: eplerenone (PO) 25mg 24hourly

Angiotensin Converting Enzyme Inhibitor (ACEI)
B: captopril (PO) 6.125mg, 12.5mg or 25mg 8hourly
OR
C: enalapril (PO) 10mg 12hourly

Angiotensin Receptor Blocker–ARB (*Do not combine with ACEI, indicated in patient sensitive to ACEIs)
B: losartan (PO) 25mg/50mg 24hourly
OR
S: candesartan (PO) 8mg/16mg 24hourly
OR
S: telmisartan (PO) 40mg / 80mg 24hourly
OR
S: irbesartan (PO) 150mg / 300mg 24hourly

Note: The prescribing of ARBs should depend on patient's presenting conditions

Beta blocker (Beta 1 selective Beta Blocker)
B: atenolol (PO) 25mg /50mg/ 100mg 24hourly
OR
C: metoprolol succinate (SR) (PO) 50- 200mg 24hourly
OR
S: metoprolol injection (IV) 1mg/ml in 5ml stat
OR
S: bisoprolol (PO) 2.5mg – 10mg 24hourly

Beta blocker (Non-selective Beta)
A: propranolol (PO) 40mg 24hourly
OR
C: carvedilol (PO) 6.25mg/12.5mg 24hourly
OR
C: labetalol (PO) 100mg 24hourly
OR
C: labetalol injection (IV) 5mg/ml in 2ml or 10mg/ml

Calcium Channel Blocker Dihydropyridines:
A: nifedipine (PO) 10mg/20mg 24hourly
OR
A: nifedipine (Slow Release/Long Acting) (PO) 20mg/30mg/ 60mg/90mg/daily
OR
B: amlodipine (PO) 5mg or 10mg 24hourly
OR
S: nimodipine (PO) 60mg 4 hourly (indicated in subarachnoid hemorrhage, less anti-hypertensive effect) for 21 days starting from the day of incident
OR
D: s-amlodipine 2.5mg/5mg 24hourly

Non–dihydropyridine
S: verapamil (PO) 30mg 8-12hourly for 24hours
OR
S: verapamil (Sustained Release) (PO) 120mg 24hourly (Initial daily dose), Maximum dose: 120mg 12hourly (single dose should not exceed 240mg)
OR
D: diltiazem (Extended Release) (PO) 60mg / 120mg 24hourly
OR
D: diltiazem (PO) 30mg 8-12hourly for 24hours

Note: non-dihydropyridine cannot be used together with beta-blockers

Alpha-2 adrenergic agonists
A: methyldopa (PO) 250mg 24hourly
OR
S: clonidine (PO) 50mcg/100mcg 24hourly

Alpha-1 adrenergic blockers
S: doxazosin (PO) 1mg / 2mg 24hourly
OR
D: tamsulosin (PO) 0.4mg24hourly

Vasodilators
B: hydralazine (PO) 25mg 8hourly
OR
B: hydralazine (IV) 20mg/ml in 1ml injection
OR
S: glyceryl trinitrate (Nitroglycerine) Injection (IV) 50mg/ml in 10ml

Fixed Dose Combination (Poly Pills) - FDCs
B: losartan + hydrochlorothiazide (FDC) (PO) 50mg/12.5mg 24hourly
OR
S: candesartan + hydrochlorothiazide (FDC) (PO) 16/12.5 mg 24hourly
OR
S: telmisartan + hydrochlorothiazide (FDC) (PO) 40/12.5mg, 80/12.5mg 24hourly
OR
S: irbesartan + hydrochlorothiazide (FDC) (PO) 150/12.5mg 24hourly

Referral indicated when:

- Resistant (Refractory) hypertension suspected,
- Secondary hypertension is suspected
- Complicated hypertensive urgency/emergencies,
- Hypertension with Heart failure.
- When patients are young (<30 years).
- Blood pressure is severe or refractory to treatment.

20.6 Resistant (Refractory) Hypertension

Hypertension that remains >140/90mmHg despite the use of 3 antihypertensive drugs in a rational combination at full doses and including a diuretic i.e. thiazide. Consider all correctable causes of refractory hypertension before you refer.

20.7 Hypertensive Urgency

Symptomatic severe hypertension SBP 180mmHg and/or DBP >110 mmHg without evidence of target organ damage, such as pulmonary edema, cardiac ischemia, neurologic deficits, or acute renal failure.

Note: All patients with hypertensive urgency should be treated in hospital

Pharmacological Management

The goal is to lower DBP to 100mmHg slowly over 48–72hours. This can be achieved with two or more oral agents preferably, Refer to Figure 20.3.

20.8 Hypertensive Emergency

A marked elevated systolic blood pressure SBP≥180mmHg and/or a diastolic DBP≥130mmHg associated with life threatening situations (target end organ damage) one or more of the following:

- Unstable angina/myocardial infarction
- Hypertensive encephalopathy e.g. severe headache, visual disturbances, confusion, coma, or seizures which may result in cerebral haemorrhage
- Acute left ventricular failure with severe pulmonary oedema (extreme breathlessness at rest)
- Excessive circulating catecholamine: e.g. pheochromocytoma – rare cause of emergency; food or drug interaction with monoamine oxidase inhibitors
- Rapidly progressive renal failure
- Acute aortic dissection
- Eclampsia and severe pre-eclampsia

Pharmacological Management

C: labetalol (IV) 20–80mg bolus every 10 minutes or 0.5–2mg/min infusion stat 20 mg, then 20–80 mg every10 min as needed, or stat with 0.5 mg/min infusion, then 1–2 mg/min (may be up to 4 mg/min) IV infusion up to 300 mg/d max.
Onset: 5–10 min; duration: 3–6 hours

AND / OR

S: nitroglycerin (glyceryl trinitrate; highly effective in setting of coronary ischemia, acute coronary syndromes.
Dose is (IV) 5–100µg/min as infusion

S: nitroglycerin (IV) initially 5–10 ug/min then may be up to >200 ug/min as needed Onset: immediate; Duration: 1–5 minutes

AND / OR

B: hydralazine (IV) 5mg slow push over 1–2 minutes, repeat 5–10mg as needed

OR

S: nicardipine initiate therapy at 10mg/hour as a continuous IV infusion may be increased by 2.5mg/hr every 15 minutes to a maximum of 15mg/hr, to maintain a SBP less than 220 mmhg and DBP<110mmhg.

Note: suitable for asthmatic patients (without bronchoconstriction effects that can be problematic with beta-blockers e.g. Labetalol – contra-indicated in advanced aortic stenosis

20.9 Heart Failure

Heart Failure is a clinical syndrome characterized by typical symptoms (e.g. breathlessness, ankle swelling and fatigue) that may be accompanied by signs (e.g. elevated jugular venous pressure, pulmonary crackles and peripheral oedema) caused by a structural and/or functional cardiac abnormality, resulting in a reduced cardiac output and/or elevated intracardiac pressures at rest or during stress.

20.9.1 Heart Failure in Pregnancy

Symptoms and signs of heart failure in a pregnant woman are an indication for urgent assessment to establish a diagnosis and appropriate management. This is best accomplished through a multidisciplinary approach in which both cardiologists and obstetricians need to participate in order to provide expert counselling and care in pursuit of safe motherhood, as well as to exclude underlying cause of heart failure.

20.9.2 Acute Heart Failure (AHF) or Decompensated Acute Heart Failure (ADHF)

AHF is defined as rapid or gradual onset of signs and symptoms of heart failure that results in urgent unplanned hospitalization or Emergency Medicine Department visits. The clinical signs and symptoms are significantly life threatening if the above features occur in patients with established diagnosis with structurally heart disease categorized as Acute Decompensated Heart Failure (ADHF). The cause and immediate precipitating factor(s) of the AHF must be identified and treated to prevent further damage to the heart.

Non-Pharmacological Management

Oxygen therapy and/or ventilatory support.

- Non-invasive positive pressure ventilation includes both CPAP and bi–level positive pressure ventilation (PPV)
- Mechanical ventilation

Note: In AHF, oxygen should not be used routinely in non–hypoxemic patients, as it causes vasoconstriction and a reduction in cardiac output

Pharmacological Management

Recommendations for the management of patients with acute heart failure:

Diuretics: Diuretics are a cornerstone in the treatment of patients with AHF. In patients with new- onset AHF or those with chronic, decompensated HF not receiving oral diuretics the initial recommended dose should be 20–40 mg intravenous furosemide (or equivalent); for those on chronic diuretic therapy, initial intravenous dose should be at least equivalent to oral dose. Diuretics should either be given as intermittent boluses or as a continuous infusion, and the dose and duration should be adjusted according to patients' symptoms and clinical status. Combination of loop diuretic with either thiazide-type diuretic or spironolactone may be considered

Loop diuretic

A: furosemide (IV) 20–120mg 24hourly

Children

- IM/IV Bolus: 1-2mg/kg/dose every 6 – 8 hours, can be increased by 1-2mg/kg/dose every 6-8 hours (maximum dose 6mg/kg/dose)
- IV Infusion: 0.1-0.4mg/kg/h

OR

S: torsemide (PO) 5–20mg 24hourly

AND

Mineralocorticoid (Aldosterone) Receptor Antagonists:

C: spironolactone (PO) 25–50mg 24hourly

Children

PO: 1-3mg/kg/day divided 12hourly

OR

S: eplerenone (PO) 25–50mg 24hourly

Vasodilators

These are the cornerstone of treatment of AHF and have dual benefit by decreasing venous tone (to optimize preload) and arterial tone (decrease afterload). Consequently, they increase stroke volume.

Intravenous vasodilators should be considered for symptomatic relief in AHF with SBP >90 mmHg (and without symptomatic hypotension). Symptoms and blood pressure should be monitored frequently during administration of intravenous vasodilators. In patients with hypertensive AHF, intravenous vasodilators should be considered as initial therapy to improve symptoms and reduce congestion. Intravenous vasodilators for treating AHF are described in table 20.4.

Note: Vasodilators should be used with caution in patients with significant mitral or aortic stenosis.

Consider oral vasodilators in case intravenous vasodilators are not available or unavailability of intensive care or high dependent unit care.

C: isosorbide dinitrate (PO) 10–20mg 12hourly

OR

B: hydralazine (PO) 25mg 6–8hourly. Maximum dose: 200 mg 24hourly

Children

PO: 0.75-3mg/kg/day divided 6-12 hours

IV: 0.1-0.5 mg/kg/dose IV q6-8hr (maximum 2mg/kg/dose)

Inotropes (Inotropic agents): Indicated in patients with hypotension (SBP <90 mmHg or mean arterial BP < 60mmHg) and peripheral hypoperfusion. Dosage see table 20.5 below.

Vasopressor (norepinephrine preferably): Indicated in patients with cardiogenic shock, despite treatment with another inotrope, to increase blood pressure and vital organ perfusion. Dosage see table 20.5 below

Indication: Patients with cardiogenic shock, despite treatment with another inotrope, to increase blood pressure and vital organ perfusion.

Table 20.5: Positive inotropes and/or vasopressors for treat acute heart failure.

Medicine	Bolus Dose	Infusion Rate	Comments / Primary Effect
S: dobutamine	No	2–20 micrograms/kg/min	Predominantly β_1-agonist (inotropic effect)
S: dopamine	No	3–5 micrograms/kg/min: inotropic (β+) >5 micrograms/kg/min: inotropic (β+) and vasopressor (α+)	Dose-dependent effects
S: norepinephrine	No	0.2–1.0 micrograms/kg/min	Potent vasopressor (α-adrenergic effect)
A: epinephrine	1 mg IV bolus during resuscitation; may be repeated every 3–5 minutes	0.05–0.5 micrograms/kg/min	Used in cardiac arrest and shock states
S: vasopressin	No	0.02–0.04 units/min	Adjunct vasopressor in refractory shock
S: milrinone	No	0.25–0.75 micrograms/kg/min	Particularly useful in post-cardiac surgery patients

Other Inotropes & inodilators:
D: digoxin (IV) 0.25 mg/ml in 2 ml injection
OR
D: digoxin (PO) 0.125mg / 0.25mg
Children
D: digoxin (PO)10-15mcg/kg/day divided 12hourly

Special Pharmacological Management consideration:
Add ACEI
B: captopril (PO) 6.25–25mg 8hourly
Children
B: captopril (PO) 0.3-0.6mg/kg/dose every 6-12 hours (maximum 6mg/kg/day
OR
C: enalapril (PO) 5–20mg 12hourly
Children
C: enalapril (PO) 0.08mg/kg/day once or divided 12 hourly (maximum 5mg)
OR
C: lisinopril (PO) 5mg – 10mg 24hourly (When patient is out of congestive state)
Children
C: lisinopril (PO) 0.07mg/kg/day (maximum 5mg/day)

Add Beta-blocker
C: carvedilol (PO) 6.25–25mg 12hourly a day especially in heart failure with reduced systolic function
Children
C: carvedilol (PO) 0.03-0.08mg/kg/dose 12 hourly

Thrombo–embolism prophylaxis
In Thrombo–embolism prophylaxis, Low Molecular Weight Heparin (LMWH) is recommended in patients not already anticoagulated and with no contra indication to anticoagulation, to reduce the risk of deep venous thrombosis and pulmonary embolism.
C: unfractionated heparin (SC) 5,000IU 12hourly
Children
C: unfractionated heparin (SC) IV Bolus: 50-100IU/kg
C: unfractionated heparin (SC) IV Infusion: 20IU/kg/h
OR
D: low molecular weight heparin (SC) 40mg–80mg 12hourly
Children

Prophylaxis
<2months: 0.75mg/kg SC evey12hr
≥2months: 0.5mg/kg SC every 12hr

OR

S: Rivaroxaban:

Drug	Adult Dose	Pediatric Dose (Weight-based dosing:)
S: rivaroxaban	15–20 mg orally 24 hourly	2.6–2.9 kg: 0.8 mg orally 8 hourly
		3.0–3.9 kg: 0.9 mg orally 8 hourly
		4.0–4.9 kg: 1.4 mg orally 8 hourly
		5.0–6.9 kg: 1.6 mg orally 8 hourly
		7.0–7.9 kg: 1.8 mg orally 8 hourly
		8.0–8.9 kg: 2.4 mg orally 8 hourly
		9.0–9.9 kg: 2.8 mg orally 8 hourly
		10–11.9 kg: 3 mg orally 8 hourly
		12–29.9 kg: 5 mg orally 12 hourly
		30–49.9 kg: 15 mg orally 24 hourly
		≥50 kg: 20 mg orally 24 hourly

Note: All patients with AHF should be treated at centre/hospital where at least can perform Echocardiographic assessment and Intensive Care Units (ICU) or High care dependent Units (HDUs) are available.

20.10 Chronic Heart Failure

Patients who have had HF as defined above for some times are often said to have 'Chronic Heart Failure'. A treated patient with symptoms and signs that have remained generally unchanged for at least 1 month is said to be 'Stable chronic heart failure'

Diagnostic Criteria

The diagnosis of chronic heart failure requires the following features:

- Symptoms of heart failure, typically breathlessness or fatigue, at rest or during exertion
- Objective evidence of cardiac dysfunction preferably by Echocardiography (Systolic and/or Diastolic)
- A clinical response to treatment is supportive but not sufficient for diagnosis.

Hence diagnosis and management of CHF should be sought at referral centres where at least echocardiography assessment can be performed.

Management of Systolic Heart Failure (LVEF< 45–50%) Goals of treatment

- Prevention of disease leading to cardiac dysfunction and heart failure e.g. hypertension, coronary artery disease, valve disease etc.
- To achieve maintenance or improvement in quality of life and improve survival

Non-Pharmacological Management

- Avoid excessive fluid intake in severe HF Limit fluid intake to 1–1.5 L/day if fluid overloaded despite diuretic therapy.
- Regular exercise within limits of symptoms and other lifestyle modification (refer to table 20.2).

Note: Sexual counselling regarding the risk of pregnancy and the use of oral contraceptives and phosphodiesterase-5 inhibitors (e.g. sildenafil) are not recommended in advanced HF, if used nitrates should be avoided <24–48hours of nitrate intakes.

Medicines to avoid or to be used with caution.

- NSAIDs & COXIBS
- Class I anti–arrhythmic
- Calcium antagonists
- Lithium
- Tricyclic antidepressants
- Corticosteroid

Pharmacological Management

(Approach combination therapy)

Diuretics

A: furosemide (PO) 40–80mg 12hourly

Children

PO: 1-2mg/kg/dose every 6 – 8 hours, can be increased by 1-2mg/kg/dose every 6-8 hours (maximum dose 6mg/kg/dose)

OR

S: torsemide (PO) 5–20mg 24hourly

Mineralocorticoid (Aldosterone) Receptor Antagonists:
C: spironolactone (PO) 25–50mg 24hourly
Children
PO: 1-3mg/kg/day divided 12hourly
OR
S: eplerenone (PO) 25–50mg 24hourly

Thiazides
D: hydrochlorothiazide (PO) 12.5–25mg 24hourly
Children
PO: 1-3mg/kg/day divided 12hourly
OR
S: metolazone (PO) 0.1–10mg 12hourly
Children
PO: 0.2-0.4mg/kg/day single daily dose or divided 12 hourly

Angiotensin Receptor Inhibitors ACEI or Angiotensin Receptor Blockers (ARB)
B: captopril (PO) 6.25–25mg 8hourly
Children
PO: 0.3-0.6mg/kg/dose every 6-12 hours (maximum 6mg/kg/day)
OR
C: enalapril (PO) 5–20mg12hourly
Children
PO: 0.08mg/kg/day once or divided 12 hourly (maximum 5mg)

Angiotensin Receptor Blocker–ARB (*Do not combine with ACEI, Indicated in patient sensitive to ACEIs)
B: losartan (PO) 50mg 24hourly
Children
Below 6 years of age, safety and efficacy are not established. ≥6 years,
PO: 0.7mg/kg/day daily
OR
S: candesartan (PO) 4–16mg 24hourly
OR

Angiotensin Receptor–Neprilysin Inhibitor.
S: sacubitril + valsartan 49mg/51mg PO 12hourly for 2-4 weeks, then 97mg/103mg 12hourly

Beta blocker (Carvedilol–improve Morbidity & Mortality in CHF).
C: carvedilol (PO) 6.25–25mg twice a day especially in heart failure with reduced systolic function
Children
PO: 0.03-0.08mg/kg/dose 12 hourly

Note: Beta Blockers is contraindication to patients with Bronchial Asthma or Severe Pulmonary Disease Symptomatic bradycardia or hypotension

Heart failure in Type 2 Diabetes Mellitus and Non-DM:
S: Dapagliflozin (PO) 10mg 24hourly

Add on therapy in patient in NYHA class III/IV.

Vasodilator agents: The combination of hydralazine/nitrate
C: isosorbide dinitrate (PO) 10–20mg 12hourly
AND
B: hydralazine (PO) 25 mg 6–8hourly. Maximum dose: 200 mg/day
Children
PO: 0.75-3mg/kg/day divided 6-12 hours

Cardiac Glycosides
Give with caution as has narrow therapeutic index see below under section of Cardiac Glycosides
D: digoxin (PO) 0.125mg–0.25mg 24hourly
Children
PO: 10-15mcg/kg/day divided 12hourly

Note: Patients at high risk of digoxin toxicity are: Elderly, patients with poor renal function, hypokalemia and low body weight

Anti–thrombotic agents.
Heparin &/or warfarin – firmly indicated on congestive heart failure with atrial fibrillation, previous thromboembolic events or a mobile LV thrombus Heparin for DVT prophylaxis for patients admitted to hospital, unless contraindicated:

C: unfractionated heparin (SC) 5000 units 8hourly
Children
IV Bolus: 50-100IU/kg
IV Infusion: 20IU/kg/h
OR
D: low molecular weight heparin (IV) 40-60mg/ml 24hourly
Children

Prophylaxis	Treatment
<2months: 0.75mg/kg SC evey12hr	<2months: 1.5mg/kg SC every 12hr
≥2months: 0.5mg/kg SC every 12hr	≥2months: 1mg/kg SC every 12hr

OR
C: warfarin (PO) 5 mg 24hourly (Monitor INR to therapeutic range (2.0–2.5)
Children
0.05–0.35 mg/kg/day
OR
S: rivaroxaban

Drug	Adult Dose	Pediatric Dose (Weight-based dosing:)
S: rivaroxaban	15–20 mg orally 24 hourly	2.6–2.9 kg: 0.8 mg orally 8 hourly
		3.0–3.9 kg: 0.9 mg orally 8 hourly
		4.0–4.9 kg: 1.4 mg orally 8 hourly
		5.0–6.9 kg: 1.6 mg orally 8 hourly
		7.0–7.9 kg: 1.8 mg orally 8 hourly
		8.0–8.9 kg: 2.4 mg orally 8 hourly
		9.0–9.9 kg: 2.8 mg orally 8 hourly
		10–11.9 kg: 3 mg orally 8 hourly
		12–29.9 kg: 5 mg orally 12 hourly
		30–49.9 kg: 15 mg orally 24 hourly
		≥50 kg: 20 mg orally 24 hourly

Antidote for heparin
B: protamine (IV) 10ml/ml in 5mls Ampoule/vial. 1mg of protamine sulphate neutralizes approximately 100units of heparin.
Thiamine Supplement: Consider in all unexplained heart failure

Note
- Ideally all patients with CHF should be managed in dedicated HF clinics/units with devoted HF expert staffs (nurses & doctors) for further evaluation and Device therapy including CRT, CRT- D and ICD. The following category of patients should be referred for specialized care
  - Severe HF class III/IV
  - HF of unknown origin
- Relative contraindication: asymptomatic bradycardia, low blood pressure, Intolerance to low doses, Previous use of ß – blockers and discontinuation because of symptoms, Bronchial asthma, or severe pulmonary disease.

20.11 Pulmonary Oedema

Diagnostic Criteria
Common cause of pulmonary oedema is cardiac/fluid overload, and the common causes include: -
- Systolic heart failure complicating fluid overload
- Renal failure complicating fluid overload- Iatrogenic fluid overload Other Cause of pulmonary oedema
- Increased capillary permeability acute respiratory distress syndrome (ARDS); many causes include Systemic sepsis–gram negative infection, pancreatitis, head injury, aspiration of gastric contents, amniotic embolus.

Non-Pharmacological Management
Initial management
- Maintain airway, bed rest in Fowler`s position except if hypotensive or comatose.
- Administer oxygen to keep PO2> 60 mmHg (O2 saturation > 90%)
- Correct base–acid & electrolyte disorders, determine and correct arrhythmias,

Pharmacological Management
Cardiac failure
A: furosemide (IV) 20mg–80mg may be repeated in 10–15 minutes, If symptoms persist,
AND
C: morphine (IV) 1–3mg diluted form,
Inotropic support if hypotensive SBP <90mmHg,

S: dobutamine (IV) 2–20 µg/kg/min
Intravenous vasodilator nitroglycerine if SBP > 100mmHg

Non–cardiac (ARDS)
- Treat the underlying conditions
- Ventilate with PEEP – if RF
- Inotropic support if SBP<90mmHg
- Dialysis if renal failure

Note
- All patients suspected with pulmonary oedema should be referred to high level of care where hospital resourced with high care dependent unit or intensive care unit.
- Patient should be stabilized first at low level of care before referral to the high level of care.

20.12 Infective Endocarditis (IE)

The infective process of endocardial layer of the heart can involve native or prosthetic valve and congenital defects/shunts. Alpha–haemolytic streptococci are the most common causes of native valve endocarditis but Staphylococcus aureus is more likely if the disease is rapidly progressive with high fever or is related to a prosthetic valve (Staphylococcus epidermidis).

Diagnostic Criteria
Use Modified Dukes Criteria below and consult microbiologist where possible. Three sets of blood cultures should be taken before starting treatment.

Modified Dukes Criteria Major Criteria
- Positive blood cultures of typical organism for IE from at least two separate blood cultures
- Evidence of endocardial involvement by echocardiogram (Trans–thoracic Echo/Trans– oesophageal Echo)

Minor Criteria
- Fever > 38ºC
- Presence of Rheumatic heart disease, congenital heart disease
- Vascular phenomena; Major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, intracranial haemorrhage, conjunctival hemorrhage, Janeway lesions
- Immunological phenomena; glomerulonephritis, Osler`s nodes, Roth`s spots,
- Rheumatoid factor.
- Serologic evidence of active infective endocarditis or blood culture not meeting major criterion.

Definition of infective endocarditis according to the modified Duke criteria: Definitive diagnosis of IE

Pathological criteria: Microorganisms demonstrated by culture or on histological examination of a vegetation, a vegetation that has embolized, or an intracardiac abscess specimen
OR
Pathological lesions: vegetation or intracardiac abscess confirmed by histological examination showing active endocarditis.

Table 20.6: Diagnostic Criteria for Infective Endocarditis (IE)

Diagnosis Category	Criteria
Definite IE (Clinical Criteria)	• Two major criteria OR • One major criterion + three minor criteria OR • Five minor criteria
Possible IE	• One major criterion + one minor criterion OR • Three minor criteria
Rejected IE	• Firm alternative diagnosis OR • Resolution of symptoms suggestive of IE with antibiotic therapy for ≤ 4 days OR • No pathological evidence of IE at surgery or autopsy, with antibiotic therapy for ≤ 4 days OR • Does not meet criteria for possible IE, as listed above

Note
- Positive blood cultures remain the cornerstone of diagnosis and provide live bacteria for both identification and susceptibility testing.
- To improve yield of culturing bacteria at least three blood sample sets are taken at 30 minutes apart each containing 10mL of blood and should be incubated in both aerobic and anaerobic atmospheres.
- Sampling should be obtained from a peripheral vein using a meticulous sterile technique.

Pharmacological Management

Empirical Treatment; Consider negative blood culture or if risk delaying treatment for blood culture outweigh the befit of starting treatment early

Treatment for native valves:

A: benzylpenicillin G (IV) 18–24milllion Units/24hours 4hourly in equally divided dose 4– 6weeks

OR

B: ceftriaxone (IV) 2g 24hourly 4–6weeks

AND

B: cloxacillin (IV) 2g 6hourly 4–6 weeks

AND

A: gentamicin (IV) 1–1.5mg/kg 8 hourly for at least 2weeks

OR

If methicillin–resistant staphylococci anaerobes (MRSA)

S: vancomycin (IV) 30mg/kg 24 hourly in two equally divided dose, not to exceed 2gm in 24hours unless serum levels are monitored 4–6weeks.

Note: It is important to assay serum gentamicin levels every 3–4days. One–hour peak concentration should not exceed 10mg/l and trough concentration (2–hour pre– dose)

Prosthetic valve empirical treatment

A: benzylpenicillin G (X–Pen) (IV) 18 –24 million Units 4 hourly for 24hours in equally divided dose 6 – 8 weeks

OR

B: ceftriaxone (IV) 2g 24hourly >6 weeks

AND

B: cloxacillin (IV) 2g 6 hourly >6 weeks

AND

A: rifampicin 300 –600mg (IV) 8hourly >6 weeks

AND

A: gentamicin 1mg/kg (IV) 8hourly 2 weeks.

Note

- It is important to assay serum gentamicin levels every 3–4days. One–hour peak concentration should not exceed 10mg/l and trough concentration (2–hour pre– dose) should be less than 2mg/L.
- Gentamicin in renal failure should be given based on CrCl.
- Patients with complicated IE should be evaluated and managed in high level of care or centre, with immediate surgical facilities and the presence of a multidisciplinary including an Infectious Disease specialist, a microbiologist, cardiologist, imaging specialists, and cardiac surgeons

Infective Endocarditis Prophylaxis

- Antibiotic prophylaxis should be considered for patients at highest risk for IE:
- Patients with any prosthetic valve, including a trans catheter valve, or those in whom any prosthetic material was used for cardiac valve repair.
- Patients with a previous episode of IE.
- Patients with Congenital Heart Disease (CHD):
  - -Any type of cyanotic CHD.
  - - Any type of CHD repaired with a prosthetic material, whether place surgically or by percutaneous techniques, up to 6 months after the procedure or lifelong if residual shunt or valvular regurgitation remains.

Note: Antibiotic prophylaxis is not recommended in other forms of valvular or CHD.

Prophylaxis of Endocarditis Infective

- To reduce the risk of bacterial endocarditis, antibiotic prophylaxis should be given to patients undergoing dental procedures requiring manipulation of the gingival or periapical region of the teeth or perforation of the oral mucosa.
- Antibiotic prophylaxis is not recommended for,
- Respiratory tract procedures including bronchoscopy or laryngoscopy, or trans nasal or endotracheal intubation
- Gastrointestinal or urogenital procedures or Trans–oesophageal Echocardiogram, gastroscopy, colonoscopy, cystoscopy, vaginal or caesarean delivery.
- Skin and soft tissue procedures

Table 20.7 : Antibiotic Prophylaxis for Infective Endocarditis

Situation	Antibiotic	Single dose 30–60 min before procedure	
		Adult Dose	Children Dose
No allergy to penicillin or ampicillin	**A:** amoxicillin **OR** **A:** ampicillin*	2 g PO/IV	50 mg/kg PO/IV
Allergy to penicillin or ampicillin	**S:** Clindamycin	600 mg PO/IV	20 mg/kg PO/IV

*Alternatively,
B: ceftriaxone (IV) 1g for adults or 50 mg/kg for children.
Cephalosporins should not be used in patients with anaphylaxis, angio–oedema, or urticaria after intake of penicillin or ampicillin due to cross–sensitivity.

20.13 Acute Rheumatic Fever

It is a non–suppurative sequela of a group A ß haemolytic streptococcal (GABHS) pharyngeal infection.

Diagnostic Criteria
See table 20.8 below

Definitive Diagnosis
- Two major criteria or
- One major criterion with two minor criteria, with evidence of antecedent streptococcal infection

Table 20.8: Jones Criteria for Acute Rheumatic Fever

Major Criteria	Minor Criteria	Supporting Evidence of Recent Group A Streptococcal Infection
• Carditis • Migratory polyarthritis • Sydenham's chorea • Erythema marginatum	**Clinical:** • Fever •Arthralgia **Laboratory:** • Elevated acute phase reactants (e.g. CRP) • Prolonged PR interval	• Positive throat culture or rapid antigen detection test for Group a Streptococcus AND/OR • Elevated streptococcal antibody titres: – Anti-streptolysin O (ASO) – Anti-deoxyribonuclease B (anti-DNase B)

Non–Pharmacological Management
Acute stage:
- Bed rest and supportive care until all evidence of active carditis has resolved
- Patient education.
- Intensive health education for prevention of sore throats.

Pharmacological Management
Treatment of acute attack for eradication of streptococci in throat: Regardless of the presence or absence of pharyngitis at the time of diagnosis.

A: benzathine benzylpenicillin (IM) 1.2MU stat
Children > 5 years 0.3MU, 5–10 years 0.6 MU > 10 years 1.2 MU stat
OR
A: phenoxymethylpenicillin (PO) 500mg 8-12 hourly 24 hourly for 10days
Children > 10years 500mg, 5–10 years 250mg, < 5years 125mg (PO) 8-12 hourly for 10 days

Patients allergic to penicillin
A: erythromycin (PO) 500mg or 40mg/kg 6hourly for 10days.

Treatment of Acute Arthritis and Carditis:
A: acetylsalicylic acid (PO) 25mg/kg 6hourly 24hourly as required.
Acetylsalicylic acid should be continued until fever, all signs of joint inflammation and the ESR have returned to normal and then tapered gradually over 2 weeks. If symptoms recur, full doses should be restarted. *Dose should be reduced if tinnitus or other toxic symptoms develop

In severe carditis with development of increasing heart failure or failure of response to aspirin,
Add
A: prednisolone (PO) 1–2mg/kg 24hourly for 3–4weeks

Then review and gradual reduction and discontinuation of prednisolone may be started after 3–4 weeks when there has been a substantial reduction in clinical disease.

Heart failure should be managed in the usual way (see Heart Failure Section 20.9).
Treatment of Sydenham's chorea:
B: haloperidol (PO) 1.5–3mg 8hourly for 24 hours as required (Adult). Paediatrics 50µg/kg for 24 hours in 2 divided doses.

Referral: Ideally all patients should be referred to high level of care a specialized hospital care, where surgery is contemplated

Antibiotic prophylaxis after rheumatic fever
Prophylaxis should be given to all patients with a history of acute rheumatic fever and to those with rheumatic heart valve lesions. The optimum duration of prophylaxis should be up to at least 21years of age.

Note: Specific situations requiring prophylaxis for longer periods (up to 30years as a guide):
- Definitive carditis in previous attacks
- High risk of exposure to streptococcal infection at home or work (crowded conditions, high exposure to children)

A: benzathine benzylpenicillin (IM) 2.4MU monthly or every three weeks*
Children <12yrs 1.2MU every 4 weeks or 3 weeks* up to 21–30yrs
OR
A: phenoxymethylpenicillin (PO) 250mg 12hourly
Children <12yr 125–250mg 12hourly for 24hours up to 21–30years
OR
A: erythromycin (PO) 250mg 12hourly for 24hours Adult
Children <12yr 125–250mg 12hourlyfor 24hours up to 21–30yrs*every 3week regimen is more effective

20.14 Valvular heart disease

As a general recommendation patient with high index of suspicion for valvular heart disease should get access for evaluation by a specialist.

Table 20.9: Common Valvular Heart Diseases

Condition	Description / Causes	Clinical Presentation	Investigations	Treatment
Mitral Stenosis	Almost all cases are due to rheumatic heart disease (RHD); more common in women. Causes: RHD, mitral annular calcification (MAC), congenital mitral stenosis, radiation-induced disease	• Shortness of breath (SOB) • Orthopnea • Palpitations • Hemoptysis • Diastolic murmur on auscultation	• Chest X-ray (CXR): Left atrial enlargement (early) • Echocardiography: Confirms diagnosis (valve morphology, valve area, hemodynamics)	Consult specialist or refer to a cardiologist
Aortic Stenosis	Causes obstruction to left ventricular outflow, resulting in left ventricular hypertrophy (LVH). Causes: Calcification of congenital bicuspid valve, calcification of tricuspid valve in the elderly, rheumatic fever	• Angina • Syncope • SOB • Orthopnea • Paroxysmal nocturnal dyspnea (PND) • Harsh systolic murmur	• CXR: Enlarged LV/LA • ECG: LVH • Echocardiography: Identifies valve lesion, degree of stenosis, and LVH	Consult specialist or refer to a cardiologist for TAVI, AVR, or AVA
Aortic Regurgitation	Due to inadequate closure of the aortic valve leaflets. Causes: Infective endocarditis, trauma, aortic dissection, iatrogenic causes, RHD	• SOB • Diastolic murmur • Wide pulse pressure • Peripheral signs of aortic regurgitation	• CXR: Dilated cardiac silhouette • Dilated aorta	Consult specialist or refer to a cardiologist for AVR/AVA
Mitral Regurgitation	Due to inadequate closure of the mitral valve; acute form is associated with high mortality. Causes: Infective endocarditis, RHD, mitral valve prolapse (MVP), ischemic heart disease	• SOB • PND • Palpitations • Holosystolic murmur radiating to the axilla	• CXR: Cardiomegaly • ECG: Atrial fibrillation (AF) • Echocardiography: Identifies leaflet abnormalities	Consult specialist or refer to a cardiologist
Tricuspid Regurgitation	Secondary in >90% of cases due to pressure/volume overload causing RV dilatation or enlarged right atrium/tricuspid annulus. Causes: Infective endocarditis, RHD, Ebstein anomaly, endomyocardial fibrosis (EMF), iatrogenic valve damage	• SOB • Lower limb swelling • Abdominal swelling	• CXR: Cardiomegaly, dilated RV • ECG: Atrial fibrillation (AF) • Echocardiography: Primary diagnostic tool for severity, aetiology, and hemodynamic assessment	Consult specialist or refer to a cardiologist

20.15 Pulmonary Embolism

20.15.1 Acute Pulmonary Embolism

Clinical Spectrum less than two weeks

- Sudden onset of dyspnoea often with unexplained anxiety (most common)
- Pleuritic chest pain and Haemoptysis
- Massive embolism: pleuritic chest pain, cyanosis, right heart failure and shock. Minor emboli or pulmonary infarction may herald massive embolism and must be treated vigorously
- About 90% of emboli are from proximal leg deep vein thromboses (DVTs) or pelvic vein thromboses. DVTs are at risk for dislodging and migrating to the lung circulation. Thus, termed as venous thromboembolism (VTE).

Diagnostic Criteria

Determination pre-test probability of PE, Use validated scoring system: Wells Score

- Score > 6.0–High clinical probability proceeds with imaging test to confirm PE and treat,
- Score 2.0 to 6.0–Moderate clinical probability; negative D–dimer, PE is excluded and D– dimer positive, obtain imaging tests to confirm based on result treat.
- Score < 2.0–Low clinical probability negative D–dimer, PE is excluded. Positive D–dimer obtain imaging tests to confirm or rule out and based on result treat

Alternatively

- Score > 4–PE likely, d–dimer positive proceeds with diagnostic imaging to confirm and treat PE.
- Score 4 or less–PE unlikely, consider d–dimer to rule out PE.

Table 20.8: Wells Score

Variable	Score
Clinically suspected DVT	3.0 points
alternative diagnosis is less likely than PE	3.0 points
Tachycardia (heart rate > 100)	1.5 points
Immobilization (≥ 3d)/surgery in previous four weeks	1.5 points
History of DVT or PE	1.5 points
Hemoptysis	1.0 points
Malignancy (with treatment within six months) or palliative	1.0 points

- ECG – Not reliable test for diagnosis may be normal. However,
- Sinus tachycardia most common feature, acute right ventricular strain – i.e. right axis shift, S1Q3T3 occurs in small percentage of cases, may develop acute bundle branch block – right or left, may simulate right ventricular infarction, may develop arrhythmias – e.g. atrial fibrillation
- Arterial blood gases; not diagnostic, the pO2 decreased <60mmHg due ventilation/perfusion mismatch. pCO2 decreased due to hyperventilation, pH increased but may decrease in shocked patient
- D–dimer test – very sensitive blood test, but not specific. A negative test d–dimer test excludes an embolus in majority of cases (best exclusive test to rule out PE when is negative)
- Chest X–ray – Not very reliable usually normal, diaphragm may be raised on affected area, atelectasis may occur, peripheral wedge–shaped shadow & plural effusion
- Cardiac Echocardiography: Useful in diagnosis, features suggestive or support
- Evidence of massive embolus acute right ventricular strain
- Computer Tomography Pulmonary Angiogram Scan (CTPA); Useful can demonstrate the presence and extent of proximal pulmonary emboli
- Ventilation/Perfusion Scan; Useful in stable patient to confirm the diagnosis. The presence of a perfusion defect with normal ventilation not corresponding to an x–ray abnormality is characteristic
- Pulmonary Angiography: Still gold standard investigation, may be necessary to establish
- Diagnosis and catheter-based embolectomy in the catheterization lab.

Non-Pharmacological Management

- Administer O2 – maintain pO2 > 60mmHg,
- Treat shock
- Correct electrolyte & acid base abnormalities and arrhythmias
- Ventilate if patient has a respiratory failure

Pharmacological Management
Anticoagulation
C: unfractionated heparin (UFH) (IV) 10,000units then maintenance infusion starts with 6,000U over 6 hours to keep PTT or clotting time 2–3times above baseline. PTT should be performed 12hourly per lab instruction.

OR

D: low molecular weight heparin (SC) 1mg/kg 12hourly for 24hours

Start warfarin after 24hours of heparin and continue post discharge for long–term. If the aetiology unknown may be for life, if aetiology is established at least for six months. Maintain INR 2.0–3.0

Thrombolytic (Fibrinolysis)
Indicated in proximal massive pulmonary emboli and haemodynamically unstable if no contraindication exists
S: streptokinase (IV)250,000IU over 30minutes, then 100,000IU per hour for 24hours

OR

S: alteplase (rtPA) (IV) 100mg over 2hours

OR

S: tenecteplase 0.2-0.5mg/kg IV bolus

Referral: All cases suspected of pulmonary embolus should be referred to a high level of care – specialized hospital care with HCDU/ICU

20.15.2 Chronic Pulmonary Embolism

Chronic pulmonary embolism is mainly a consequence of incomplete resolution of acute pulmonary thromboembolism. Clinically symptoms and signs may be preceded by Acute Pulmonary Embolism for more than 2weeks.

Pharmacological Management
Long-term oral anticoagulation

C: warfarin (PO) 2–10mg 24hourly
(Maintain INR 2.0–3.0 for warfarin use individuals.)

OR

S: rivaroxaban (PO) 15-20mg 24hourly

Referral: All cases suspected of pulmonary embolism should be referred to a high level of care
IVC filter (IVC filters are a valuable tool for preventing PE in patients who cannot be managed with anticoagulation, but their use should be carefully considered due to the increased risk of DVT and potential long-term complications. Their benefit is most pronounced in the early period after placement, and filters should be removed when no longer indicated

20.16 Cardiac Arrhythmias/ Dysrhythmias

Always exclude underlying structural cardiac disease in all patients with cardiac dysrhythmias as well as performing Holter ECG monitoring aiding at detecting type of arrhythmia.

20.16.1 Tachyarrhythmias

20.16.1.1 Narrow QRS Complex Tachyarrhythmias (SVTs)

Definition Sustained (> 30 seconds) or non–sustained narrow QRS (≤ 0.1 seconds) tachycardias.

Atrial Fibrillation
Acute onset (< 48 hours)

- Assess clinically, e.g. heart failure, mitral stenosis, thyrotoxicosis, hypertension, age and other medical conditions.
- Consider anticoagulation with heparin or warfarin.
- Synchronized DC cardioversion is occasionally necessary in emergency especially haemodynamic instability or consider if is the first episode.

Non-acute/chronic (> 48 hours)

- As above, but not immediate DC cardioversion is indicated, unless in hypotensive emergency cases. Anticoagulation with oral warfarin 2-5mg orally once a day for at least a month, then perform elective cardioversion at specialized hospital. Atrial flutter
- P waves visible before QRS, commonly occurs, usually 2:1. (150 per minute). P waves, usually negative in Lead II precede QRS, blocked P in ST segment or hidden by QRS.
- Vagal stimulation with ECG may reveal blocked P waves.

20.16.1.2 AV Junctional Re-Entry Tachycardias

- Usually paroxysmal, often young with normal heart.
- AV nodal re-entry or WPW syndrome.
- P waves usually not visible (hidden by QRS).

Non-Pharmacological Management
Electrical Cardioversion. Synchronized DC cardioversion, 200 J, after sedation with:
A: diazepam (IV)10–20 mg stat

If flutter has been present longer than 48hours, defer cardioversion for 4weeks after anticoagulation with warfarin, unless severe symptoms or heart failure requires urgent cardioversion.

Pharmacological Management
None is nearly as effective as DC cardioversion. Consider anticoagulants if Atrial flutter sustained.
Long term treatment: Recurrent atrial flutter is an indication for referral. Many can be cured by radiofrequency catheter ablation.

Atrial tachycardias

- Rare, often incessant P before QRS (often long PR) or hidden in T
- May cause heart failure (tachycardia cardiomyopathy).

Atrial fibrillation
With fast ventricular response without aberrant conduction.

Pharmacological Management
Anticoagulation
C: warfarin (PO) 2–10mg 24hourly (Maintain INR 2.0–3.0 for warfarin use individuals.)
OR
S: rivaroxaban (PO)15-20mg 24hourly (in Non-valvular AF)

Control the ventricular rate with one of the following):
D: digoxin (IV) Initial dose: 0.25-0.5mg; then 0.25mg 4-6hourly to maximum of 1mg; Maintenance dose: 0.125-0.25mg 24hourly
OR
D: digoxin (PO) 0.25mg daily; use only in heart failure).
OR
B: atenolol (PO) 50–100mg 24hourly (contraindicated in asthmatics).
OR
D: diltiazem (IV) initial dose: 15-20mg over 2minutes; may repeat in 15 minutes, Maintenance dose: 5-15mg hourly by continuous IV infusion
OR
S: verapamil (IV) 5 to 10 mg over 2minutes; may repeat in 30minutes DC cardioversion in selected cases, after 4weeks of anticoagulation

Digoxin only controls rate at rest and is insufficient on its own. If used for long-term, combine with β – blocker:
D: digoxin (PO) 0.125-0.25mg 24hourly

In the elderly and patients with renal impairment: Adjust dosages according to trough levels within the therapeutic range. Do levels only if the patient has been on the drug for at least 10 days.
AND / OR
B: atenolol (PO) 50–100 mg 24hourly
OR
S: bisoprolol (PO) 2.5mg – 10mg 24hourly
OR
C: metoprolol (PO) 25mg -50mg 24hourly
OR
S: sotalol (PO) 80mg – 160mg 12hourly

Note: Avoid use of Digoxin in patients with Accessory pathway.

With fast ventricular response with Aberrant conduction (e.g.: Wolff-Parkinson-White syndrome, WPW)

Catheter ablation of the accessory pathway in symptomatic patients with preexisted AF, especially if the accessory pathway has a short refractory period that allows rapid antegrade conduction.

Long – term: Continue warfarin anticoagulation long-term, unless contraindicated:
C: warfarin (PO) 5mg 24hourly
OR
S: rivaroxaban (PO) maintenance dose; 15mg / 20mg 24hourly
OR
Left atrial appendage occlusion (LAAO).
In poor HR control, frequent or severe symptoms for curative RFA

Note
- INR monitoring in patients on warfarin. Maintain therapeutic Range INR 2–3: Stable patients check 3 monthly. If INR < 1.5 or > 3.5: do monthly monitoring.
- Left atrial appendage occlusion (LAAO) is indicated in Atrial Fibrillation patients who cannot tolerate long-term Anticoagulation or contraindicated to OACs (Oral anticoagulants) and have thrombo-embolic risk (CHA2DS2-VASc score ≥2), increased risk of bleeding (HASBLED score ≥ 3) and thrombo-embolic events despite adequate OAC after excluding other plausible causes (e.g. carotid disease).

20.16.2 AV Junctional Re-Entry Tachycardias

Non-Pharmacological Management
Vagal maneuvers: Valsalva or carotid sinus massage. The patient should be supine and as relaxed as possible, to avoid competing sympathetic reflex

Pharmacological Management
If vagal maneuvers fail:
S: adenosine (IV) 6mg over 1-3 seconds (maybe given IO) followed by rapid flush with 20mL NS, if no conversion within 1-2minutes give 12mg, repeat a second time if necessary (30mg total).

If none of the above is effective, and patient is hypotensive, consider DC shock

Prevention of recurrent paroxysmal atrial fibrillation
Only in patients with severe symptoms despite the above measures:
S: amiodarone (PO) 200mg 8hourly for 1week, followed by 200mg 12hourly for one week and thereafter 200mg 24hourly. Specialist initiated.

Precautions:
- Half dosage of warfarin and monitor INR closely if patient on warfarin, until stable
- Avoid concomitant digoxin use.

Note: Verapamil and digoxin are contraindicated in WPW syndrome.

Long-term treatment: Teach the patient to perform vagal maneuver's, Valsalva is the most effective. For infrequent, non–incapacitating symptoms:
B: atenolol (PO) 50–100mg 24hourly (If asthmatic)
OR
S: verapamil (PO) 80–120mg 8hourly for 24hours (Normal heart)

Referral: Refer to Cardiac specialized center for Mapping and Radiofrequency Ablation (RFA)

20.16.3 Wide QRS (Ventricular) Tachyarrhythmias (VTs)

Sustained (> 30 seconds) or non-sustained wide QRS (> 0.12 seconds) tachycardias

20.16.3.1 Regular Wide QRS Tachycardias

These are ventricular tachycardias until proved otherwise. Regular wide QRS supraventricular tachycardias are uncommon.

Non-Pharmacological Management
Refer all cases after resuscitation and stabilization. Emergency DC cardioversion is mandatory with a full protocol of Cardiopulmonary Resuscitation (CPR)

- If no cardiac arrest: DC cardioversion, 200J, after sedation with: Diazepam, I.V, 10–20mg If 200J fails, use 360J.
- If cardiac arrest: Defibrillate (not synchronized).

Pharmacological Management
DC cardioversion is first line therapy for regular wide QRS tachycardias. Medicines are needed if VT recurs after cardioversion or if spontaneous termination/recurrence.

S: amiodarone (IV) 5mg/kg (150-300mg) infused over 30minutes then continue with maintenance dose to total dose of 1200mg/24hours

OR

S: amiodarone (PO) 800 mg 24hourly for 7days, 600mg/day for 3days followed by a maintenance dose of 200–400mg/day

Amiodarone may cause serious long-term side effects due to long half-life. Therefore, patients require regular monitoring by specialist.
A: lidocaine (IV) 50–100mg (1–2mg/kg) initially and at 5minute intervals if required to a total of 200–300mg,

Thereafter, for recurrent ventricular tachycardia only
A: lidocaine (IV)1–3mg/minute for 24–30hours. lidocaine will only terminate ± 30% of sustained ventricular tachycardias, and may cause hypotension, heart block or convulsions.

Note

- Never give verapamil IV to patients with a wide QRS tachycardia.
- For emergency treatment of ventricular tachycardia, DC cardioversion is first–line therapy, even if stable.

20.16.3.2 Sustained (> 30 Sec) Irregular Wide QRS Tachycardias

They are usually due to atrial fibrillation with bundle branch block, or pre-excitation (WPW syndrome).

Non-Pharmacological Management

- If the QRS complexes have a pattern of typical right or left bundle branch block, with a rate
- < less than 170/minute, treat as for atrial fibrillation. See the section on atrial fibrillation.
- If the rate is > 170 per minute, and/or the complexes are atypical or variable, the likely diagnosis is WPW syndrome with atrial fibrillation, conducting via the bypass tract, DC conversion.

Referral: Refer patient to high care centre for further management including arrhythmia mapping and RFA

20.16.3.3 Non-Sustained (< 30 Sec) Irregular Wide QRS Tachycardias

They are usually ventricular, commonly in acute myocardial infarction. In acute myocardial infarction, only treat non–sustained ventricular tachycardia if causes significant haemodynamic compromise. Ensure the serum potassium level is above 4 mmol/L.

Pharmacological Management
Medicines are needed if VT recurs after cardioversion or if spontaneous termination/recurrence.

S: amiodarone (IV) 5 mg/kg (150-300mg) over 30minutes then continue with maintenance dose to total dose of 1200mg for24hours

OR

S: amiodarone (PO) 800mg 24hourly for 7days, followed by 600mg 24hourly for 3 days then a maintenance dose of 200–400mg 24hourly

Only in a haemodynamically stable patient:
A: lidocaine (IV) 50–100mg (1–2mg/kg) initially and at 5minute intervals if required to a total of 200–300mg

Thereafter, for recurrent ventricular tachycardia only:
A: lidocaine (IV) 1–3mg/minute for 24–30hours
In the absence of acute ischemia or infarction, consider torsade's de pointes.

20.16.4 Torsade's De Pointes Ventricular Tachycardia (VT)
Has a twisting pattern to the QRS complexes and a prolonged QT interval in sinus rhythm, it is usually due to a QT–prolonging drug, ± hypokalemia.

Non-Pharmacological Management
- Cardioversion/defibrillation, as necessary.
- Torsade's complicating bradycardia: temporary pacing

Pharmacological Management
Stop all QT-prolonging drugs. Correct serum potassium.

A: magnesium sulphate (IV) 2g over 5–10minutes

If recurrent episodes after initial dose of magnesium sulphate:
A: magnesium sulphate (IV) 2g over 24hours Torsade's complicating bradycardia: temporary pacing.
AND
A: epinephrine (adrenaline) infusion to raise heart rate to >100 per minute (if temporary pacing unavailable).

Referral: Refer all cases of wide QRS tachycardia, after resuscitation and stabilization for possible arrhythmia mapping and RFA.

20.16.5 Heart Block (Second and Third Degree)
Most cases occur in patients over 60 years and is idiopathic. Acute, reversible AV block commonly complicated by inferior myocardial infarction, here temporary Pacemaker used as bridge therapy. The condition may also be induced by medicines, metabolic and electrolyte derangements.

Non-Pharmacological Management
- Emergency cardio-pulmonary resuscitation.
- External pacemaker should be available in all secondary hospitals and must be preceded by appropriate analgesia.

Pharmacological Management
Analgesia if external pacemaker:
C: morphine (IM)10–15mg 3–6hourly

For Temporary treatment of complete AV block before referral for pacemaker:
A: atropine (IV) bolus 0.6–1.2mg every 3 – 5min (max 3mg) may be repeated until a temporary or permanent pacemaker is inserted.
(Use in an Inferior Infarct patients, hypotension, and second-degree AV block).

For resuscitation of asystole:
A: epinephrine (adrenaline) (IV) 1:10000, slow 5mL (0.5mg)

Referral
- All cases with a heart rate below 40 beats/minute after resuscitation and stabilization to high level of care where permanent pacemaker implantation can be performed.
- All cases of second or third-degree AV block, whether myocardial infarct or other reversible cause is suspected, and whether the patient is thought to be symptomatic.

Note: Complete Heart Block Is a Medical Emergency Refer Urgently

20.16.6 Sinus Bradycardia & Sinus Arrest
This rhythm does not require treatment, unless they are causing symptoms, i.e. syncope, dizziness, tiredness, and poor effort tolerance. Sinus bradycardia <50/minute or sinus arrest with slow escape rhythm, accompanied by hypotension, strongly suggests a treatable underlying cause:
- Acute inferior myocardial infarct
- Hyperkalemia, especially if wide QRS and/or peaked T waves
- Drugs, especially combination of verapamil and ß –blocker or digoxin
- Hypothermia
- Hypoxia

Treat the cause. Consider atropine if inferior in

Note: Refer the patient After stabilization to the Cardiac Specialized centre for thorough evaluation and Pacemaker Implantation [Temporary/Permanent Pacemaker Implantation (single or Dual chamber) depending on the underlying cause], prepare Vancomycin injection for sterilization of Permanent Pacemaker pouch.

20.17 Aortic diseases and peripheral arterial diseases

20.17.1 Aortic Aneurysm

In clinical practice aortic root dilatation can be suspected in male adults when the aortic diameter is >40mm and at females at >36mm.

Causes: hypertension, marfan syndrome, syphilis

Clinical Presentation

Shortness of breath, awareness of heartbeat, hoarseness of voice.

Investigations

- CXR-widening of mediastinum,
- Echocardiogram-in ascending aortic root and arch,
- CT-aortogram is the definitive diagnostic tool

Management

Consult specialist and refer to the high-level specialized hospital Management for AAA

- AAAs are usually treated with surgical repair in ruptured, symptomatic or appropriately sized aneurysms. When indicated, unruptured aneurysms can undergo elective repair Newer minimally invasive techniques extend aortic aneurysm treatment into an increasingly elderly population. Recommend elective repair for the patient at low or acceptable surgical risk with a fusiform AAA that is ≥5.5 cm in males and >5cm in females.
- If an AAA ruptures, emergency surgical repair is required. The primary repair methods are as follows:
- Open - This requires direct access to the aorta via a transperitoneal or retroperitoneal approach
- Endovascular - This involves gaining access to the lumen of the abdominal aorta, usually via the femoral vessels; an endograft, typically a polyester or Gore-Tex graft with a stent exoskeleton, is placed within the lumen of the AAA, extending distally into the iliac arteries

20.17.2 Aortic Dissection

Aortic Dissection Is the life-threatening condition in which a tear develops in the inner layer(intima) of the aorta.

Causes and risk factors: Hypertension, marfan-syndrome, trauma, etc.

Clinical Presentation

severe chest pain (tearing or ripping in nature), fainting, sweating, vomiting, pulse deficits or differences in blood pressure between arms

Classification:

- Stanford type A- involves the ascending aorta (may extend to the arch or descending aorta)- requires urgent surgery
- Stanford type B- involves only the descending aorta- may be managed medically unless complications arise

Investigations

- CXR- an abnormal aortic contour,
- Aortic knuckle double,
- CT-aortogram is crucial in diagnosing and assessing aortic dissection

Management

Consult specialist and refer to the high-level specialized hospital

20.17.3 Peripheral arterial disease (PAD)

Chronic peripheral arterial disease (PAD) may be asymptomatic, present with intermittent claudication, or manifest as critical limb ischemia.

Intermittent claudication is one of the most common manifestations of peripheral arterial occlusive disease (PAOD) caused by atherosclerosis. It is characterized by reproducible ischemic muscle pain that occurs during physical activity and is relieved by a short period of rest. The pain results from inadequate blood flow to the affected limb.

Table 20.9: Chronic Peripheral Arterial Disease (PAD) Management

Component	Details
Risk Factors	• Diabetes mellitus, • Hypertension, • Hyperlipidemia, • Family history of cardiovascular disease, • Sedentary lifestyle, • Tobacco use, • Chronic kidney disease
Clinical Assessment	• Claudication pain during exercise relieved by rest; • Complete lower-extremity examination; • Palpation of pulses from abdominal aorta to foot; • Auscultation for abdominal and pelvic bruits; • Handheld Doppler assessment if pulses are absent

Component	Details
Ankle-Brachial Index (ABI)	• Non-invasive assessment tool calculated as ankle systolic BP ÷ brachial systolic BP: 0.9–1.1 = normal; <0.9 = suggestive of PAD
Laboratory Investigations	• Renal function tests, • Lipid profile
Imaging Studies	• Duplex ultrasonography; • CT angiography (CTA); • Magnetic resonance angiography (MRA); • Conventional angiography (gold standard when intervention is planned)
Non-Pharmacological Management	• Smoking cessation; • Regular exercise; • Control of diabetes, hypertension, and lipid levels
Pharmacological Management	**A:** acetylsalicylic acid (PO) 75 mg 24 hourly **OR** **D:** clopidogrel (PO) 75 mg 24 hourly **AND/OR** **S:** cilostazol (PO) 100 mg every 12 hours
Surgical/Interventional Management	• Reserved for severe disease, • Critical limb ischemia, or lifestyle-limiting claudication not responding to medical therapy: • Open bypass surgery; Endovascular therapy (stenting, balloon angioplasty, atherectomy); • Minimally invasive interventional radiology procedures; • Thrombectomy; thrombectomy without stenting; catheter-directed thrombolysis (CDT)

20.17.4 Varicose Veins and Venous Ulcers

Varicose veins and telangiectasia (spider veins) are dilated, elongated and tortuous superficial veins of lower limbs, the visible surface manifestations of an underlying problem with reverse venous flow, which is also termed venous insufficiency syndrome. Mild forms of venous insufficiency are merely uncomfortable, annoying, or cosmetically disfiguring, but severe venous disease can produce serious systemic consequences and can lead to loss of life or limb.

Inspection may reveal the following findings:

Signs and symptom	Inspection may reveal the following findings
Leg heaviness- Venous claudication	Ulceration
Pain or tenderness along the course of a vein	Lipodermatosclerosis
Pruritus	Interdigital mycosis
Burning sensations	Eczematous lesions
Restless legs	Micro ulcers
Edema	Stasis dermatitis
Skin changes	Prominent varicose veins
Paresthesias	Scars from a prior surgical operation
	Evidence of previous sclerosant injections

Investigations

- Doppler Ultrasound,
- Magnetic resonance venography (MRV)

Management

Conservative treatment with stockings and external compression is an acceptable alternative to surgery, but worsening cutaneous findings or symptoms despite these measures usually warrant intervention.

The following are the modern techniques used to ablate varicosities:

- Sclerotherapy – The most widely used medical procedure for varicose veins and spider veins ((performed by vascular surgeon & interventional radiologist)
- Laser and intense-pulsed-light therapy
- Radiofrequency (RF) or laser ablation (performed by vascular surgeon & interventional radiologist)
- Common surgical approaches to large-vein varicose disease include the following:
- Ligation of the saphenofemoral junction with vein stripping.
- Phlebectomy performed through microincisions
- Endovenous RF thermal ablation (performed by vascular surgeon & interventional radiologist)
- Endovenous laser thermal ablation (performed by vascular surgeon & interventional radiologist)
- Varicose vein VenaSeal cyanoacrylate (performed by interventional radiologist)
- Varicose vein Sclerotherapy (performed by interventional radiologist)
- Varicose vein Clarivein (performed by interventional radiologist)
- Varicose vein Varithena (performed by interventional radiologist)

Lymphedema
Lymphedema is an abnormal collection of protein-rich fluid in the interstitium resulting from obstruction of lymphatic drainage.

Clinical Presentation
- Chronic swelling of an extremity preceded lymphedema
- Primarily lower extremity involvement (80%) but can also involve the upper extremities, face, genitalia, and trunk
- Fevers, chills, and generalized weakness
- Severe impairment of daily activities
- Recurrent bacterial or fungal infections
- Recurrent episodes of cellulitis, lymphangitis, fissuring, ulcerations, and/or verrucous changes

Investigations
- Lymphoscintigraphy is the new criterion standard for evaluation of the lymphatic system
- Doppler uss
- CT angiography
- MRI Angiography

Management
The goals of lymphedema management are to restore limb function, reduce swelling and associated physical and psychological morbidity, prevent recurrent infections and other complications, identify and treat the underlying cause in secondary lymphedema, and promote weight management and regular physical activity to improve clinical outcomes and reduce disease progression.

Non Pharmacological Management
Conservative measures for managing lymphedema include the following:
- Maintenance of appropriate hygiene and skin care
- Use of complex physical therapy (first-line treatment) and compression stockings
- Weight loss (if overweight)
- Avoiding trauma
- Avoiding constrictive clothing
- Elevating affected limb

Surgical treatment
Surgical treatment is indicated for selected patients with refractory lymphedema and is intended to reduce limb volume, improve lymphatic drainage, and enhance function and quality of life. Surgery is **palliative rather than curative** and should be used as an adjunct to, not a replacement for, ongoing conservative management, including compression therapy and skin care.

20.18 Congenital Heart Disease (CHD)

These are structural abnormalities of the heart and intrathoracic blood vessels that occur during fetal development. It is the most common type of birth defect. CHD is divided into non-cyanotic CHD and cyanotic CHD.

Clinical Presentation
- Failure to thrive
- Interrupted breastfeeding
- Recurrent cough and difficulty in breathing
- Tachypnoea
- Cyanosis and digital clubbing
- Echocardiographic evidence of CHD

Critical cyanotic congenital heart disease (CCHD): Defined as lesions requiring surgery or catheter-based intervention in the first year of life

Evaluation
Prenatal screening during a standard obstetric ultrasound examination
Pulse oximetry screening – recommended to done to all newborns when at least 24 hours of age. To be done in the right hand and either foot. A positive screening result includes one of the following:
- Any Oxygen Saturation less than 90%
- Oxygen Saturation less than 95% in both extremities, on 3 measures, each separated by 1 hour
- More than 3% absolute difference in oxygen saturation between the right hand and foot on 3 measures, each separated by 1 hour
- Chest X-ray
- Electrocardiogram
- Echocardiogram

Note: Appropriate referral to a facility with neonatal intensive care unit or cardiac care unit

Initial stabilization
- Inotropes to manage shock and hypotension
- Appropriate respiratory support – oxygen therapy and mechanical ventilation for severe cases

Pharmacological Management
If ductal-dependent CHD confirmed or if there is a strong suspicion but echocardiography not readily available:
D: prostaglandin E1 0.01 mcg/kg per minute (maximum dose 0.1 mcg/kg per minute

Other supporting management: PDA stent **Definitive management:** Intracardiac repair (ICR)

CHAPTER TWENTY-ONE

KIDNEY AND UROLOGICAL DISORDERS

These disorders result from structural malformation or function of the genitourinary system that may lead to kidney impairment. These disorders include diseases originating from the kidney and systemic diseases, which result in complications affecting the kidney. Hypertension and diabetes mellitus are the commonest conditions causing complications in the kidney; therefore, all patients with hypertension and diabetes mellitus should be regularly screened for kidney complications.

21.1 Chronic Kidney Diseases (CKD)

It is structural or functional kidney damage present for >3 months, with or without a decreased glomerular filtration rate (GFR). Early screening in high-risk groups [hypertension, Diabetes and glomerular diseases] is crucial in improving the outcome of CKD. Once the cause and plan for care have been established, adults with early CKD stages 1-3 can be managed at the primary care level. Patients with CKD stage 4 should be referred to a nephrologist whenever possible.

Common causes of CKD

- Vascular: Hypertension, renal artery stenosis, vasculitis, etc.
- Glomerular diseases; Diabetes, autoimmune diseases (e.g., lupus nephritis), chronic systemic infections (e.g., HIV, HBV, syphilis), drugs, neoplasia
- Tubulointerstitial diseases; UTI, drug-induced interstitial nephritis (e.g. rifampicin, allopurinol, fluoroquinolones, sulphonamides, β-lactam antibiotics, proton pump inhibitors, non-steroidal anti-inflammatory drugs)
- Structural: Polycystic kidneys, renal masses, obstruction (stones, strictures)
- Others; Congenital: Chronic kidney disease can be entirely asymptomatic until over 75% of kidney function is lost

Clinical Presentation

Clinical features depend on the stage of kidney disease. In advanced stage includes:

- Anorexia
- Malaise
- Vomiting
- Oliguria/anuria

Investigations

- Kidney function tests (serum creatinine and urea) - at diagnosis, check every month for 3 months. If active sediment/proteinuria, provider may check more frequently
- FBC (HB)
- Serum electrolytes Potassium, Calcium Phosphate and Sodium [CKD stage 3-5: Check monthly]
- Serum albumin
- Total protein
- Serum lipids (cholesterol / LDL/ HDL/ Triglyceride
- Serum bicarbonate levels (venous) [CKD stage 3-5: Check monthly]
- Parathyroid hormone levels, Serum Phosphate, and Alkaline phosphatase (ALP)
- Urinalysis (Protein, red blood cells and cast cells), then quantify the amount of protein in urine by Esbach test or Urine albumin-creatinine ratio or Urine protein-creatinine ratio
- Kidney-Ureter-Bladder (KUB) ultrasound
- CXR
- ECG
- Echocardiogram
- Other tests to be done as per the doctor's discretion and needs on the specific patient

Note:
Determine and address the underlying cause of CKD, especially when considering kidney transplantation.

- Treat reversible causes of kidney dysfunction.
- Prevent or slow the progression of kidney disease.
- Treat complications of kidney dysfunction.
- Identify and adequately prepare patients who may require kidney replacement therapy.

Table 21.1: Staging of kidney disease for adequate management of CKD stage/glomerular filtration rate (GFR*) (ml/minute/1.73 m²)

Stage	eGFR (mL/min/1.73 m²)	Description	Recommended Action
Stage 1	>90	Kidney damage with structural or functional abnormalities (e.g., persistent albuminuria, urine sediment abnormalities, imaging changes, electrolyte imbalances, or histological abnormalities) with normal eGFR	Diagnose and treat underlying cause and comorbid conditions
Stage 2	60–89	Kidney damage with mild reduction in eGFR	Refer to determine the cause and develop a care plan; monitor eGFR regularly to ensure kidney function is not worsening rapidly and assess for progression to Stage 3
Stage 3	30–59	Moderate reduction in eGFR	Refer to physician/nephrologist; monitor and manage complications; check serum creatinine and blood urea nitrogen (BUN) every 3 months
Stage 4	15–29	Severe reduction in eGFR	Refer to nephrologist; prepare for kidney replacement therapy
Stage 5	<15	Kidney failure requiring kidney replacement therapy	Refer to nephrologist for kidney replacement therapy

Note:
Estimation of Glomerular Filtration Rate (eGFR);-

- Use the CKD-EPI formula without the ethnicity factor for adults.
- For children aged 1–18 years, use the Schwartz bedside eGFR calculator.
- These calculators are freely available online.
- Laboratories in Tanzania should routinely report kidney function as estimated glomerular filtration rate (eGFR).

Table21.2 : Classification of Proteinuria

Category	Albumin-to-Creatinine Ratio (ACR) (mg/g)	Protein-to-Creatinine Ratio (PCR) (g/day)	Approx. Esbach (g/L)
A1 (Normal)	< 30	< 150	< 0.15
A2 (Abnormal – Moderate proteinuria)	30–300	~150–500	~0.15–0.5
A3 (Abnormal – Severe proteinuria)	> 300	> 500	> 0.5

Significant proteinuria is defined as: > +2 protein on urine dipstick, OR Category A2 or A3 proteinuria based on the above classification.

Non-Pharmacological Management

- Salt Restriction: Limit sodium intake to less than 2,300 mg/day (about 1 teaspoon)
- Cardiovascular Risk Reduction: Control hypertension, diabetes, dyslipidemia, smoking cessation, and maintain healthy weight.
- Patient Education: Inform patients about CKD progression, lifestyle modifications, medication adherence, and when to seek medical advice.
- Protein Intake: Moderate to low protein restriction in advanced stages (not exceeding 0.5-1 g/kg/day), with adequate caloric intake to prevent malnutrition
- Reduce cardiovascular disease risk factors – See section: Prevention of ischaemic heart disease and atherosclerosis.
- Maintain blood pressure ≤130/80 mmHg if tolerated.
- Treat underlying conditions.
- Optimize glycemic control in diabetes.
- Emphasize smoking cessation, weight management, and regular physical activity (≥150 minutes/week).
- Avoid nephrotoxic agents such as NSAIDs.
- Monitor kidney function (eGFR) and albuminuria (ACR) regularly (at least annually).
- Decrease significant proteinuria, if present

Pharmacological Management

Component	Details
Drug Use Principles in CKD	• Regularly review all medications and adjust according to eGFR • Use CKD-EPI (adults) and Schwartz equation (children) to estimate eGFR • Avoid nephrotoxic drugs • Check history of drug allergies/adverse reactions before prescribing • Monitor drug toxicity and serum levels where available (e.g. aminoglycosides)
General CKD Management Principles	• Reduce proteinuria regardless of blood pressure status • Monitor kidney function and serum potassium closely • Correct volume depletion before starting ACE inhibitors or ARBs to avoid AKI • Identify and treat underlying cause (e.g. diabetes, hypertension, glomerular disease) • Consider nephrology referral for possible kidney biopsy

Drug Class	Drug & Dose	Key Notes
ACE Inhibitors	**C:** enalapril (PO) 10–20 mg 12 hourly **OR** **C:** lisinopril (PO) 5–10 mg 24 hourly (titrate up to 40 mg 24 hourly)	•Start low and titrate gradually •Contraindicated in hyperkalemia •Monitor BP, renal function, and potassium •Maximize dose as tolerated to reduce proteinuria
Angiotensin Receptor Blockers (ARBs)	**B:** losartan (PO) 50 mg 24 hourly (titrate up to 100 mg daily)	•Reduce proteinuria by ~30–40% •Effective in diabetic and non-diabetic CKD •Can be used in hypertensive and normotensive patients
SGLT2 Inhibitors	**S:** dapagliflozin (PO) 10 mg 24 hourly	•Provide renal protection and additional proteinuria reduction •Used with ACEI/ARB regardless of diabetes status

Hyperlipidemia and Referral to a Nephrologist (CKD)

Hyperlipidemia, when present as a co-existent risk factor in chronic kidney disease (CKD), should be managed according to the relevant cardiovascular guidelines (see Chapter 20 Cardiovascular disease conditions).

Referral to a nephrologist is indicated in the following situations:

- Reduced kidney function: eGFR <60 mL/min/1.73 m² (CKD stage G3 or worse) or rapid decline in eGFR (>5 mL/min/1.73 m² per year).
- Significant albuminuria/proteinuria: Persistent urine albumin-to-creatinine ratio (UACR) ≥30 mg/g on at least two occasions, nephrotic-range proteinuria (>3.5 g/day), or nephrotic syndrome.
- Active urinary sediment or unexplained hematuria: Presence of red blood cell casts, dysmorphic red blood cells, or other active sediment.
- Suspected or confirmed secondary kidney disease: Including congenital anomalies, glomerulonephritis, and systemic diseases such as lupus nephritis or HIV-associated nephropathy.
- CKD complications: Refractory anemia, electrolyte disturbances (e.g., hyperkalemia, metabolic acidosis), or bone mineral disorders not responding to initial therapy.
- Pediatric CKD: Any child diagnosed with CKD.
- Preparation for renal replacement therapy (RRT): Planning for dialysis access or kidney transplant evaluation.

21.1.1 Diabetic Kidney Disease

Diabetic kidney disease (DKD) is a clinical diagnosis based on the presence of albuminuria, reduced estimated glomerular filtration rate (eGFR), or both in patients with diabetes mellitus. It includes diabetic nephropathy, which classically presents with microalbuminuria (30–300 mg/g or 3–30 mg/mmol) and diabetic retinopathy.

DKD typically develops after long-standing diabetes (usually >10 years in type 1 diabetes) but may be present at the time of diagnosis in type 2 diabetes. It may also occur without retinopathy or without albuminuria, particularly in type 2 diabetes. Alternative causes of kidney disease should be considered when atypical features are present.

Clinical Presentation

- Hypertension
- Diabetic retinopathy
- Edema
- Symptoms of advanced CKD (fatigue, pallor, bleeding tendency)
- Signs of peripheral neuropathy

Investigations

- Urinalysis: Dipstick testing for proteinuria and microscopic examination for casts (RBC casts, WBC casts) and dysmorphic red blood cells
- Albuminuria quantification: Spot urine albumin-to-creatinine ratio (ACR) or 24-hour urine protein collection
- Confirm elevated albuminuria in at least 2 of 3 samples over 3–6 months
- Imaging: Kidney, ureter, and bladder (KUB) ultrasound to exclude obstruction or structural abnormalities
- Additional investigations may be performed based on clinical judgment and patient-specific needs

Referral to a Nephrologist for Kidney Biopsy

Kidney biopsy should be considered when the cause of kidney disease is unclear or atypical features are present, including:

- Albuminuria >300 mg/g within 5 years of onset of type 1 diabetes
- Active urinary sediment (RBC casts, dysmorphic RBCs, WBC casts)
- Presence of systemic illness (e.g., Systemic Lupus Erythematosus)
- Rapid decline in eGFR (>5 mL/min/1.73 m² per year)

Pharmacological Management

Table 21.2: eGFR-Based Antiglycemic Medication Recommendations in Diabetes with CKD

eGFR (mL/min/1.73 m²)	CKD Stage	Recommended Medicines (Dose and Frequency)	Key Considerations
>90	Stage 1	Standard diabetes management as per Diabetes Mellitus guidelines. For T2DM with high cardiovascular/renal risk: **S:** dapagliflozin (PO) 10 mg 24 hourly **OR** **S:** sitagliptin (PO) 50 mg 24 hourly	• Maintain optimal glycemic control. • Manage hypertension and dyslipidemia. • Screen for albuminuria.
60–89	Stage 2	Same as Stage 1	• Continue SGLT2 inhibitors if indicated. • Monitor renal function periodically.
30–59	Stage 3	**A:** gliclazide (PO) 40–80 mg 12 hourly **OR** **C:** glimepiride (PO) 1–8 mg 24 hourly **AND** **S:** dapagliflozin (PO) 10 mg 24 hourly (if eGFR ≥20 mL/min/1.73 m²)	• Use metformin cautiously. • Avoid long-acting sulfonylureas. • Titrate doses carefully to reduce hypoglycemia risk.
15–29	Stage 4	**A:** gliclazide (PO) 40–80 mg 12 hourly **OR** **C:** glimepiride (PO) 1–8 mg 24 hourly **AND** **S:** sitagliptin (PO) 25 mg 24 hourly **AND/OR** **S:** dapagliflozin (PO) 10 mg 24 hourly (if eGFR ≥20 mL/min/1.73 m²)	• Insulin dose reduction may be required. • Avoid metformin if eGFR <30 mL/min/1.73 m². • Monitor for hypoglycemia.
<15	Stage 5	Preferred: **D:** insulin therapy (individualized regimen) **OR** **D:** pioglitazone (PO) 15–30 mg 24 hourly (if no contraindications)	• Reduce insulin dose progressively as kidney function declines. • Monitor for fluid retention with pioglitazone. • High risk of hypoglycemia.
On Dialysis	Dialysis-dependent CKD	Preferred: **D:** insulin therapy (individualized regimen) **OR** **D:** Pioglitazone (PO) 15–30 mg 24 hourly (if no contraindications)	• Frequent glucose monitoring required. • Insulin requirements may fluctuate. • Ensure adequate nutritional/protein intake.

Note:

- SGLT2 inhibitors may be initiated/continued in patients with T2DM and CKD when eGFR ≥20 mL/min/1.73 m², unless contraindicated.
- Avoid Metformin when eGFR <30 mL/min/1.73 m² due to the risk of lactic acidosis.
- Regular monitoring of HbA1c, renal function, albuminuria, electrolytes, and hypoglycemia risk is recommended.
- Consider referral to a nephrologist for advanced CKD (Stage 4–5).

21.1.2 Hypertension and CKD

- For adults and children with CKD and albuminuria (UACR ≥30 mg/g), target BP is <50th percentile (pediatric) or <120/80 mmHg (adults).
- BP <140/90 mmHg is recommended for adult CKD patients without significant proteinuria (albuminuria <30 mg/g) and target BP <75th percentile in children.
- Albuminuria categories (A1, A2, A3) remain the cornerstone for risk stratification and treatment decisions.

Note: Angiotensin-converting enzyme inhibitors (**ACEIs**) and angiotensin II receptor blockers (**ARBs**) are contraindicated in pregnancy. Use alternative antihypertensive agents in pregnant women.

Non-Pharmacological Management

- Dietary Sodium restriction; Limit sodium intake to <90 mmol/day (~5–6 grams of salt per day) one teaspoon per day.
- Weight Management: weight loss of ≥4% in overweight or obese patients.
- Physical Activity: Encourage regular, tailored physical activity suitable for CKD stage and patient capacity.
- Alcohol Moderation and Stress Management
- Holistic and Multidisciplinary Care-Emphasize patient education, nephrotoxin avoidance, and management of CKD complications alongside lifestyle modifications

Table21.3: Pharmacological Management of hypertension and CKD Based on eGFR and Proteinuria Status

eGFR Range (mL/min/1.73 m²)	With Proteinuria (Albuminuria ≥30 mg/g or >0.5 g/day)	Without Proteinuria (Albuminuria <30 mg/g or <150 mg/day)	Key Considerations
≥30 CKD Stage 1: >90) CKD Stage 2: (60–89) CKD Stage 3: (30–59)	**First-line:** **C:** enalapril (PO) 10–20 mg 12 hourly **OR** **C:** lisinopril (PO) 5–10 mg 24 hourly (titrate up to 40 mg 24 hourly) **OR** **B:** losartan (PO) 50 mg 24 hourly **OR** **S:** irbesartan (PO) 150–300 mg 24 hourly If BP remains uncontrolled: **B:** amlodipine (PO) 5 mg 24 hourly (maximum 10 mg daily) **OR** **D:** hydrochlorothiazide (PO) 25–50 mg 24 hourly **OR** **S:** chlorthalidone (PO) 12.5–25 mg 24 hourly Combination of ACEi/ARB + CCB is encouraged when needed. Consider adding: **D:** diltiazem (PO) 60–120 mg 12 hourly **OR** **S:** verapamil (PO) 40–80 mg 8 hourly For diabetic CKD: **S:** dapagliflozin (PO) 10 mg 24 hourly	**First-line:** ACEi or ARB as above Add if needed: **B:** amlodipine (PO) 5–10 mg 24 hourly **OR** Thiazide/thiazide-like diuretic as above. For diabetic CKD: **S:** dapagliflozin (PO) 10 mg 24 hourly If BP remains uncontrolled: **C:** spironolactone (PO) 25 mg 24 hourly (maximum 50 mg 24 hourly)	• Monitor serum potassium. • Repeat serum creatinine 5–7 days after initiating or increasing ACEi/ARB dose. • Avoid dual ACEi + ARB therapy.
<30 CKD Stage 4: (15- 29) CKD Stage 5: (<15) (Including dialysis patients)	**First-line:** ACEi/ARB + CCB as above (use cautiously) Diuretics: **A:** furosemide (PO) 20–40 mg once or twice daily (titrate according to volume status) Children **A:** furosemide (PO) 1 mg/kg/dose 12 hourly	Same approach as patients with proteinuria, but individualized based on blood pressure control, fluid status, and tolerability.	• Use ACEi/ARB cautiously and monitor potassium/creatinine closely. • Repeat creatinine 5–7 days after initiating ACEi/ARB. • In eGFR <15 mL/min/1.73 m² or dialysis patients, ACEi/ARB may need to be withheld depending on

	Continue SGLT2 inhibitor if already initiated and tolerated, even if eGFR falls below 20; discontinue once dialysis is initiated. **S:** finerenone (PO) 10 mg 24 hourly, titrate to 20 mg 24 hourly (for diabetic CKD) If BP remains uncontrolled: **C:** metoprolol (PO) 25 mg 24 hourly (maximum 100 mg daily) **OR** **S:** bisoprolol (PO) 2.5 mg 24 hourly **OR** **S:** doxazosin (PO) 1 mg 24 hourly (titrate up to 16 mg 24 hourly) Alternative diuretics: **A:** furosemide (PO) 40–80 mg 24 hourly (up to 600 mg/day) ± **S:** metolazone (PO) 2.5 mg 24 hourly (maximum 5 mg daily) **OR** **S:** torsemide (PO) 10 mg 24 hourly (maximum 20 mg daily)		volume status or hyperkalemia.

21.1.3 Fluid overload

Resistant fluid overload in CKD refers to persistent volume retention despite standard sodium restriction and diuretic therapy. The management focuses on the following objectives; -

- Control fluid retention
- Prevent complications such as hypertension, edema, and heart failure
- Preserve kidney function and improve quality of life

Investigations

- Natriuretic Peptides (BNP, NT-proBNP)
- Creatinine, BUN, eGFR
- Serum/Urine Sodium, Potassium, Chloride
- Serum Osmolality
- Hematocrit, Hemoglobin
- Serum Albumin, Total Protein
- Other tests to be done as per the doctor's discretion and needs on the specific patient

Non-Pharmacological Management

- Sodium restriction: Limit intake to <90 mmol/day (~5–6 g salt/day)/ one teaspoon per day
- Patient education: Emphasize adherence to fluid and salt restriction, medication compliance, and self-monitoring (weight, edema)
- Avoid nephrotoxic drugs and agents that worsen fluid retention (e.g., NSAIDs, certain calcium channel blockers)
- Adjust doses of antihypertensives and diuretics according to kidney function

Pharmacological Management

First-line Therapy: Loop Diuretics

A: furosemide (PO): Start 20–40 mg once or twice daily; titrate up to 200 mg/day

OR

S: torsemide (PO) Start 10–20 mg 24 hourly; titrate up to 200 mg/d

ADD

Thiazide or Thiazide-like Diuretics If diuresis is inadequate

D: hydrochlorothiazide (PO) 25-50 mg 12 hourly

OR

S: metolazone (PO): 2.5–5 mg 24 hourly, given 30 minutes before loop diuretic. (Note: Monitor electrolytes closely due to the risk of hypokalemia and hyponatremia.)

Monitoring

- Monitor blood pressure, serum electrolytes (potassium, sodium), and kidney function regularly
- Monitor for signs of volume overload or depletion

21.1.3.1 Refractory Fluid Overload

When oral therapy is insufficient or rapid volume control is needed

Pharmacological Management
A: furosemide 20–40 mg IV bolus; 6–8 hourly (in severe cases, doses up to 600 -1500mg/ day)
Maximum single bolus dose:160–200 mg
Doses above 80 mg should be given by slow IV infusion (Infusion rate: ≤4 mg/min).
OR
S: torsemide 10–20 mg IV 24 hourly. Longer half-life; titrate up to 100–200 mg/day as tolerated

Address contributing factors such as hypoalbuminemia, medication non-adherence, or heart failure

Adults
S: albumin solution (IV) 20% or 25% , 0.5–1 g/kg/dose IV Maximum: generally should not exceed 2 g/kg/day
Children
S: albumin solution (IV) 20% or 25% , 0.5–1 g/kg/dose IV administered over 30 minutes–2 hours, depending on indication and clinical status.
May repeat doses every 24–48 hours depending on clinical response and volume status

Administer with
loop diuretics
A: furosemide 1–2 mg/kg IV) to enhance diuresis and prevent volume overload

Monitor: blood pressure, fluid balance, signs of volume overload (pulmonary edema, hypertension), electrolytes
Avoid: in patients with uncontrolled hypertension, congestive heart failure, or pulmonary edema

Use this formula for calculating doses depending on IV albumin concentration available at the facility

$$\text{Volume (mL)} = \frac{\text{Dose (g)}}{\text{Concentration (g/mL)}}$$

Referral: Refer to a nephrologist CKD patient if fluid overload is refractory to medical management or
if they have resistant hypertension, refractory fluid overload, rapid decline in kidney function, high risk of kidney failure, severe albuminuria, serious electrolyte disturbances, or AKI superimposed on CKD or if dialysis is indicated.

Note: Patients who might qualify for dialysis and transplantation or who have complications should be referred early to ensure improved outcome and survival on dialysis, i.e. as soon as GFR drops below 30 mL/min/1.73m2, or as soon as diagnosis is made/suspected

21.1.4 Vaccination in CKD patients

Patients with chronic kidney disease have weakened immune systems that make them more susceptible to severe infections, making vaccination a critical strategy to prevent serious illness, reduce hospitalizations, and improve their overall health outcomes.

Table 21.4: Recommended Vaccinations for Patients with Chronic Kidney Disease (CKD)

Vaccine	Adult CKD Patients (≥19 years)	Paediatric CKD Patients (<19 years)
B: hepatitis B vaccine (HBV) (dose according to product specifications)	**CKD Stages 3–4:** • 10 micrograms: 3 doses at 0, 1, and 6 months **OR** • 20 micrograms: 4 doses at 0, 1, 2, and 6 months **CKD Stage 5 (including dialysis):** • 40 micrograms: 3 doses at 0, 1, and 6 months **OR** • 40 micrograms: 4 doses at 0, 1, 2, and 6 months Booster dose: administer when anti-HBs titre is <10 mIU/mL	• Higher antigen dose may be required in children on dialysis (e.g., 40 micrograms, depending on product). • Administer 3–4 doses according to vaccine type and national immunization guidance.

Vaccine	Adult CKD Patients (≥19 years)	Paediatric CKD Patients (<19 years)
S: pneumococcal polysaccharide vaccine	**If not previously vaccinated:** • PCV13 first • Followed by PPSV23 at least 8 weeks later • Second dose of PPSV23 at least 5 years after first PPSV23 dose **Previously received PPSV23:** • Give PCV13 at least 1 year after PPSV23 • Give second PPSV23 dose at least 8 weeks after PCV13 and 5 years after first PPSV23 **Previously received PCV13:** • Give PPSV23 at least 8 weeks later • Repeat PPSV23 after 5 years	Follow age-appropriate schedule: • PCV13 first • Followed by PPSV23 where indicated according to age and national immunization schedule
A: tetanus, diphtheria, Pertussis (Td/Tdap)	If vaccination history is incomplete or unknown: • 3 doses at 0, 1, and 6–12 months • Booster: Td every 10 years	Administer according to age-appropriate national schedule (e.g., DTaP for younger children and Tdap for adolescents)
A: measles-rubella (MR) Vaccine	2 doses given at least 28 days apart for individuals without evidence of immunity	Administer according to routine childhood immunization schedule
B: COVID-19 Vaccine	Administer updated COVID-19 vaccine according to current national recommendations and product guidance	Administer according to age eligibility, product guidance, and national recommendations

Notes:

- Vaccination status should be assessed routinely in all CKD patients, especially before dialysis initiation or kidney transplantation.
- Live vaccines should be used cautiously in immunocompromised patients.
- Follow national immunization schedules where applicable.

21.1.5 Dialysis

Refer to the National guidelines for Dialysis services from Ministry of Health for detailed indications, procedures and management of patients on dialysis (Hemodialysis or Peritoneal dialysis)

Dialysis is a medical treatment that performs the essential functions of the kidneys by removing waste products, excess fluids, and electrolytes from the blood when the kidneys are no longer able to do so adequately. It is a form of renal replacement therapy used in patients with advanced chronic kidney disease or acute kidney injury.

Table 21.5: Types of Dialysis and Indications for Dialysis Initiation in Acute Kidney Injury and Chronic Kidney Disease

Section	Category/Population	Description/Indications
Types of Dialysis	**D:** Hemodialysis (HD)	Blood is circulated outside the body through a dialyzer (artificial kidney), where waste products and excess fluid are filtered before the blood is returned to the patient.
	D: Peritoneal Dialysis (PD)	The peritoneal membrane acts as a natural filter. Dialysis fluid is introduced into the peritoneal cavity to absorb waste products and excess fluid, which are later drained out.
	D: Conservative Kidney Management	Consider when both hemodialysis and peritoneal dialysis are not feasible, unavailable, or not preferred (refer to KDIGO guidelines).
Modality Choice	Factors influencing dialysis modality	• Age • Availability of vascular access • Local expertise • Access to and availability of dialysis services • Patient/family preference
Indications for Dialysis in Acute Kidney Injury	Acute Kidney Injury	• Refractory hyperkalemia • Severe metabolic acidosis • Volume overload • Uremic complications (e.g., pericarditis, encephalopathy, bleeding diathesis) • Severe azotemia • Severe electrolyte disturbances • Fluid imbalance • Toxin removal when indicated

Section	Category/Population	Description/Indications
Indications for Dialysis in Chronic Kidney Disease	Adults	• Uremic symptoms/signs: nausea, vomiting, anorexia, pruritus, pericarditis, cognitive impairment • Fluid overload refractory to medical therapy • Electrolyte abnormalities (e.g., hyperkalemia) not controlled medically • Metabolic acidosis not controlled medically • Protein-energy wasting/malnutrition despite interventions **OR** • eGFR <7 mL/min/1.73 m² in asymptomatic patients • Dialysis is commonly initiated when eGFR is between 5–10 mL/min/1.73 m² depending on symptoms
	Pregnant Women	• Women with end-stage kidney disease should receive frequent prolonged hemodialysis • Consider initiation when blood urea nitrogen (BUN) is <18 mmol/L
	Paediatric Patients	• Clinical indications similar to adults • Growth failure • Poor nutritional status despite medical management • Developmental and psychosocial considerations **OR** • eGFR <15 mL/min/1.73 m² with symptoms/signs of uremia, fluid overload, or malnutrition • Initiate before asymptomatic patients reach eGFR <7 mL/min/1.73 m²
Modality Choice in Paediatrics	HD vs PD	Depends on age, vascular access, clinical condition, and family preference.

Note: For detailed protocols and operational guidance on dialysis initiation, refer to the National Dialysis Guideline.

Table 21.6: Vascular Access for Hemodialysis

Type of Vascular Access	Description / Indications	Key Notes
D: Arteriovenous Fistula (AVF)	Gold standard vascular access for long-term hemodialysis. Created surgically by connecting an artery and vein.	• Preferred access for chronic hemodialysis patients • Best long-term patency and lowest complication rate
D: Arteriovenous Graft (AVG)	Synthetic graft used to connect an artery and vein when AVF is not feasible.	• Secondary option after AVF • Used for long-term hemodialysis access
D: Central Venous Catheter (CVC) – Non-tunneled (temporary catheter)	Inserted via central veins (internal jugular or femoral vein) for immediate or short-term dialysis access.	• Used in AKI requiring urgent dialysis • Used in CKD patients awaiting AVF/AVG maturation • Not recommended for long-term use due to high infection risk and poorer outcomes
D: Permanent Tunneled Hemodialysis Catheter (TCC/Permacath)	Long-term catheter placed in a central vein for chronic hemodialysis.	• Used in CKD patients not suitable for or awaiting AVF/AVG maturation • Provides longer-term access than temporary CVC

Procedure	Authorized Personnel
AVF/AVG creation	Nephrologist, trained vascular surgeon, general surgeon, or urologist
Permanent tunneled catheter insertion	Nephrologist, trained vascular surgeon, general surgeon, interventional radiologist, or urologist
Temporary non-tunneled catheter insertion	Nephrologist; where unavailable: anaesthesiologist, vascular surgeon, or trained internist
Hemodialysis and peritoneal dialysis procedures	Trained dialysis nurse or dialysis technologist under supervision of a nephrologist

Note:

- **AVF/AVG** remains the preferred vascular access for patients with CKD requiring long-term hemodialysis.
- All patients should be referred by a nephrologist for appropriate vascular access planning.
- All dialysis centres should operate under the supervision of a nephrologist.
- Refer to the National Dialysis Guideline for detailed procedural guidance.

Table 21.7: Dialysis Management summary (Hemodialysis & Peritoneal Dialysis)

Refer to the National Dialysis Guideline for detailed procedural guidance.

Dialysis type	Subsection	Recommendation / Details
Hemodialysis	Anticoagulation	**C:** unfractionated heparin **OR** **D:** low molecular weight heparin during HD
		Patients with heparin allergy → use non-heparin anticoagulation
	Dialysis time	Minimum ≥12 hours/week for thrice-weekly patients with minimal residual function
		≥4 hours/session reduces mortality (all-cause & cardiovascular)
		Improves BP, anaemia, phosphate control
		Incremental HD (e.g., twice weekly) must be nephrologist-supervised
	Adequacy – URR	URR = 100 × (Upre − Upost) / Upre
		Target: ≥65%
		Monthly monitoring; simple audit tool
	Adequacy – spKt/V	Target: 1.2–1.4 per session (thrice weekly)
		Minimum acceptable: ≥1.2
		Monthly average acceptable
Peritoneal Dialysis (PD)	Catheter types – Acute PD	Rigid catheters
		Improvised catheters (e.g., NG tubes) – emergency use only
		Flexible catheters (e.g., Tenckhoff-type)
	Catheter types – Chronic PD	Tenckhoff catheter (silicone, double cuff, straight or curled tip) – standard worldwide
	Insertion methods	Surgical (open/laparoscopic)
		Percutaneous (radiologic or nephrologist-guided)
		Ultrasound/fluoroscopy guided, local anaesthesia (e.g., lidocaine)
	Antibiotic prophylaxis	**D:** Cefuroxime preferred Adults: **D:** Cefuroxime (IV) 750 mg–1.5 g **OR** **D:** Cefuroxime (PO) 500 mg 30–60 min pre-procedure Children **D:** Cefuroxime (IV) 50 mg/kg (max 1.5 g) **OR** **D:** Cefuroxime (PO) 15 mg/kg Continue oral cefuroxime twice daily for 3 days (selected cases) Intraperitoneal: cefuroxime 250 mg in first dialysis bag
	Alternatives	**S:** Vancomycin 15 mg/kg IV (max 1 g) – MRSA risk **OR** **A:** Gentamicin 3–5 mg/kg IV single dose
	PD modalities	CAPD: manual exchanges 3–5 times/day, no machine
		APD: automated machine-assisted dialysis, usually overnight

21.1.6 CKD Associated Metabolic Acidosis

Defined as Serum bicarbonate < 22 mmol/L in a patient with chronic kidney disease

Clinical Presentation

- Fatigue, weakness, malaise
- Deep, rapid breathing (compensatory hyperventilation)
- Nausea, anorexia
- Muscle wasting, bone pain
- Growth retardation
- Worsening protein catabolism, worsening CKD progression
- Confusion, arrhythmias (rare in chronic compensated states)

Investigations

- ↓ Bicarbonate (<22 mmol/L)
- Metabolic acidosis (↓ HCO_3^-, normal/compensatory ↓ CO_2)
- Elevated creatinine and urea (CKD evidence)
- May be elevated (hyperkaliemia common in CKD)
- Underlying CKD changes (proteinuria, low concentrating ability)
- Usually normal to mildly increased in CKD

Non-Pharmacological Management

Intervention	Details
Dietary modification	Increase intake of fruits and vegetables (if potassium allows)
Protein management	Avoid excessive protein restriction; maintain adequate intake to reduce catabolism
CKD control	Optimize blood pressure and glycaemic control
Dialysis (advanced CKD)	Consider if refractory metabolic acidosis in end-stage CKD
Education	Advise adherence to CKD diet and medications

Pharmacological Management

D: sodium bicarbonate (PO) 650 mg 12 hourly

OR

B: calcium carbonate (PO) 500 mg 12 hourly

Note:

- Treatment targets and monitoring should be kept at sodium bicarbonate: 22–26 mmol/L
- Check serum bicarbonate levels regularly (e.g., every 2–4 weeks initially) to guide dose adjustments.
- Monitor serum calcium and electrolytes to avoid hypercalcemia (especially with calcium carbonate).
- Assess for symptom improvement and signs of volume overload.

21.1.7 Hyperkalaemia

Defined as serum potassium ≥5.5 mmol/L

Severity Classification

- Mild: 5.5–6.0 mmol/L
- Moderate: 6.1–6.5 mmol/L
- Severe: >6.5 mmol/L or presence of ECG changes (e.g., peaked T waves, prolonged PR, widened QRS)

Clinical Presentation

- Ascending muscle weakness
- Muscle fasciculations
- Paralysis
- Cardiac conduction abnormalities and arrhythmias

Investigations

- Serum potassium: repeat at 0 hr, 1 hr, 3 hr as clinically indicated
- ECG: monitor for changes such as decreased P wave amplitude, peaked T waves, prolonged PR interval, and widened QRS
- Serum bicarbonate, creatinine, full blood count
- Blood glucose, lipid profile, uric acid

Non-Pharmacological Management

- Restrict dietary potassium (avoid bananas, potatoes, green leafy vegetables)
- Discontinue or withhold potassium-elevating medications (e.g., RAAS inhibitors, NSAIDs, potassium-sparing diuretics

Pharmacological Management

Step 1: Stabilize Cardiac Membrane Indicated for serum K+ >6.5 mmol/L or ECG changes

Adults:

A: calcium gluconate 10% IV, 10–30 mL over 5–10 minutes (repeat once after 5–10 min if ECG abnormalities persist)

OR

D: calcium chloride 10% IV, 10 mL reserved for resuscitation or central line administration

Note: Do not mix calcium with sodium bicarbonate infusion

Step 2: Shift Potassium Intracellularly

A: insulin and glucose:

Adults:

A: insulin short-acting (IV)10 units

AND

C: Dextrose (IV) 50% (only if blood glucose <11 mmol/L)

Children:

A: insulin short-acting (IV) 0.1 IU/kg

AND

C: Dextrose (IV) 50% 0.5 g/kg over 30 minutes

Monitor blood glucose to prevent hypoglycemia; repeat doses every 4–6 hours as needed

B: salbutamol nebulizer

Adults and children: 2.5–10 mg every 4–6 hours (adjuvant, not monotherapy)

AND

D: sodium bicarbonate IV (only if metabolic acidosis present and patient not volume overloaded):

1 mEq/kg over 15 minutes

Step 3: Remove Potassium from the Body

D: potassium binders: (use cautiously due to risk of bowel necrosis)

Adults

D: calcium polystyrene sulfonate (PO) 15–30 g 8 hourly for up to 3 days

Children

D: calcium polystyrene sulfonate (PO) 0.5–1 g/kg/day 8 hourly for up to 3 days

OR

D: calcium polystyrene sulfonate 30 g rectally as retention enema, may be repeated as needed. in divided doses.

Alternatively

Adults

D: sodium polystyrene sulfonate (PO) 15–60 g daily given as 15 g orally 1–4 times daily, or Single daily dose depending on potassium level and clinical status.

Children

D: sodium polystyrene sulfonate (PO)1 g/kg/day in divided doses

OR

D: sodium polystyrene sulfonate Rectal route: 30–50 g rectally every 6 hours as retention enema when oral administration is not feasible.

OR

C: lactulose 10–30 mL orally hourly until laxation, then 30 mL every 8 hours if binders are unavailable:

OR

Diuretics:

A: furosemide 40–80 mg orally or slow IV every 12 hours (if patient is volume replete and non-oliguric)

Dialysis: Urgent dialysis in severe or refractory cases, especially with ECG changes or volume overload

Monitoring

- Continuous cardiac monitoring until hyperkalaemia resolves
- Frequent serum potassium and glucose checks
- Monitor fluid balance and signs of volume overload

Referral: Urgent nephrology or critical care referral for severe or refractory hyperkalaemia (K+ ≥6.5 mmol/L) or persistent ECG abnormalities despite treatment

21.1.8 CKD Associated Anaemia

Patients with CKD present with anemia due to erythropoietin deficiency, iron deficiency due to low iron stores, and impaired iron utilization due to inflammation. Other causes include shortened red blood cell lifespan due to Uremic toxins, nutritional deficiencies, such as folate and vitamin B12, and blood loss due to frequent blood draws, gastrointestinal bleeding, or dialysis-related blood loss further decreases red blood cell counts. **[Refer to the national guidelines for dialysis]**

Investigations

For anaemia patients with CKD stage 3-5

- Full blood count
- Reticulocyte count: Iron Studies:
- Serum ferritin, Transferrin Saturation (TSAT)
- For Unexplained Anemia or Complex Cases: Peripheral blood smear, Haptoglobin and lactate dehydrogenase (LDH), C-reactive protein (CRP), Vitamin B12 and folate levels: Liver function tests
- Serum protein electrophoresis (SPEP), serum free light chains, urinary Bence-Jones protein, Thyroid-stimulating hormone (TSH)
- Stool analysis

Pharmacological Management
Hemodialysis patients: follow the National Dialysis guideline recommendations
Iron Therapy if: Ferritin <100 ng/mL and TSAT <30%, or Ferritin 100–300 ng/mL with TSAT <20–30%

A: ferrous sulfate (PO) 325 mg (65 mg elemental iron) 1–3 times daily
Intravenous (IV) iron is preferred if oral iron is ineffective, not tolerated, or rapid correction is needed.
D: iron sucrose 100–200 mg IV per dose, repeated weekly until iron repletion (typically 1–2 g total).

Erythropoiesis-Stimulating Agents (ESAs)
Non-Dialysis: adults and paediatric:

D: erythropoietin alfa 50 to 100 I.U/kg body weight, 3 times per week (IV) or (SC).
Avoid targeting hemoglobin >11 g/dL due to increased cardiovascular risks. Dose adjusted based on Hb response, aiming to keep Hb generally between 10 and 11.5 g/dL

Hemodialysis: adults /paediatric
D: erythropoietin alfa 50 IU/kg three times per week intravenously (IV) if IV access is available.

Maintenance phase:
Adults: The total weekly dose ranges from 75 IU/kg to 300 IU/kg, adjusted to maintain hemoglobin between 10-12 g/dL.
Maximum doses should not exceed 150 IU/kg three times per week, or 240 IU/kg once weekly, or 480 IU/kg once every two weeks
Children: Maintenance phase: Dose is adjusted to maintain hemoglobin between 9.5-11 g/dL. Children under 30 kg may require higher maintenance doses than adults. Dose adjustments are made cautiously to avoid hemoglobin rises greater than 2 g/dL over 4 weeks

S: darbepoetin alfa:
Older children (1–18 years) and adults: 0.45 mcg/kg IV or SC once weekly or 0.75 mcg/kg every two weeks.
Children
1–7 months 0.25 to 1.1 mcg/kg/week,

21.1.8 Mineral Bone Disease (MBD)

Mineral and bone disorders (MBD) are common in CKD patients, including those on hemodialysis, and significantly increase the risk of fractures and cardiovascular complications. New evidence shows that disrupted mineral metabolism, inflammation, and hormonal imbalances like elevated FGF23 contribute to both bone disease and vascular calcification.

Clinical Presentation
- Bone pain, fractures
- Convulsions, tetany (due to hypocalcemia)
- Soft tissue and vascular calcification
- Cardiovascular complications and increased mortality

Investigations
For CKD Stage 3 and Below
- Serum calcium (corrected for albumin)
- Serum phosphate
- Intact parathyroid hormone (iPTH)
- Vitamin D levels (25-hydroxyvitamin D)
- Serum albumin (for calcium correction)
- Lateral lumbar X-ray
- DEXA scan (bone mineral density)

Non-Pharmacological Management
- Dietary management: Low phosphate diet and adequate calcium intake
- Lifestyle modification encourages physical activity as tolerated

Pharmacological Management
Hyperphosphatemia -treatment
Adults
B: calcium carbonate (PO) 500–1500 mg per day 8hourly taken with meals
Children
B: calcium carbonate (PO) 500 mg per day 8hourly taken with meals
OR
Adults:
S: calcium acetate (PO): 667 mg (2 tablets) 8hourly with meals
Children
S: calcium acetate (PO) 667mg (one tablet) 8 hourly with meals
OR
Adults
S: sevelamer carbonate (PO) 800-1600mg per dose 8 hourly with meals
Children
S: sevelamer carbonate (PO) dose by body surface area (BSA) ≥0.75 to <1.2 m², the typical starting dose is 800 mg three times daily with meals.
For children with BSA ≥1.2 m², the starting dose is often 1,600 mg three times daily with meals.

Monitoring and Follow-up

- Repeat serum calcium, phosphate, PTH, and vitamin D every 3–6 months depending on CKD stage and treatment status.
- Monitor for signs of vascular calcification clinically and by imaging as indicated.
- Adjust therapy based on trends rather than single values.

21.1.9 Vitamin D and Parathyroid Hormone (PTH) Management in CKD

Indicated for the management of:

- Vitamin D deficiency in CKD
- Secondary hyperparathyroidism
- CKD-mineral and bone disorder (CKD-MBD)

Table 21.8: Vitamin D and Parathyroid Hormone (PTH) Pharmacological Management

Patient group	Vitamin D type	Pharmacological agent	Typical starting dose
Adults with CKD (Stages 3–5, non-dialysis)	Nutritional vitamin D (for deficiency)	**C:** cholecalciferol (Vitamin D3), **OR** **C:** ergocalciferol (Vitamin D2)	1,000–4,000 IU orally once daily or equivalent weekly/monthly dosing
	Active vitamin D analogues	**S:** calcitriol	0.25 micrograms orally once daily or every other day; titrate according to calcium, phosphate, and PTH levels
Adults on dialysis	Active vitamin D analogues	**S:** calcitriol	0.25 micrograms orally once daily or every other day; titrate according to calcium, phosphate, and PTH levels
Children with CKD (non-dialysis and dialysis)	Nutritional vitamin D (for deficiency)	**C:** cholecalciferol, (Vitamin D3), **OR** **C:** ergocalciferol (Vitamin D2)	Dose according to age and serum vitamin D levels
	Active vitamin D analogues	**S:** calcitriol	0.25–0.5 micrograms orally once daily or 0.5–1 microgram three times weekly under specialist guidance

Monitoring:

- Serum calcium
- Serum phosphate
- Parathyroid hormone (PTH)
- 25-hydroxy vitamin D levels
- Avoid hypercalcaemia and hyperphosphatasemia

21.1.10 Hyponatraemia

Hyponatraemia is defined as a serum sodium concentration <135 mmol/L.

Table: 21.9: Classification of Hyponatraemia and Clinical features

Category	Definition/Severity	Clinical Features / Causes
Mild hyponatraemia	Serum sodium 130–134 mmol/L	May be asymptomatic or present with headache, nausea, fatigue
Moderate hyponatraemia	Serum sodium 125–129 mmol/L	Headache, nausea, vomiting, fatigue, gait disturbances, confusion
Severe hyponatraemia	Serum sodium <125 mmol/L	Seizures, reduced level of consciousness, coma, respiratory arrest
Acute hyponatraemia	Develops within <48 hours	Self-induced water intoxication, post-operative fluid administration, drug-induced causes

Note:

- Rapid correction of chronic hyponatraemia may lead to osmotic demyelination syndrome, which may be irreversible or fatal.
- Monitor serum sodium frequently
- Correction should generally not exceed 8 mmol/L in 24 hours

Table 21.10: Pharmacological Management of different Types of Hyponatraemia

Type	Common causes	Management
Hypovolaemic hyponatraemia	•Vomiting, •Diarrhoea, •Diuretics, •Burns, •Adrenal insufficiency	Treat underlying cause. **D:** sodium chloride 0.9% IV infusion cautiously. Monitor sodium closely.
Euvolaemic hyponatraemia	•SIADH, •Hypothyroidism, •Glucocorticoid deficiency, • Excessive water intake	Treat underlying cause. Fluid restriction. Consult specialist if severe or persistent.

Type	Common causes	Management
Hypervolaemic hyponatraemia	•Heart failure, •Cirrhosis, •Nephrotic syndrome, •Kidney failure	In the presence of fluid overload: **A:** furosemide (PO) 40 mg twice daily in divided doses. Increase dose according to clinical response.
Severe symptomatic acute hyponatraemia	•Acute water intoxication, •Severe SIADH, Post-operative causes	**D:** sodium chloride 3% IV infusion under specialist supervision. Frequent sodium monitoring required.

Monitoring:

- Serum sodium (frequent monitoring)
- Fluid balance
- Neurological status
- Renal function
- Serum potassium

21.1.11 Haemodialysis (HD) Catheter Related Bloodstream Infection

Hemodialysis catheter care is a critical component in ensuring effective and safe dialysis treatment for patients with end-stage renal disease. Proper catheter maintenance, including strict aseptic technique and meticulous site care, helps prevent infections and mechanical complications that can significantly impact patient outcomes.

Principles of hemodialysis catheter care

- Strict aseptic technique and catheter care bundles to prevent infections:
- Use A:>0.5% chlorhexidine with alcohol for skin antisepsis
- Apply antimicrobial ointments **D:** mupirocin at exit site
- Dressings: Use sterile gauze or transparent semi permeable dressings; change gauze every 2 days and transparent dressings at least every 7 days unless contraindicated.

21.1.11.1 Types of hemodialysis catheter-related infections:

21.1.11.1.1 Exit-site infection: Infection localized at the catheter exit site on the skin.

Infection localized at the catheter exit site on the skin

Clinical Presentation:
Redness, tenderness, crusting, and purulent discharge at the catheter exit site.

Investigation:
Culture from the drainage material at the exit site

Pharmacological Management:
Localized infection (without systemic symptoms)
C: mupirocin 2% ointment (topical) Apply to the affected exit site 8- 12 hourly daily for 5–10 days after cleaning the site.

If associated with surrounding cellulitis, purulent discharge, or failure of topical treatment
Use systemic antibiotics guided by suspected organism and culture results.
B: ampicillin + cloxacillin FDC (PO) 500mg 8 hourly for 7- 14 days
OR
A: Ciprofloxacin (PO) 500 mg 12 hourly for 7–14 days
(if Gram-negative infection suspected)

21.1.11.1.2 Tunnel infection: Infection along the subcutaneous tunnel through which the catheter passes.

Infection along the subcutaneous catheter tunnel,

Clinical Presentation:
Tenderness, erythema, swelling, or purulent discharge along the tunnel tract

Investigations
Clinically and by culture of tunnel site drainage

Pharmacological Management
Same as for catheter-related bloodstream infection

21.1.11.1.3 Catheter-related bloodstream infection (CRBSI) : is a systemic infection originating from the catheter.
A systemic bloodstream infection originating from an intravascular catheter, confirmed or strongly suspected when the catheter is the source of bacteraemia.

Clinical Presentation:
Fever, chills, rigors, hypotension, or sepsis without another obvious source.

Investigations

- Obtain two sets of blood cultures (one from catheter hub, one peripheral or dialysis circuit
- Catheter tip cultures
- Full blood picture (FBP)
- Imaging and further investigations if metastatic infection suspected (e.g., echocardiogram for endocarditis)

Non-Pharmacological Management

- Immediate referral for sepsis management if the patient is in shock.
- Catheter removal; in non-response to appropriate antibiotic therapy or tunnel infection or metastatic infection (e.g., endocarditis, osteomyelitis) or hemodynamic instability or severe sepsis

Pharmacological Management
All patients should have appropriate cultures (e.g. blood & site cultures) taken before starting therapy. Empirical treatment should be guided by local antibiogram data and adjusted according to culture & sensitivity results to reduce antimicrobial resistance.

Empirical Antibiotic Therapy (while waiting for Culture and sensitivity results)
Coverage: Both Gram-positive (especially Staphylococcus aureus, including MRSA) and Gram-negative organisms. Treatment duration is 14-21 days

Adults
S: vancomycin (IV) in MRSA: Loading dose of 20 mg/kg over the last hour of dialysis, then maintenance doses of 500–1000 mg IV during the last hour of subsequent HD sessions, three times weekly

OR

C: flucloxacillin (IV) in MSSA: 1-6 g/day divided into 3 doses and then oral therapy

AND

D: ceftazidime (IV): a loading dose of 1 g IV after hemodialysis (HD) followed by 1 g after subsequent HD sessions

Children
S: vancomycin (IV) in MRSA: 10 mg/kg/dose, over the last hour of dialysis, then maintenance doses with consideration for serum level monitoring

OR

C: flucloxacillin (IV) in MSSA: 25-50 mg/kg/day divided into 3 doses and then oral therapy

AND

D: ceftazidime (IV):50 mg/kg every 48 hours,

OR

B: ceftriaxone 1–2 g IV after dialysis, 3 times weekly. administered after dialysis on dialysis days

Note:

- Give empirical treatment while waiting for culture results
- Antibiotics should then be tailored to bacteriological results
- If negative culture results continue with empirical treatment showing cl

21.1.11.2 Antibiotic Lock Therapy (Adjunctive)
Antibiotic lock therapy (ALT) is an adjunctive treatment to systemic antibiotics for catheter-related bacteremia in dialysis patients, aiming to salvage the catheter by sterilizing its lumens with high concentrations of antibiotics.

Pharmacological Management

Drug	Concentration	Dwell Time	Remarks
S: vancomycin lock solution	5 mg/mL	12–48 hours	Often combined with heparin; used for Gram-positive organisms including MRSA
A: gentamicin lock solution	1–5 mg/mL	12–48 hours	Often combined with citrate or heparin; used for Gram-negative organisms
D: citrate lock solution	4%	48–72 hours	Effective and safe anticoagulant lock solution; may be used with antibiotics

21.2 Peritoneal Dialysis Catheter-Related Infections

Table 21.11: Clinical Presentation Peritoneal Dialysis Catheter-Related Infections

Condition	Clinical features
Exit Site Infection (ESI)	Redness, swelling, tenderness, purulent discharge at catheter exit site
Tunnel Infection (TI)	Pain, erythema, swelling, or induration along the subcutaneous catheter tunnel, may occur without exit-site involvement
Peritonitis	Abdominal pain, fever, cloudy peritoneal dialysate fluid, positive dialysate cultures

Investigations

- Dialysis effluent white cell count (> 100/mL or > 0.1 109 /L (after a dwell time of at least 2 h), with > 50% polymorphonuclear leukocytes (PMN);
- Dialysis effluent culture

Non-Pharmacological Management

Exit-site care

- Leave dressing intact for 7 days' post-catheter insertion unless soiled
- After healing, clean the exit site at least twice weekly and after water exposure
- Daily topical antibiotic prophylaxis may be considered Mupirocin ointment or Gentamicin cream
- Screen for Staphylococcus aureus nasal carriage before catheter insertion
- Ensure strict hand hygiene
- Train patients/caregivers on proper connection techniques
- Immobilize catheter after insertion to reduce trauma and infection risk
- Perform regular assessment of exit site and tunnel for early infection detection

Table 21.12 Pharmacological Management of Peritoneal Dialysis Catheter-Related Infections

Condition	First-line Treatment	Alternative Treatment	Duration/Notes
Exit Site Infection (ESI)	Adults: **B:** amoxicillin+ clavulanic acid (PO) FDC 500 mg/125 mg twice daily Children: **B:** amoxicillin+ clavulanic acid (PO) FDC 250 mg/125 mg twice daily **OR** Adults: **B:** cefalexin (PO) 250–500 mg twice daily Children: **B:** cefalexin (PO) 25–50 mg/kg/day in divided doses (max 2 g/day)	Adults: **A:** ciprofloxacin (PO) 500–750 mg once daily after PD **OR** Adults: **C:** clarithromycin (PO) Loading dose 500 mg, then 250 mg every 12 hours (reduce dose by 50% in PD patients) **OR** Adults: **S:** clindamycin (PO) 300–450 mg every 6–8 hours	7–10 days Adjust treatment according to culture and sensitivity results
MRSA/Resistant Exit Site Infection	Adults: **S:** clindamycin (PO) 300 mg every 8 hours Children: **S:** clindamycin (PO) 10–20 mg/kg/day	Adults: **A:** sulfamethoxazole + trimethoprim (PO) 960 mg every 12 hours Children: **A:** sulfamethoxazole + trimethoprim (PO) 4–5 mg/kg TMP every 12 hours	2–3 weeks
Tunnel Infection (TI)	Treat as for Exit Site Infection	Consider IV antibiotics if severe or unresponsive	2–3 weeks Remove catheter if refractory infection, abscess formation, or clinical deterioration
Peritonitis	**S:** vancomycin **AND** **D:** ceftazidime	**S**: cefepime	Adjust treatment according to culture and sensitivity results. Remove catheter in fungal, refractory, or relapsing infections

Table 21.13: Intraperitoneal Antibiotics for Peritoneal Dialysis-Associated Peritonitis

Antibiotic	Adult Dose (Intraperitoneal)	Paediatric Dose (Intraperitoneal)	Duration of Treatment	Remarks
S: vancomycin	15–30 mg/kg intraperitoneally every 5–7 days (maximum 2 g per dose)	15–30 mg/kg intraperitoneally every 5–7 days (maximum 2 g per dose)	2 weeks (extend to 3 weeks for Pseudomonas or Staphylococcus aureus infections)*	Monitor serum vancomycin levels where available
D: ceftazidime **OR** **S:** cefepime	1–1.5 g per exchange (maximum 1.5 g)	50 mg/kg per exchange (maximum 1.5 g)	As above	Provides Gram-negative coverage
A: gentamicin	0.6 mg/kg intraperitoneally once daily (maximum 50 mg)	0.6 mg/kg intraperitoneally once daily (maximum 50 mg)	As above	Use cautiously; monitor for ototoxicity and nephrotoxicity

Note:
- Adjust antibiotic selection based on dialysate culture and sensitivity results.
- Remove the catheter in cases of fungal, refractory, or relapsing peritonitis.

Table: 21.14: Prophylactic Antibiotics for Catheter Insertion

Medicine	Adult Dose	Paediatric Dose	Remarks
C: Cefazolin (IV)	1–2 g single dose before catheter insertion	25 mg/kg single dose before catheter insertion (maximum 2 g)	First-line prophylaxis
Alternative: **S:** Vancomycin (IV)	Dose according to body weight and renal function	Dose according to body weight and renal function	Use in patients with severe beta-lactam allergy or high risk of MRSA infection

21.3 Acute Kidney Injury (AKI)

Acute kidney injury is a sudden decline in the glomerular filtration rate (GFR) resulting in elevation of serum blood urea, creatinine and other waste products. Practically AKI is recognized when there is urine output of less than 0.5ml/kg/hour for >6 hours. Causes of AKI are classified as pre-renal, renal and post-renal causes and usually result in reversible kidney failure, these causes include;

Table 21.15: Classification, Causes and Management of Acute Kidney Injury (AKI)

Type of AKI	Description	Common Causes	Management
Pre-renal AKI	Loss of effective blood flow to the kidneys	• Hypovolaemia (e.g. diarrhoea, burns, acute blood loss) • Heart failure • Hepatic failure • Hypotension	• Restore intravascular volume • D: Intravenous fluids • Manage hypotension • Use inotropes where indicated • Treat underlying cause
Intrinsic (Renal) AKI	Caused by direct injury to kidney tissue	• Glomerulonephritis • Nephrotoxic medications • Rhabdomyolysis • Tumour lysis syndrome	• Treat specific renal disorder • Discontinue offending nephrotoxic drugs • Provide supportive management
Post-renal AKI	Occurs due to urinary tract obstruction	• Benign prostatic hyperplasia (BPH) • Urinary stones • Obstructed urinary catheters • Bladder stones	• Relieve obstruction • Urinary catheterization • Nephrostomy where indicated • Treat underlying cause

Clinical Presentation
Oedema, Oliguria/anuria, Convulsions in children

Investigations
Early disease (diagnosis of AKI)
- Serum creatinine: increase of ≥26.5 µmol/L (≥0.3 mg/dL) within 48 hours, or ≥50% increase within 7 days defines AKI
- Urine output <0.5 mL/kg/hour for more than 6 hours

Advanced disease
- Urine output <0.5 mL/kg/hour for more than 12 hours

Additional investigations
- Ultrasound KUB
- Urinalysis (dipstick and microscopy)
- Serum electrolytes (potassium, chloride, bicarbonate, sodium, phosphate, and calcium)
- Arterial blood gases

- Uric acid
- Urine electrolytes – fractional excretion of sodium
- Chest X-ray
- ECG
- Kidney biopsy if the cause is not clinically obvious or if glomerular disease is strongly suspected
- Creatine kinase if rhabdomyolysis is suspected

Non-Pharmacological Management

- Give oxygen and nurse in semi-Fowler's position if the patient has respiratory distress
- Stop intake of all salt- and potassium-containing foods and fluids
- Restrict fluid intake to 10 mL/kg/day plus visible fluid losses
- Discontinue nephrotoxic medications
- Provide adequate nutritional support with sufficient energy and protein; consider enteral or parenteral nutrition where appropriate

Pharmacological Management

Population	Clinical Condition / Indication	Management
Adults	Treat underlying cause	Manage according to identified cause
	Dehydration / hypovolaemia	**A:** sodium chloride 0.9% (PO/IV) while monitoring urine output
	BP control (DBP >100 mmHg or SBP >150 mmHg)	**B:** amlodipine (PO) 5 mg once daily
	Respiratory distress with fluid overload (crackles, raised JVP, orthopnea)	**A:** furosemide (IV bolus) 40–80 mg (may repeat once at higher dose if needed)
	Metabolic acidosis (low bicarbonate, laboured breathing)	**D:** sodium bicarbonate (IV) 150 mEq in 1 L of 5% dextrose
	Risk of gastrointestinal bleeding	**C:** pantoprazole (IV/PO) 40 mg every 24 hours
	Hyperkalaemia	Treat as per section 21.1.7
	Severe AKI (renal failure)	Haemodialysis or peritoneal dialysis when indicated
Paediatrics	Hypovolaemia / volume depletion	10–20 mL/kg isotonic saline (normal saline) IV bolus over 30–60 min; repeat as needed with monitoring
	Maintenance fluids	Adjust based on fluid balance, urine output, and clinical status
	Fluid overload (oliguric AKI)	**A:** furosemide: 2–5 mg/kg IV bolus once; or infusion 0.1–0.3 mg/kg/hour if responsive
	Monitoring during diuretics	Stop if no urine output within 2 hours; monitor electrolytes and ototoxicity
	Dose adjustment	Adjust antibiotics and other drugs according to renal function
	Nephrotoxic drugs	Avoid or discontinue nephrotoxic medications
	Dopamine / renal vasodilators	Not recommended (no benefit, potential harm)
	Asphyxiated neonates at risk of AKI	**D:** theophylline 5 mg/kg single dose within first hour of life
	Fungal infections	Use liposomal amphotericin or azoles with adequate hydration
	Nutrition	Refer to STG nutrition chapter 24

Table 21.16 Anaemia in Chronic Kidney Disease (CKD)

Therapy Component	Population / CKD Stage	Criteria / Indication	Recommendation
Iron therapy	CKD G5HD (haemodialysis patients with anaemia)	Ferritin ≤500 ng/mL (≤500 µg/L) AND TSAT ≤30%	Initiate iron therapy
	CKD G5HD	At initiation of iron therapy	Intravenous iron preferred over oral iron
ESA initiation	CKD G5D (HD or PD patients with anaemia)	Hb ≤9.0–10.0 g/dL (90–100 g/L)	Start ESA therapy
ESA maintenance (adults)	CKD patients on ESA therapy	On treatment monitoring	Maintain Hb <11.5 g/dL (115 g/L)
ESA target (children)	CKD with anaemia (paediatric patients)	Individualized clinical decision	Hb targets individualized based on: improved QoL, school performance, avoidance of transfusion, and potential risks

Referral: Management may be instituted at the appropriate hospital level where adequate laboratory and clinical resources exist. Refer to a nephrologist when:

- Glomerulonephritis is strongly suspected (e.g., haematuria and proteinuria)
- The patient worsens despite initial treatment

21.4 Glomerular Diseases (GD)

Glomerular diseases include a broad array of clinicopathological syndromes which progress to glomerulosclerosis and eventually end stage kidney disease. Glomerular disease may be a result of a primary condition of the kidney or may be secondary to a systemic disorder.

Clinical Presentation

- Proteinuria
- Reduced GFR (and its effects)
- Haematuria
- Hypertension
- Oedema

21.4.1 Glomerular disease - Nephritic syndrome

A non-infectious inflammatory process that involves the nephron. History and examination should exclude secondary causes.

Clinical Presentation

- Painless macroscopic turbid, bloody or brownish urine
- Peripheral and facial oedema
- Difficulty in breathing
- Hypertension encephalopathy with impaired level of consciousness or convulsions
- Little or no urine excretion

Investigations

- Serum Creatinine
- Blood urea nitrogen/Urea
- Urinalysis (Dipstick + microscopy)
- confirm proteinuria by Urine albumin-creatinine ratio (UACR) or Urine protein-creatinine ratio (UPCR)
- Urine culture
- Complete blood count
- Kidney biopsy and histology
- Others on tertiary hospital e.g. ANA, dsDNA, RF, , complements, Syphilis tests (VDRL or RPR)

Non-Pharmacological Management

- Give oxygen, and nurse in semi-Fowler's position if the patient has respiratory distress.
- Restrict intake of all salt
- Restrict potassium containing foods and fluids
- Restrict fluid intake to 10 mL/kg/day daily plus visible fluid losses

Pharmacological Management

Adults

Fluid overload

A: furosemide (IV bolus) 80mg If hypertension

If diastolic blood pressure is greater than 100mmHg or systolic blood pressure is above 150mmHg:

B: amlodipine (PO) 5mg stat before referral to higher facility

Continue with other medications as in hypertension section (caution contraindications)

Note: The definitive treatment of nephritis depends on the cause – an assumption of acute post streptococcal nephritis or any other disease cannot be made without specific investigation, which may include kidney biopsy.

21.4.2 Nephrotic syndrome

It is a kidney disorder characterized by urinary protein loss leading to generalized body swelling. It is severe proteinuria defined as: Adults: 3.5 g/day,

Clinical Presentation

- Oedema
- Hypoalbuminemia
- Hyperlipidaemia

Note:

- Diagnosis of nephrotic syndrome requires a kidney biopsy, however in children (1year-18 years) biopsy is indicated for children with steroid resistant nephrotic syndrome
- Children (1-18 years) should be given treatment with steroid, they should be referred for renal biopsy if there is no response.

Non-Pharmacological Management

- Adequate calories and adequate protein 1g/kg/d
- No added salt to limit fluid overload

Pharmacological Management

The management of glomerular disease depends on the type/cause of the disease and is individualized guided by a specialist according to the histology results obtained after renal biopsy

Note: Referral to nephrologist may include treatment using immunosuppressant such as prednisolone, mycophenolate mofetil, cyclophosphamide, angiotensin blockade .

Table 21.17: Histological Patterns of Glomerular Disease and Treatment Regimens

S/N	Histological Pattern	Treatment Regimen	Special Considerations
1	Minimal Change Disease (MCD)	**Children (Steroid-sensitive)** **A:** prednisolone 60 mg/m²/day or 2 mg/kg/day (max 60 mg/day) for 6 weeks. Continue with **A:** prednisolone 40 mg/m² or 1.5 mg/kg on alternate days for 6 weeks, then taper over 6 weeks (5–10 mg/week). **Relapsing steroid-sensitive disease:** **A:** prednisolone 60 mg/m² or 2 mg/kg/day until remission for 3 days, **THEN** **A:** prednisolone 40 mg/m² or 1.5 mg/kg on alternate days for at least 4 weeks. **Frequent relapse/steroid dependent**: **S:** cyclophosphamide 2 mg/kg/day for 10–12 weeks (maximum cumulative dose 168 mg/kg) **OR** **S:** cyclosporine 4–5 mg/kg/day **OR** **S:** tacrolimus 0.1 mg/kg/day **OR** **S:** everolimus 0.5–2 mg every 12 hours **OR** **S:** sirolimus 1–3 mg every 12 hours **OR** **S:** mycophenolate mofetil 1200 mg/m²/day in two divided doses **OR** **S:** rituximab 375–1000 mg/m². **Steroid-resistant disease**: **S:** mycophenolate mofetil 1200 mg/m²/day in two divided doses **OR** **S:** mycophenolate sodium **AND** **A:** prednisolone high dose. Adults: **A:** Prednisolone 1 mg/kg/day (max 80 mg) **OR** alternate day dose of 2 mg/kg (max 120 mg), taper after remission over 6 months.	Kidney biopsy indicated in children with • Steroid resistance, • Late failure to respond after initial response, or • Declining kidney function. Monitor: • Calcineurin inhibitor toxicity. • Screen HbA1c and osteoporosis in frequent relapsing disease.

S/N	Histological Pattern	Treatment Regimen	Special Considerations
2	Focal Segmental Glomerulosclerosis (FSGS)	**For idiopathic disease only:** **D:** prednisolone 1 mg/kg/day (max 80 mg) **OR** alternate-day dose of 2 mg/kg (max 120 mg) for 4–16 weeks. **Steroid intolerance/resistance:** **S:** cyclosporine 3.5–5 mg/kg/day in two divided doses **OR** **S:** tacrolimus 0.1 mg/kg/day in two divided doses.	• Exclude secondary causes. • Slow steroid taper after remission over 6 months. • Monitor calcineurin inhibitor levels.
3	Membranous Nephropathy	**Children (Idiopathic):** **D:** methylprednisolone injection 10 mg/kg for 3 days followed by **A:** prednisolone 0.5 mg/kg for 27 days during months 1, 3, and 5. **AND** **S:** cyclophosphamide 2 mg/kg/day for 30 days during months 2, 4, and 6. **Alternative regimen:** **S:** cyclosporine 3.5–5 mg/kg/day in two divided doses **AND** **A:** prednisolone 0.15 mg/kg/day for 6 months **OR** **S:** tacrolimus 0.2 mg/kg/day. Adults: **D:** methylprednisolone IV for 3 days monthly during months 1, 3, and 5 **THEN** **A:** prednisolone 0.5 mg/kg/day for 27 days. **AND** **S:** cyclophosphamide 2 mg/kg/day PO during months 2, 4, and 6 **OR** **S:** cyclophosphamide IV 1.5 mg/kg/day. **Alternative regimen**: **S:** tacrolimus 0.1 mg/kg/day **OR** **S:** cyclosporine 3.5–5 mg/kg/day with low-dose **A:** prednisolone.	• Exclude secondary causes. • Observe for 6 months before treatment unless severe symptoms or rising creatinine. • Avoid treatment if serum creatinine >309 micromol/L in CKD. • Repeat biopsy may be required. If albumin <25 g/L with thrombosis risk: **C:** warfarin 5 mg PO.
4	Membranoproliferative Glomerulonephritis (MPGN)	**S:** cyclophosphamide **OR** **S:** mycophenolate mofetil 1200 mg/m²/day in two divided doses **OR** **S:** mycophenolate sodium **AND** **A:** prednisolone.	Individualize treatment based on etiology and disease severity.
5	IgA Nephropathy	**Initial supportive care for 3–6 months:** **C:** enalapril 10–20 mg once daily **OR** **C:** lisinopril 2.5–10 mg once daily. Persistent proteinuria >1 g/day for 6 months: **A:** prednisolone 1 mg/kg/day for 6 months.	Other registered ACE inhibitors or ARBs may be used according to hypertension guidelines.

S/N	Histological Pattern	Treatment Regimen	Special Considerations
6	Lupus Nephritis (Adults)	**All patients:** **S:** hydroxychloroquine 6 mg/kg/day maintenance. Class II with proteinuria >3 g/day: Treat as Minimal Change Disease. Class III and IV induction (6 months): **D:** methylprednisolone IV 250–1000 mg over 30 minutes for 3 days monthly **AND** **S:** cyclophosphamide IV 500–1000 mg/m² monthly **OR** **S:** mycophenolate mofetil 0.5–1 g every 12 hours (titrate up to 1.5 g every 12 hours) **OR** **S:** mycophenolate sodium. Maintenance: **S:** azathioprine 1.5–2.5 mg/kg/day **OR** **S:** mycophenolate mofetil 0.5–1 g every 12 hours **OR** **S:** mycophenolate sodium **OR** **S:** cyclosporine 4–5 mg/kg/day **OR** **S:** tacrolimus 0.1 mg/kg/day.	• Oral prednisolone alone is less effective. • EURO-Lupus regimen may be used: **S:** cyclophosphamide 500 mg every 2 weeks for 6 doses. • Class V with persistent nephrotic proteinuria is treated similarly to Class III/IV.
7	Pauci-Immune Focal and Segmental Necrotizing Glomerulonephritis	**Initial therapy:** **S:** cyclophosphamide IV 15 mg/kg every 2 weeks for 3 doses, then every 3 weeks for 3–6 months **OR** **S:** cyclophosphamide PO 1.5–2 mg/kg/day for 3–6 months **AND** **D:** methylprednisolone IV 250–1000 mg over 30 minutes for 3 days followed by **A:** prednisolone 1 mg/kg/day tapered gradually. **Severe disease:** **S:** rituximab injection 1 g followed by another 1 g after 14 days **OR** **S:** rituximab 375 mg/m² weekly for 4 weeks. Maintenance therapy: **S:** azathioprine 1–2 mg/kg/day for 18 months **OR** **S:** mycophenolate mofetil 1 g every 12 hours **OR** **S:** mycophenolate sodium.	**S:** Haemodialysis may be required. S: Plasmapheresis in selected indications.

21.5 Kidney Transplantation

21.5.1 Transplant Donor Evaluation

General Principles

The evaluation of a living kidney donor aims to ensure donor safety, minimize risks, and support informed, voluntary decision-making without undue pressure. The transplant program's policies should guide the evaluation process. Both accepted and excluded donors require appropriate follow-up care plans.

Clinical Assessment

- A thorough medical history and physical examination must be documented.
- Psychosocial evaluation is essential to assess mental health, social support, and the donor's understanding of risks and benefits.

Eligibility Criteria

- Adults aged 21 years and above are eligible for living donation.
- Evaluation should be individualized, considering demographic and health profiles, with particular attention to long-term kidney health risks.

Investigations

Table 21.18: Pre-Donation Assessment for Living Kidney Donors

S/N	Domain	Recommended Assessment
1.	General Medical Assessment	Height, weight, BMI, blood pressure (measured on two separate occasions), baseline laboratory investigations including hematology, coagulation profile, electrolytes, fasting blood glucose, lipid profile, liver function tests, chest X-ray, and ECG.
2.	Psychosocial Assessment	Formal psychosocial assessment by trained professionals to evaluate psychological fitness, informed consent capacity, and adequacy of social support.
3.	Surgical Suitability Assessment	Assessment of obesity, anticoagulation status, vascular anatomy including imaging (KUB and abdominal ultrasound), and urological assessment where indicated.
4.	Diabetes Screening	Fasting blood glucose and HbA1c to exclude diabetes mellitus or prediabetes.
5.	Cancer Screening	Age- and risk-appropriate cancer screening including imaging, colonoscopy, cystoscopy, and other relevant investigations. Prior treated malignancy is not an absolute contraindication but requires individualized assessment and waiting periods. PSA screening is recommended for men aged ≥50 years. Pap smear screening should follow national cervical cancer screening guidelines.
6.	Pulmonary Assessment	Clinical history, physical examination, and additional investigations as indicated.
7.	Cardiovascular Evaluation	ECG, echocardiography, stress testing (stress ECG or dobutamine stress echocardiography for donors >40 years or those with cardiovascular risk factors), and ambulatory blood pressure monitoring where indicated.
8.	Peripheral Arterial Disease Assessment	Clinical assessment, vascular imaging (CT renal angiogram with IVU), and surgical consultation where indicated.
9.	Neurological Assessment	Evaluate history of stroke or transient ischemic attack (TIA); defer donation for at least 6 months after such events. Screen for intracranial aneurysms in high-risk conditions such as autosomal dominant polycystic kidney disease (ADPKD).
10.	Gastrointestinal/Liver Assessment	Clinical history and examination to exclude active gastrointestinal or liver disease; perform targeted investigations such as abdominal ultrasound and others as indicated.
11.	Hematological Assessment	Screen for thrombophilia and antiphospholipid antibodies in high-risk individuals. Anticoagulation therapy alone is not a contraindication.
12.	Immunological Assessment	Document sensitizing events such as blood transfusions and pregnancies; perform HLA antibody testing.
13.	Infection Screening	Screen for Hepatitis B, Hepatitis C, HIV, CMV, VDRL, urine culture, and other regionally relevant infections.

Marginal or Expanded Criteria Living Donors (ECLDs)

Marginal or Expanded Criteria Living Donors (ECLDs) are living kidney donors who have one or more of the following risk factors:

Table 21.19: Risk Factors

S/N	Risk Factor
1	Age >60 years
2	Body mass index (BMI) >30 kg/m²
3	Controlled hypertension
4	Mildly reduced kidney function (e.g., estimated glomerular filtration rate [eGFR] <80 mL/min)
5	Impaired glucose tolerance
6	History of smoking

21.5.2 Transplant Candidate

All patients with CKD stage 4-5 should be informed of, educated about and considered for kidney transplantation regardless of socioeconomic status, sex, or ethnicity. Pre-emptive transplantation referral should be 6-12 months before anticipated RRT initiation. Active diseases should be controlled first before transplantation.

The following are not recommended for kidney alone transplant: -

- Multiple myeloma and AL amyloidosis
- Decompensated cirrhosis
- Severe irreversible obstructive or restrictive lung disease
- Severe uncorrectable and symptomatic cardiac disease
- Progressive central neurodegenerative disease

Kidney Transplant Candidate Assessment

All transplant candidates should undergo comprehensive evaluation as detailed outlined on the table 21.20 below

Table 21.20: Kidney Transplant Candidate Assessment

S/N	Domain	Assessment Requirements
1	Psychosocial Assessment	Assess psychosocial stability, adherence to therapy, and counsel on tobacco use avoidance/cessation.
2	Surgical Assessment	Assess suitability for transplantation including obesity, anticoagulation status, vascular anatomy, evaluation of native kidneys in autosomal dominant polycystic kidney disease, and urological assessment where indicated.
3	Diabetes Screening	Screen for diabetes mellitus using appropriate investigations.
4	Cancer Screening	Perform age- and risk-appropriate cancer screening before transplantation and continue screening after transplantation. This may include imaging, cystoscopy, colonoscopy, and other investigations for high-risk individuals. Patients with cured malignancy should not be automatically excluded; waiting period depends on type of malignancy.
5	Pulmonary Assessment	Assess for underlying pulmonary disease through history, physical examination, and investigations as indicated.
6	Cardiovascular Assessment	Perform ECG and echocardiography. Stress echocardiography or dobutamine stress echocardiography should be performed in candidates aged >40 years or those with risk factors for coronary artery disease.
7	Peripheral Arterial Disease Assessment	Screen all candidates through history and physical examination. Imaging may be required, and vascular surgery consultation should be considered prior to transplantation.
8	Neurological Assessment	Delay transplantation for at least 6 months after stroke or transient ischemic attack (TIA). Screen for intracranial aneurysms in high-risk patients with autosomal dominant polycystic kidney disease.
9	Gastrointestinal and Liver Assessment	Conduct history and physical examination to exclude active peptic ulcer disease, diverticulitis, pancreatitis, cholelithiasis, inflammatory bowel disease, and liver disease. Additional investigations may be required where indicated.
10	Haematological Assessment	Screen high-risk individuals for thrombophilia and antiphospholipid antibodies. Requirement for anticoagulation is not a contraindication to transplantation.
11	Immunological Assessment	Document sensitizing events such as blood transfusion and miscarriage. Perform HLA antibody testing during transplant evaluation.
12	Infection Screening	Screen for Hepatitis B, Hepatitis C, HIV, CMV, and other relevant infections based on local epidemiology.

Table 21.21: Pre-Transplant Laboratory and Diagnostic Evaluation

Category	Test/Investigation	Purpose/Details
Blood Grouping	ABO blood grouping	Essential for donor–recipient compatibility.
Hematology	Complete blood count (CBC) and platelet count	Assess haemoglobin level, infection status, and clotting profile.
Glycaemic Assessment	Fasting blood glucose, HbA1c	Evaluate diabetes control and metabolic status.
Immunogenetics	HLA typing (Class I and II: HLA-A, B, C, DR, DQ, DP)	Low- to medium-resolution molecular typing for donor–recipient matching.
Crossmatching	Complement-dependent cytotoxicity (CDC) crossmatch and flow cytometry crossmatch	Detect preformed donor-specific antibodies and reduce rejection risk.
Antibody Screening	Donor-specific antibodies (DSA) and panel reactive antibodies (PRA) (when indicated)	Assess sensitization level and risk of rejection.
Molecular Testing	DNA fingerprinting (when indicated)	Confirm donor/recipient identity and biological relatedness.
Biochemistry	Calcium, phosphate, alkaline phosphatase, AST, LDH, urea, creatinine, uric acid	Assess renal and metabolic function.
Electrolytes	Sodium, potassium, chloride, bicarbonate/CO_2	Assess electrolyte balance.
Liver Function Tests	Total bilirubin, direct bilirubin, albumin, total protein	Evaluate liver function.
Lipid Profile	Total cholesterol, triglycerides, LDL, HDL	Assess cardiovascular risk factors.
Urine Assessment	Midstream urine for urinalysis and culture	Detect urinary tract infection and assess kidney status.
Microbiology/Serology	Hepatitis B, Hepatitis C, CMV, EBV, HIV	Screen for transmissible infections that may affect transplant outcomes.
Radiological Assessment	Chest X-ray	Assess cardiopulmonary status.
	KUB ultrasound	Evaluate kidney, ureter, bladder anatomy and urinary tract.
	Abdominal ultrasound	Assess abdominal organs and detect structural abnormalities.
	Pelvic X-ray (when indicated)	Evaluate pelvic anatomy where required.

Category	Test/Investigation	Purpose/Details
Cardiac Evaluation	12-lead ECG	Assess baseline cardiac status.
	Echocardiography with dobutamine (when indicated)	Assess cardiac function in patients with suspected cardiovascular disease.
Male-Specific Screening	PSA (men ≥40 years)	Screen for prostate pathology.
	Uroflowmetry (men ≥40 years)	Assess urinary flow and function.
Female-Specific Screening	Obstetrics/Gynaecology clearance with negative Pap smear (within 6 months)	Assess reproductive health prior to transplantation.

21.5.3 Transplant Recipient

This section will cover the management of kidney transplant recipients (KTRs). It includes initial and maintenance immunosuppression, monitoring and management of special conditions. Enhanced investigations and treatment in this group is paramount to ensure kidney graft survival.

21.5.3.1 Induction Therapy

Induction immunosuppression is used to reduce the risk of early acute graft rejection after kidney transplantation. The two main classes of induction agents are:

Interleukin-2 receptor antagonists (IL-2RA) example Basiliximab and **Lymphocyte-depleting agents** Example: Rabbit Antithymocyte Globulin (rATG)
Rabbit Antithymocyte Globulin (rATG) is preferred over horse ATG and is the most commonly recommended lymphocyte-depleting agent for induction therapy, particularly in patients with high immunological risk. Selection of induction therapy should be guided by immunological risk stratification.

Note: Monitor platelet count daily during administration of (S) rATG and adjust dose accordingly.

Table 21.22: Induction Immunosuppression Based on Immunologic Risk

Patient Factor	Preferred Induction Agent	Recommended Dose	Special Considerations
Low immunologic risk	**S:** basiliximab	Adults: 20 mg IV on Day 0 (day of transplant) **AND** Day 4 post-transplant. Children: <35 kg: 10 mg IV on Day 0 **AND** Day 4 post-transplant Children ≥35 kg: 20 mg IV on Day 0 **AND** Day 4 post-transplant	Well tolerated. Standard dosing usually does not require adjustment.
High immunologic risk (high PRA/cPRA, donor-specific antibodies, re-transplantation, multiple HLA mismatches, ABO incompatibility)	**S:** antithymocyte globulin (rabbit) (rATG)	Adults: 1–1.5 mg/kg IV once daily for 3–5 days starting Day 0 (total dose 4.5–7.5 mg/kg). Children (≥5 months): 1.5 mg/kg IV once daily for 3–5 days starting Day 0 (total dose 4.5–7.5 mg/kg).	Adjust dose based on lymphocyte count, platelet count, and infection risk.
Need for steroid minimization in high-risk patients	**S:** antithymocyte globulin (rabbit) (rATG)	Use dosing as above	May allow steroid minimization while maintaining rejection prophylaxis.
Delayed graft function risk	**S:** antithymocyte globulin (rabbit) (rATG)	1.5 mg/kg IV once daily for 3–5 days	May reduce rejection risk associated with ischemic injury.
Marginal/Expanded Criteria Donor Transplant	**S:** antithymocyte globulin (rabbit) (rATG)	Use dosing as above	May help address increased immunologic risk associated with expanded criteria donors.

21.5.3.2 Premedication for (S) Rabbit Antithymocyte Globulin (rATG)

Premedication should be administered 30 minutes to 1 hour before each dose of (S) rATG to reduce infusion-related reactions.
Administer:
D: paracetamol 1 g IV stat
AND
A: chlorpheniramine 4 mg PO stat
AND
C: pantoprazole 40 mg IV once daily
AND
D: hydrocortisone 100 mg IV stat
OR
D: methylprednisolone 125 mg IV stat
Administer a test dose of (S) rATG at 10 mL/hour for 10 minutes before giving the full daily dose. Follow institutional transplant SOPs for rATG dilution and administration.

21.5.3.3 Other Induction Medicines

D: methylprednisolone 500 mg IV diluted in 100 mL normal saline and infused over 1 hour intraoperatively on the day of transplantation.
THEN
D: methylprednisolone 250 mg IV on Day 2 post-transplant
THEN
D: methylprednisolone 125 mg IV on Day 3 post-transplant
Followed by:
A: Prednisolone 60 mg PO once daily, then reduce by 10 mg daily until a maintenance dose of 20 mg once daily is reached.

Table 21.23: Perfusion Fluids for Kidney Transplantation (Organ Preservation)

Perfusion Fluid	Key Composition & Features	Dose / Volume Used	Clinical Notes / Recommendations
Organ preservation solutions	• High potassium, low sodium solution • Contains lactobionate, raffinose, glutathione, hydroxyethyl starch (colloid)	• 50–70 mL/kg donor weight for aortic flush • 1–2 L for static cold storage (SCS)	• Gold standard for cold organ preservation • Provides excellent osmotic and cellular protection • Used for static cold storage and machine perfusion (e.g., Belzer machine perfusion system) • Maximum perfusion pressure ~200 mmHg • Associated with excellent graft survival outcomes
	• Low potassium, low viscosity solution • Contains histidine buffer • Contains mannitol (osmotic agent)	• 70 mL/kg donor weight for flush (~5–6 L in 70–80 kg donor) • 1–2 L for static cold storage (SCS)	• Low viscosity allows rapid and uniform perfusion • Recommended perfusion pressure ~100 cm H_2O (≈74 mmHg) • Comparable graft outcomes to UW solution • May be used alone or in combination with UW flush depending on institutional protocol

21.5.3.4 Maintenance Immunosuppressive Medication

Maintenance immunosuppression after kidney transplantation is critical to prevent allograft rejection and ensure long-term graft survival by using a combination of immunosuppressive agents tailored to balance efficacy and toxicity. The standard regimen typically includes a calcineurin inhibitor (tacrolimus preferred), an antiproliferative agent (mycophenolate mofetil or azathioprine), and corticosteroids, with mTOR inhibitors (sirolimus or everolimus) reserved for special circumstances.
Investigations
To be done on monthly basis

- Serum creatinine and Blood urea nitrogen
- Urinalysis
- Urine biochemistry (Urine dipstick)
- Serum Tacrolimus (12-h trough) sample taken preferably before the morning Tacrolimus dose or cyclosporine (12-h trough or 2-h post dose) levels according to patient's regime

Table 21.24: Pharmacological Management of maintenance Immunosuppression in Kidney Transplantation

Drug	Dose	Key Dose Adjustment / Monitoring	Clinical Role / Recommendations
S: tacrolimus (CNI)	Similar mg/kg dosing; individualized	Adjust by therapeutic drug monitoring (TDM) using trough levels	First-line calcineurin inhibitor; initiate before or at transplantation; lower doses preferred to reduce nephrotoxicity
S: cyclosporine A (CNI)	3–5 mg/kg/day (PO) in two divided doses (BID)	Adjust to trough levels 100–400 ng/mL; close monitoring required	Alternative CNI; less preferred than tacrolimus; avoid delayed initiation
S: mycophenolate mofetil (MMF)	Adults: 1,000–1,500 mg(PO) BID (2,000–3,000 mg/day total) Children: ~600 mg/m² BSA BID (≈30–50 mg/kg/day)	Dose reduction required in toxicity; routine level monitoring optional	First-line antiproliferative agent; commonly combined with CNI and steroids
S: azathioprine	1–3 mg/kg/day (PO) once daily	Consider TPMT testing before initiation to reduce risk of myelosuppression	Alternative antiproliferative agent when MMF is not tolerated
A: prednisolone	Initial: 0.1–1 mg/kg/day, tapered to maintenance 5–10 mg/day	Individualized taper based on risk profile	May be withdrawn early in low-risk patients; otherwise maintained at lowest effective dose
S: sirolimus (mTOR inhibitor)	Loading: 6 mg once, then 2 mg/day maintenance (target trough 5–15 ng/mL)	Limited pediatric data; individualized dosing required	Used after graft stability and wound healing; often combined with reduced CNI dose to reduce nephrotoxicity
S: everolimus (mTOR inhibitor)	0.75–1 mg BID (total 1.5–2 mg/day), target trough 3–8 ng/mL	Limited pediatric data; individualized dosing and monitoring required	Similar to sirolimus; used as CNI-sparing agent after stable graft function

Drug Monitoring of immunosuppressants

- **Tacrolimus (CNI)** 12-hour trough level (C0) - Every other day during the immediate post-op period until stable target levels are reached. At least 3 times/week early post-transplant. Whenever medication changes or clinical status changes. Whenever graft dysfunction or nephrotoxicity suspected. Target trough levels vary by time post-transplant and immunologic risk (typically 5–15 ng/mL)
- **Cyclosporine** A (CNI) 12-hour trough (C0) or 2-hour post-dose (C2) levels. Same as tacrolimus: every other day post-op until stable, then regularly and as clinically indicated.C2 monitoring may better correlate with exposure; target trough 100–400 ng/mL depending on timing
- **Mycophenolate mofetil (MMF).** Area under curve (AUC) preferred; C0 levels less reliable. Monitoring suggested but not routinely mandatory; consider in cases of toxicity or poor clinical response Limited evidence for routine monitoring; limited sampling strategies may be used if needed
- **Sirolimus / Everolimus** (mTOR inhibitors)12-hour trough level (C0).Regular monitoring especially early post-transplant and after dose changes; frequency individualized. Target trough 3–15 ng/mL depending on agent and time post-transplant; monitor to avoid toxicity
- **Prednisolone**. No routine blood level monitoring Clinical monitoring for efficacy and side effects Dose adjusted clinically; no standard drug level monitoring

Note:

- Use of a non-dihydropyridine CCB to minimize CNI dosage may be economical.
- Assessment for medication adherence is crucial. So education for all KTRs and family members is important.

Table 21.25: Recommended Therapeutic Blood Levels of Calcineurin Inhibitors (CNIs)

CNI	Monitoring Level	First 3 Months	4–6 Months	6–12 Months	After 1 Year
S: Tacrolimus	C0 (trough level, ng/mL)	8–12	5–8	5–8	5–6
S: Cyclosporine A	C0 (trough level, ng/mL)	300–350	150–250	100–150	75–125
S: Cyclosporine A	C2 (2-hour post-dose level, ng/mL)	1300	800–900	500–700	450–500

21.5.3.5 Monitoring schedule for the Kidney Transplant Recipients (Routine)

Kidney transplant recipients have high risk of getting complications including surgical complications (first 3 months), frequent infections (first six months) and complications related to immunosuppressive medications, including diabetic mellitus. Some of the immunosuppressive medications have a narrow therapeutic window and have toxic effects, including nephrotoxicity. Therefore, these patients need regular and frequent follow-up as indicated in the table below.

Table 21.26: Post-Kidney Transplant Monitoring Schedule

Test / Parameter	0–1 Month Post-Transplant	2–6 Months	7–12 Months	>12 Months
Serum creatinine / eGFR	Daily to 2–3 times per week	Weekly to every 2 weeks	Monthly	Every 2–3 months
Urine protein (UACR / UPCR)	Once	Every 3 months	Every 6–12 months	Annually
Complete blood count (CBC)	Daily to 2–3 times per week	Weekly to monthly	Every 3–6 months	Annually
Blood glucose	Weekly	Every 3 months	Every 6 months	Annually
Lipid profile	Not routinely done	Once	Annually	Annually
BK virus (BKV) PCR	Monthly	Every 3 months	Every 3 months	Every 3 months
EBV PCR	Baseline and monthly	Every 3 months	Every 3 months	Every 3 months
HBV / HCV testing	Baseline; monthly if positive	Every 3–6 months if positive	Annually	Annually
Vital signs (BP, pulse, weight)	At each clinic visit	At each clinic visit	At each clinic visit	At each clinic visit

Note:

- Baseline screening for HIV, HBV, and HCV is mandatory before transplantation to identify infection status and guide management.
- For patients who are HIV-negative, HBV-negative, and HCV-negative at baseline, no routine serial viral load or antibody testing is recommended post-transplant unless new exposures, donor-derived infection risk, or clinical suspicion arises.
- HBV-negative patients should receive hepatitis B vaccination if non-immune, with periodic monitoring of antibody titers to ensure protection.

21.5.4 Acute Kidney Graft Rejection

Refers to an immune-mediated attack on the transplanted kidney, confirmed usually by biopsy and characterized by histologic changes (e.g., T cell–mediated rejection or antibody-mediated rejection).
An acute rejection is clinically suspected in patients with increased serum creatinine, after the exclusion of other causes of graft dysfunction. Other causes are generally excluded with a biopsy. Acute rejection should be treated after kidney biopsy unless this will substantially delay treatment.

Clinical Presentation

- Occur within the first six months after transplantation
- Fever
- Malaise
- Oliguria
- Graft pain and/or tenderness
- Worsening hypertension

Investigations

- Kidney biopsy which may be repeated if there is failure of treatment
- Serum creatinine and Blood Urea nitrogen
- KUB Ultrasound and Doppler USS of the kidney graft

Table 21.27: Pharmacological Management of kidney transplant rejection

Rejection Type	Treatment Agent	Adult Dose	Pediatric Dose	Notes
Acute Cellular Rejection (ACR)	**D:** methylprednisolone (IV)	300–500 mg IV daily for 3–5 days	600 mg/m² IV daily (max 500 mg) for 3–5 days	Follow with oral prednisone taper; dose guided by Banff grade and clinical response
	If steroid-resistant: **S:** antithymocyte globulin (rabbit) (rATG)	1.5 mg/kg/day IV for 4–7 days	1.5 mg/kg/day IV for up to 14 days (may extend to 21 doses given every other day)	Monitor for cytopenias and infections; induces lymphocyte depletion
Antibody-Mediated Rejection (AMR)	**D:** methylprednisolone (IV)	300–500 mg IV daily for 3–5 days	600 mg/m² IV daily (max 500 mg) for 3–5 days	Initial high-dose steroids to reduce inflammation
	Plasma Exchange (PLEX)	5 sessions every 24–48 hours until serum creatinine improves to within 30% of baseline	Same as adult	Usually 3–5 sessions; adjust based on clinical response
	S: immunoglobulin intravenous (IGIV)	2 g/kg total dose divided over 2–5 days after PLEX	Same as adult	Administer after completion of plasmapheresis; immunomodulatory effect
	S: rituximab	200–375 mg/m² IV once after PLEX and IVIG	Same as adult	B-cell depletion therapy; timing is critical after PLEX and IVIG

Table 21.28: Other Common Conditions Among Transplant Recipients and Their Management

Diagnosis / Condition	Evaluation	Treatment / Management
Recurrent kidney disease	Urine protein, serum creatinine, kidney biopsy, ± ANCA, ± anti-GBM antibodies, CBC, LDH	± Plasmapheresis; ± cyclophosphamide and corticosteroids; ± ACE inhibitors or ARBs
Tuberculosis (TB)	Detailed history, risk-based screening, IGRA, sputum AFB smear and culture, nucleic acid amplification tests, bronchoscopy if needed	Refer to STG chapter 7 on tuberculosis management
Hepatitis B / C	As per liver disease workup and virology screening	Refer to STG chapter 10 on gastrointestinal diseases
BK polyomavirus (BKV)	Kidney biopsy; BKV nucleic acid testing	Reduction of immunosuppression
Cytomegalovirus (CMV)	Donor and recipient CMV serology pre-transplant; plasma nucleic acid testing for diagnosis and monitoring	Prophylaxis: 3 months High risk (R−/D+): **S:** valganciclovir 900 mg PO once daily Intermediate risk (R+/D−): **S:** valganciclovir 450 mg PO daily ATG induction or post-rejection: **S:** valganciclovir 450 mg PO three times weekly for 3 months Treatment (severe disease): **S:** ganciclovir IV 6 mg/kg every 12 hours until clinical response **THEN** **S:** valganciclovir 900 mg PO twice daily until symptom resolution
Epstein–Barr virus (EBV) / PTLD	EBV nucleic acid testing	Reduction of immunosuppression in patients with rising EBV viral load; management of EBV disease / post-transplant lymphoproliferative disorder as per protocol
Herpes simplex virus (HSV 1/2) and Varicella zoster virus (VZV)	Clinical diagnosis ± laboratory confirmation	Superficial disease: oral acyclovir or valacyclovir until lesions resolve Systemic disease: IV acyclovir and reduction of immunosuppression Frequent recurrences: prophylactic antivirals
Pneumocystis Jirovecii pneumonia (PJP)	Bronchoalveolar lavage and/or lung biopsy	Prophylaxis for 3–6 months: **A:** sulfamethoxazole + trimethoprim (cotrimoxazole) 480 mg PO daily Continue prophylaxis for 6 weeks after rejection therapy Add corticosteroids in moderate to severe disease
Candida infection	Clinical diagnosis ± microbiology	Prophylaxis for 3 months: **A:** clotrimazole oral drops 20 drops every 8 hours **OR** **A:** nystatin 100,000 IU (1 mL) every 6 hours **OR** **A:** fluconazole 50 mg (PO) once daily
New-onset diabetes after transplantation (NODAT)	Fasting blood glucose, HbA1c, oral glucose tolerance test	Prefer: **A:** insulin **A:** metformin (stable patients) **S:** DPP-4 inhibitors: Sitagliptin, Linagliptin Refer Chapter 19
Atherosclerotic cardiovascular disease (ASCVD)	Clinical assessment ± cardiovascular risk evaluation	**A:** acetylsalicylic acid 75 mg PO once daily (maintenance)
Malignancy (general)	Patient education on self-examination and healthcare-directed screening	Refer to relevant oncology/STG chapter
Kaposi sarcoma	Clinical evaluation ± biopsy	Reduction or withdrawal of immunosuppression; conversion from calcineurin inhibitors to mTOR inhibitors (sirolimus or everolimus)

Vaccination recommendation for kidney transplant recipient

Vaccinations are crucial for kidney transplant recipients because their immunosuppressed status increases susceptibility to serious infections. This table outlines the recommended vaccines, doses, and schedules to help protect both pediatric and adult patients from preventable infectious diseases.

Table 21.29: Recommended Vaccination Schedule for Kidney Transplant Recipients (Pediatric and Adult)

Vaccine	Type	Pediatric Dose & Schedule	Adult Dose & Schedule	Timing & Recommendations
S: pneumococcal (PCV13 + PPSV23)	Conjugate + polysaccharide	• <2 years: PCV13 0.5 mL IM (4-dose series) • 2–5 years: 1–2 doses PCV13 (≥8 weeks apart) + PPSV23 0.5 mL IM ≥8 weeks after last PCV13 • 6–18 years: PCV13 0.5 mL IM once + PPSV23 0.5 mL IM ≥8 weeks later	• PCV13: 0.5 mL IM once • PPSV23: 0.5 mL IM ≥8 weeks after PCV13 • PPSV23 booster after 5 years	• Give PCV13 first, then PPSV23 after ≥8 weeks • Booster PPSV23 after 5 years • Prefer vaccination pre-transplant
B: hepatitis B	Inactivated	• 10–20 mcg IM at 0, 1, 6 months • Check anti-HBs 1–3 months after series • Booster if <10 IU/mL	• 20 mcg IM at 0, 1, 6 months • Monitor anti-HBs titers • Booster if <10 IU/mL	• Vaccinate if anti-HBs <10 IU/mL • Best response pre-transplant • Post-transplant response may be reduced
A: tetanus, Diphtheria, Pertussis)	Inactivated	• DTaP: 5-dose childhood series (0.5 mL IM each) • Tdap booster: 0.5 mL IM at 11–12 years	• Tdap 0.5 mL IM every 10 years	• Complete age-appropriate schedule • Acellular pertussis vaccines preferred
B: COVID-19 vaccine	mRNA or inactivated	• Age-specific dosing per vaccine type	• Adult dosing per vaccine product	• Start ≥3 months pre-transplant if possible • Additional doses may be required post-transplant
A: measles–rubella (MR)	Live attenuated	• 0.5 mL SC at 12–15 months and 4–6 years (2 doses ≥4 weeks apart)	Same as pediatric (pre-transplant only)	• Contraindicated post-transplant • Administer only before transplantation
C: meningococcal (MenACWY)	Inactivated	• 0.5 mL IM at 11–12 years • Booster at 16 years (or earlier if high risk)	• 0.5 mL IM based on risk category	• Indicated in high-risk groups (e.g., asplenia, outbreaks)
A: Polio (IPV)	Inactivated	• 0.5 mL IM/SC per routine immunization schedule	• 0.5 mL IM/SC if indicated	• Oral polio vaccine contraindicated post-transplant
A: Rabies	Inactivated	• Post-exposure: 1 mL IM on days 0, 3, 7, 14, 28 (5-dose regimen)	Same as pediatric	• Only for post-exposure prophylaxis • Safe in transplant recipients

21.6 Cystic Kidney Disease

Acquired or hereditary disorders of the kidneys. Autosomal dominant polycystic kidney disease is a common cause of end stage kidney disease. It is progressive and incurable condition.

Clinical Presentation

Kidney

- Nocturia, polyuria and frequency due to concentration defect
- Hypertension
- Pain syndrome (infection, bleeding, stones, rupture or compression)
- Uremic manifestations

Extra-kidney manifestations

- Polycystic liver disease
- Intracranial aneurysms
- Cardiac – valvular heart disease

Diagnostic ultrasonographic criteria

Age group	Diagnostic criterion
15–39 years	≥3 cysts, unilateral or bilateral
40–59 years	≥2 cysts in each kidney
≥60 years	≥4 cysts in each kidney

Investigations

- Ultrasonography – KUB
- Serum creatinine
- Urinalysis – biochemistry and microscopy
- Genetic testing for those who want.to be donor (family history)
- MRI for detailed cyst detection, volume measurement, monitoring progression, extra-renal cysts, and aneurysms
- CT scan – best for valuation of complications (stones, tumors), when MRI contraindicated or unavailable
- ALT, AST and bilirubin if using Tolvaptan

Non-Pharmacological Management

- Increase fluid intake >3 L in patients with eGFR ≥30 mL/min/1.73 m², unless contraindicated. For those with eGFR <30, individualized assessment is needed.
- Low-salt Diet: Recommended for all patients.
- Kidney transplantation when indicated; pre transplant nephrectomy may be needed for massively enlarged kidneys

Pharmacological Management

S: tolvaptan (PO) 45mg in the morning and 15mg 8 hours later (titrate to 90mg am and 30mg pm). pm dose should be taken before 4pm

Pediatric Considerations

Autosomal Dominant Polycystic Kidney Disease (ADPKD) may be diagnosed in childhood, especially with family history or genetic testing.

Screening: Ultrasound screening recommended in at-risk children, typically starting at age 15 or earlier if symptomatic.
MRI can be used for detailed assessment but is less commonly performed routinely in children.

Non-Pharmacological Management

Lifestyle: Encourage healthy diet, physical activity, and avoidance of nephrotoxins.

Pharmacological Management

Blood pressure management: Target blood pressure at or below the 50th percentile for age, sex, and height.

ACE inhibitors or ARBs are first-line agents for hypertension.

Medicine	Initial Dose	Maximum Dose	Frequency
C: enalapril	0.08–0.2 mg/kg/day	0.6 mg/kg/day (maximum 40 mg/day)	1–2 divided doses
OR			
C: lisinopril	0.07 mg/kg/day	0.6 mg/kg/day (maximum 40 mg/day)	Once daily
OR			
B: captopril	0.3–0.5 mg/kg/dose	6 mg/kg/day (maximum 450 mg/day)	2–3 divided doses
OR			
B: losartan	0.7 mg/kg/day	1.4 mg/kg/day (maximum 100 mg/day)	Once daily

Note:

- Tolvaptan Evidence for long-term safety and efficacy in children is limited
- Considered only in selected pediatric patients with rapidly progressive disease,
- Dosing is weight-based and should be supervised by a pediatric nephrologist

Extrarenal Manifestations

Polycystic liver disease, intracranial aneurysms, and cardiac valvular abnormalities are common and should be screened for based on clinical risk factors.
Intracranial aneurysm screening is recommended in patients with family history or high-risk features.

21.7 Renal artery stenosis

Renal artery stenosis (RAS) is the narrowing of one or both renal arteries, most commonly due to atherosclerosis (especially in older adults) or fibromuscular dysplasia (typically in younger patients, especially women).
If untreated, RAS can lead to resistant hypertension, chronic kidney disease (CKD), and end-stage kidney disease (ESKD).

Clinical Presentation

- Hypertension, which is resistant, refractory to therapy with three or more drugs.
- Young onset hypertension with no family history
- An acute rise in serum creatinine >30% after ACE-inhibitor or ARB use
- Episodes of flash pulmonary oedema
- Asymmetrical kidneys.
- Unexplained hypokalemia

Investigations

- Serum creatinine/BUN
- Urine protein creatinine ratio
- Urinalysis
- Duplex Doppler ultrasonography
- Computer tomography angiography
- Magnetic resonance angiography
- ACE-inhibitor Scintigraphy
- Conventional arteriography

Non-Pharmacological Management
Revascularization (when >80% stenosis)

Pharmacological Management
A: Aspirin 75 mg orally once daily
ACE inhibitors or ARBs (refer to hypertension management section)

21.8 Thrombotic Microangiopathy (TMA)

Thrombotic microangiopathy (TMA) is a pathological syndrome characterized by: Thrombocytopenia, Microangiopathic haemolytic anaemia and Organ injury. Acute kidney injury (AKI) is a common manifestation due to glomerular microvascular injury and occlusion. Early recognition and treatment are essential.

Clinical Presentation
- Haemolysis
- Ischaemic organ dysfunction
- Acute kidney injury (AKI)

Extrarenal manifestations may include:
- Pancreatitis
- Hepatitis
- Seizures
- Diarrhoea, vomiting, and abdominal pain
- Digital gangrene
-

Investigations
- ADAMTS13 activity (>10% makes thrombotic thrombocytopenic purpura [TTP] less likely)
- Bacterial culture/serology
- HIV serology
- Antinuclear antibody (ANA)
- Anti-double stranded DNA (anti-dsDNA)
- Antiphospholipid antibodies
- Anti-Scl-70 antibodies
- Kidney biopsy (where indicated)

Pharmacological Management
Identify and treat the underlying cause. Primary thrombotic microangiopathies include:
- Complement-mediated atypical haemolytic uraemic syndrome (aHUS)
- Thrombotic thrombocytopenic purpura (TTP) associated with reduced ADAMTS13 activity

S: Plasma exchange until ADAMTS13 results are available to exclude TTP, with or without immunosuppression.

21.8 Reflux nephropathy

A chronic kidney disease characterized by renal scarring and interstitial fibrosis resulting from vesicoureteric reflux (VUR) and/or recurrent urinary tract infections (UTIs), typically originating in early childhood. It is often associated with congenital abnormalities of the urinary tract such as renal dysplasia and posterior urethral valves, leading to progressive loss of renal function and hypertension."

Clinical Presentation
- Usually asymptomatic
- Hypertension
- Frequency of micturition
- Dysuria
- Aching lumbar pain
- Urinalysis shows leucocytes

Investigations
- Urine analysis– dipstick/biochemistry/microscopy
- Serum creatinine
- Urine culture
- Ultrasonography – KUB
- Radionuclide DMSA scans
- MCUG- micturating cystourethrography
- Serial imaging by Magnetic Resonance Imaging – MR
- Renal biopsy

Non-Pharmacological Management
- If recurrent pyelonephritis occurs in an abnormal kidney with minimal function – Nephrectomy
- Hypertension may be cured by removal of a diseased kidney
- Severe reflux may be managed by ureteric reimplantation or sub trigonal injection of Teflon/polysaccharide
- Blood pressure targets: Children: ≤50th percentile for age, sex, and height Adults: <120/80 mmHg (or individualized based on comorbidities)

Pharmacological Management
Antibiotic Prophylaxis:
Adult: Not routinely recommended; treat UTIs promptly

Children: Recommended for high-grade VUR or recurrent febrile UTIs
Acute UTI Treatment:
Adult / Paediatric: Prompt appropriate antibiotics, Treat UTI as in section with Urinary tract infection.

Blood Pressure Control: use RAAS inhibitors;
Adult
B: Losartan: start 50 mg once daily, titrate up to 100 mg daily
Children

Medicine	Initial Dose	Maximum Dose	Frequency
C: enalapril	0.08–0.2 mg/kg/day	0.6 mg/kg/day (maximum 40 mg/day)	1–2 divided doses
OR			
C: lisinopril	0.07 mg/kg/day	0.6 mg/kg/day (maximum 40 mg/day)	Once daily
OR			
B: captopril	0.3–0.5 mg/kg/dose	6 mg/kg/day (maximum 450 mg/day)	2–3 divided doses
OR			
B: losartan	0.7 mg/kg/day	1.4 mg/kg/day (maximum 100 mg/day)	Once daily

Proteinuria Management: see section with proteinuria in adults consider SGLT2i

21.9 Contrast Induced Nephropathy (CIN)

Contrast induced nephropathy (CIN), which is also known as Contrast Induced Acute Kidney Injury may occur after administration of iodinated contrast material, which is called contrast-induced nephropathy. Common contrast based studies resulting in CIN include CT scan, MRI and coronary angiography. Contrast induced acute kidney injury is usually characterized by rapid recovery of renal function.

Clinical Presentation

- Early mild increase in serum creatinine that is generally observed within 24-48 hours after the iodinated contrast exposure and that is usually mild. Serum creatinine starts to decline within 3-7days of exposure
- No oliguria, patients with CIN are passing urine normally and if it occurs develop immediately. Oliguria and more severe elevation of creatinine may develop in patients with moderate to severe CKD.
- Urinalysis may show sediments consistent with acute tubular necrosis.
- Other manifestations of reduced GFR including hyperkalaemia, acidosis and hyperphosphataemia

Investigations

- All patients scheduled for contrast studies should have serum creatinine performed before the study and 24-48hours after contrast study
- For patients with raised creatinine
  > Serial creatinine should be performed until 7 days
  > Potassium, sodium, phosphorus, calcium and urinalysis
  > Kidney ureters and bladder ultrasound

Non-Pharmacological Management

- Identify all at risk patients; diabetic mellitus, heart failure, patients with CKD
- Withdrawal of nonessential potentially nephrotoxic medications (e.g., NSAIDs, diuretics, aminoglycosides, amphotericin, platins, zoledronate, and methotrexate) in people with AKI or eGFR <30 ml/min per 1.73 m2 for 24–48 hours before contrast study
- For people with AKI or an eGFR <30 ml/min per 1.73 m^2, stop metformin restart 48 hours later only if GFR remains stable
- withholding RAASi in people at risk for 48 hours before elective contrast-enhanced CT restart 48 hours later only if GFR remains stable
- Encourage adequate hydration prior to study
- Use lower possible dose of contrast (<125 ml)
- Use low osmolar (iohexol, ioversol) or iso-osmolar (iodixanol) contrast media
- Prophylactic peri contrast hemodialysis has been shown to be potentially harmful and is not recommended.

Pharmacological Management
Fluid administration should be used if there are no contra-indications. Normal saline should be administered before and continued for few hours after the study

Outpatients:
A: sodium chloride 0.9% ,3mL/kg over one-hour pre-procedure and 1-1.5mL/kg/hour during and for four to six hours' post-procedure, with administration of at least 6mL/kg post-procedure

Inpatients
A: sodium chloride 0.9%, 1mL/kg/hour for 6-12hours pre-procedure, intra-procedure, and for 6- 12hours post-procedure

Note: Patient with severe CIN may need to undergo haemodialysis if there is no improvement within 7days

21.10 Urinary Tract Infection (UTI)

Urinary tract infections may involve the upper or lower urinary tract. Infections may be complicated or uncomplicated. Uncomplicated cystitis is a lower UTI in a non-pregnant woman of reproductive age and who has a normal urinary tract. All other UTIs should be regarded as complicated. The commonest causative pathogens for UTIs irrespective of the group of patients involved in Tanzania are Escherichia coli, Klebsiella pneumonia, Proteus spp. and Staphylococcus aureus.

Note:
- Differentiation of upper from lower urinary tract infection in young children is not possible on clinical grounds
- Upper UTI is a more serious condition and requires longer and sometimes intravenous antimicrobial treatment.
- Special considerations should be given in the following groups of patients: children, pregnant women, elderly (>60 years) and other individuals with functional or structural abnormalities in the urinary tract.

Table 21.30: Clinical Presentation of Urinary Tract Infections

Type of UTI	Clinical Presentation
Lower UTI (Cystitis)	• Suprapubic pain/tenderness • Dysuria • Urinary frequency • Urgency • Pyuria • Occasionally haematuria • Temperature ≥38°C
Upper UTI (Pyelonephritis)	• Flank pain/tenderness • Pyuria • Occasionally haematuria • Temperature ≥38°C • Vomiting
Catheter-Associated UTI (CAUTI)	Presence of symptoms and signs of cystitis or pyelonephritis in a person whose urinary tract is currently catheterized or who had a urinary catheter in place within the previous 48 hours.
Urosepsis	Features of cystitis or pyelonephritis plus two or more of the following: • Temperature >38°C or <36°C • Tachycardia >90 beats/minute • Tachypnoea >20 breaths/minute • WBC count >12,000/mm³ or <4,000/mm³ • Confusion • Hypotension • Other evidence of organ dysfunction

Investigations
- Quantitative or semi-quantitative urinalysis (high protein, low sugar, nitrites positive, leukocyte esterase positive, and low pH) and Urine microscopy (>8–10 WBC/HPF) may be suggestive of UTIs.
- Quantitative urine culture (growth of at least 104 or 105 colony forming units of bacteria/ml of urine) and antimicrobial sensitivity testing. Concomitant urine and blood cultures are indicated in case of urosepsis.
- Urinary LAMM – in patients with suspected to have genitourinary TB
- Ultrasound (kidney and pelvis) to exclude stones or structural abnormalities in patients with recurrent UTI

Note: Positive WBC counts on urinalysis or urine microscopy + compatible 2 or more Clinical Presentations supported by urine culture in centers where this test is available.

Non-Pharmacological Management
- Ensure adequate hydration
- Voiding of urine whenever an urge to micturate occurs; or after sexual intercourse in adults.
- Removal of indwelling bladder catheter (where indicated)

Pharmacological Management

Analgesics in severe dysuria and flank pain
Adults
A: paracetamol (PO) 500-100 mg every 6-8 hours.
Children:
A: paracetamol (PO) 15 mg/kg/dose 4–6 hourly when required to a maximum of 4 doses per 24 hours;

Uncomplicated Cystitis
Adults
A: nitrofurantoin: 100 mg PO twice daily for 5 days
OR
C: flucloxacillin + amoxicillin (FDC): 500 mg PO three times daily for 5 days

Complicated Cystitis
Adult
A: ciprofloxacin: 500 mg PO twice daily for 7 days
OR
B: amoxicillin + clavulanic acid (FDC): 625 mg PO twice daily for 7 days

Catheter-Associated UTI (CAUTI)
A: ciprofloxacin: 500 mg PO twice daily for 7 days (only if symptomatic)

Urosepsis
A: gentamicin: 120 mg IV/IM once daily (7.5 mg/kg in children) for 5 days
AND
D: ceftriaxone+ sulbactam: 1 g IV once daily (80 mg/kg in children) for 5 days
OR
S: piperacillin + tazobactam: 4.5 g IV every 6–8 hours for 5–7 days

Treatment of Urinary Tract Infection (UTI) in Children

General Principles
- Always confirm UTI with urine culture before starting antibiotics, if possible.
- Choose empiric therapy based on local resistance patterns, clinical severity, and patient age.
- Adjust antibiotics according to culture and sensitivity results.
- For febrile or complicated UTI, consider initial intravenous (IV) therapy, then switch to oral antibiotics when the child is afebrile and improving.

Empirical Antibiotic Choices

Uncomplicated Cystitis (Lower UTI)

A: nitrofurantoin: 5–7 mg/kg/day PO divided into 4 doses (max 400 mg/day) for 5 days (Do not use in infants <1 month, G6PD deficiency, or pyelonephritis)
OR
B: amoxicillin + clavulanic acid: 20–40 mg/kg/day (amoxicillin component) PO divided into 3 doses (max 2000 mg amoxicillin/day) for 7 days
OR
B: cefalexin: 25–50 mg/kg/day PO divided into 2–4 doses for 5–7 days

Febrile or Complicated UTI / Pyelonephritis

Initial IV Therapy (for moderate/severe illness, infants, or unable to tolerate oral):
B: ceftriaxone:50–100 mg/kg IV/IM once daily (max 2 g/day) for 7 days
OR
A: gentamicin:5–7.5 mg/kg IV/IM once daily for 7 days (monitor renal function and drug levels)
OR
S: amikacin: 15 mg/kg IV once daily for 7 days (for multidrug-resistant organisms)
OR
S: piperacillin + tazobactam: 80–100 mg/kg (piperacillin component) IV every 8 hours for 7 days

Oral Step-Down Therapy (once afebrile and improving):

B: amoxicillin + clavulanic acid:20–40 mg/kg/day (amoxicillin component) PO divided into 3 doses
OR
B: cefalexin:25–50 mg/kg/day PO divided into 3–4 doses
OR
A: Trimethoprim-Sulfamethoxazole (TMP-SMX): 5 mg/kg/day (trimethoprim component) PO divided into 2 doses (if susceptible)
OR
A: ciprofloxacin:10–15 mg/kg/dose PO twice daily (max 750 mg/dose); reserved for resistant infections
OR
S: meropenem (IV) 250–500mg 8hry for 5–7days
Once results for urine and blood cultures are available change the antibiotic treatment options accordingly.

Referral: Refer the patient urgently to the next facility with adequate expertise and facilities if: -
Acute pyelonephritis with:
- Vomiting
- Features of suggestive of urosepsis
- Diabetes mellitus Acute pyelonephritis in:
- Pregnant women
- Women beyond reproductive age
- Men

21.11 Urology Disorders

Are diseases that affect urinary system including urinary incontinence, urolithiasis, benign prostatic hyperplasia, prostate cancer.

21.11.1 Hematuria

Hematuria is the presence of blood in the urine, either visible (gross hematuria) or microscopic. It is a clinical sign indicating possible underlying pathology in the urinary tract or systemic disease. Prompt evaluation and appropriate management are essential to identify treatable causes and prevent complications.

Clinical Presentation

- Gross hematuria: Visible red or cola-colored urine, often alarming to patients.
- Microscopic hematuria: Detected on urinalysis without visible discoloration.
- Associated symptoms may include dysuria, flank pain, fever, urinary frequency, urgency, or clots in urine

Table 21.31: Initial Assessment and Diagnosis

Assessment Component	Details/Parameters to Assess	Purpose/Notes
History	Duration and quantity of haematuria	Determine onset, severity, and progression
	Associated urinary symptoms (pain, burning, frequency)	Identify infection, inflammation, or obstruction
	History of trauma, instrumentation, or catheterization	Assess iatrogenic or traumatic causes
	Past urinary tract infections or schistosomiasis exposure	Evaluate common infectious causes (context-specific)
	Medication history (anticoagulants, herbal medicines)	Identify drug-induced bleeding or interactions
	Risk factors for malignancy (age >40 years, smoking, occupational exposure)	Stratify risk and urgency of investigation
Physical Examination	Vital signs (including features of anemia or shock)	Assess haemodynamic stability and severity
	Abdominal and flank tenderness	Suggest stones, infection, or obstruction
	Palpation for bladder distension or masses	Detect urinary retention or tumours
	Genital examination	Identify local sources of bleeding or infection
Laboratory Tests	Urinalysis (blood, protein, leukocytes, nitrites)	Confirm haematuria and detect infection or glomerular disease
	Urine microscopy (RBC morphology)	Differentiate glomerular vs non-glomerular bleeding
	Urine culture	Identify infection and guide antibiotics
	Complete blood count (CBC)	Assess anaemia or infection
	Coagulation profile	Detect bleeding disorders
Imaging	Ultrasound of kidneys and bladder	First-line imaging for stones, masses, obstruction
	Plain X-ray KUB	Detect radio-opaque stones
	CT urography / IV urography	Detailed evaluation when indicated and available
Endoscopy	Cystoscopy	Indicated for persistent or unexplained gross haematuria, especially in adults >40 years or with malignancy risk factors

Table 21.32: Management of Haematuria by Cause/Condition

Cause/Condition	Management	Notes
Urinary Tract Infection (UTI)	Antibiotics according to local sensitivity patterns (e.g., ampicillin, ceftriaxone, ciprofloxacin), hydration, and analgesia	Follow Tanzania STG antimicrobial guidelines to reduce resistance
Schistosomiasis	Praziquantel single dose (40 mg/kg)	Refer to national schistosomiasis control program guidelines
Urolithiasis (kidney/bladder stones)	Pain control (NSAIDs), hydration, and referral for lithotripsy or surgical intervention if obstruction or infection is present	Early referral if obstruction or infection suspected

Cause/Condition	Management	Notes
Trauma-related haematuria	Supportive care (bed rest, analgesia), catheterization if urinary retention, surgical intervention if severe	Monitor for worsening bleeding or obstruction
Suspected malignancy (bladder, kidney, prostate)	Urgent referral for cystoscopy, biopsy, and oncological evaluation	Early detection is critical for prognosis
Glomerular causes (e.g., glomerulonephritis)	Referral to nephrology for further evaluation and management	May require immunosuppressive therapy
Bleeding disorders / coagulopathy	Correct underlying coagulopathy; blood transfusion if severe bleeding; consult haematology	Follow national blood transfusion and coagulation protocols
Obstructive uropathy	Relieve obstruction via catheterization or surgery; treat underlying cause	Monitor renal function and urine output

Supportive Care

- Maintain adequate hydration to help flush the urinary tract.
- Monitor vital signs and haemoglobin levels in cases of significant bleeding.
- Blood transfusion only if clinically indicated (e.g., severe anaemia or haemodynamic instability).
- Provide pain management using paracetamol or NSAIDs where appropriate.

Referral Criteria

Refer patients for specialist care in the following situations:

- Persistent or recurrent haematuria with no clear cause after initial evaluation.
- Gross haematuria with clots causing urinary retention or obstruction.
- Suspected urinary tract malignancy.
- Severe anaemia or haemodynamic instability due to bleeding.
- Complex urological conditions requiring specialist intervention.

Patient Education and Prevention

- Educate on personal hygiene and prevention of urinary tract infections.
- Promote awareness of schistosomiasis prevention, including avoidance of contaminated freshwater.
- Encourage early health-seeking behavior when haematuria or urinary symptoms occur.
- Counsel on medication adherence and follow-up appointments.

21.11.2 Prostatitis

It is an inflammation of the prostate usually secondary to bacterial infection caused by urinary or STI pathogens

Clinical Presentation

- Perineal, sacral or suprapubic pain Dysuria and Urinary frequency
- Varying degrees of obstructive symptoms which may lead to urinary retention
- Sometimes fever

Investigations

Urine analysis, Urine culture

Pharmacological Management

Acute bacterial prostatitis

In men < 35 years or if there are features of associated urethritis (STI regimen):

S: cefixime (PO) 400mg as a single dose

THEN

A: doxycycline (PO) 100mg 12hourly for 7days

In men > 35 years or if there is associated cystitis:

A: ciprofloxacin (PO) 500 mg 12hourly for 14days

Referral to Urologist if:

- No response to treatment
- Urinary retention
- High fever
- Chronic/relapsing prostatitis

Note:

- Avoid unnecessary use of broad-spectrum or reserve antibiotics at primary care level
- Educate patients on medication adherence and the importance of follow-up.

21.11. 3 Benign Prostatic Hyperplasia (BPH)

Benign prostatic hyperplasia is a noncancerous (benign) growth of the prostate gland. Management of BPH depends on severity of symptoms according to International Prostate Symptom Score (IPSS)

Clinical Presentation

- Obstructive symptoms: weak, intermittent stream and urinary hesitancy
- Irritative (frequency, nocturia and urgency) voiding symptoms.
- Digital Rectal Examination reveals a uniform enlargement of the prostate with smooth surface and firm in consistence. The median sulcus is also palpable
- Urinary retention with a distended bladder may be present in the absence of severe symptoms, therefore it is important to palpate for an enlarged bladder during examination.
- Pelvic or transrectal USS confirms the prostate enlargement
- Prostatic specific antigen levels are within normal range
- Symptoms should be graded by the IPSS – international prostate symptom score into mild, moderate and severe.

Non-Pharmacological Management

- Patients with mild symptoms should be put under watchful waiting (change of lifestyle and regular follow up). Reduce fluid intake especially in the evening, avoid caffeinated drinks
- Patients with severe symptoms should undergo surgery, transurethral resection of the prostate for prostate weighing up to 75g and those weighing more than 75g should undergo open prostatectomy
- For patients presenting with urinary retention, insert a urethral catheter as a temporary measure while patient is transferred to hospital
- Remove drugs that prevent urinary outflow e.g. tricyclics and neuroleptics.

Pharmacological Management

Patients with moderate symptoms according to IPSS should be put under medical therapy unless opt for surgery.
Medical treatment of BPH includes alpha-adrenergic blocker or 5 alpha- reductase inhibitor or a combination of both

Adrenergic Alpha Blockers:
D: tamsulosin (PO) 0.4mg 24hourly
OR
D: alfuzosin (PO) 10mg 24hourly

5-alpha Reductase Inhibitors
D: finasteride (PO) 5mg 24hourly
OR
S: dutasteride (PO) 0.5mg 24hourly

Anticholinergics
S: oxybutynin (PO) 5mg 8hourly for patients with persistent urgency despite above medications

Note: All patients with BPH and associated complications like recurrent UTI, Haematuria, Kidney insufficiency, hernia and urinary stones need surgery and should be referred to centres where specialized care can be offered.
Prostate Cancer has been posted in Oncology section

21.11.4 Cryptorchidism

Cryptorchidism is the absence of one or both testes from the scrotum due to failure of testicular descent. It is a common congenital anomaly affecting approximately 1-4% of full-term male infants and is associated with risks of infertility, testicular malignancy, and psychological impact if untreated.

Clinical Presentation

- Empty scrotum on one or both sides
- Asymmetrical or underdeveloped scrotum
- Non-palpable testis in scrotum
- Palpable testis in inguinal canal (some cases)
- Testis may be intra-abdominal in non-palpable cases
- Usually asymptomatic
- May be associated with inguinal hernia

Investigations

- Clinical examination (primary diagnostic method)
- Ultrasound of inguinal region and abdomen (if testis not palpable)
- MRI or diagnostic laparoscopy (Gold standard for non-palpable testes to confirm presence and location.)

Non-Pharmacological Management

- Orchidopexy (definitive treatment), Ideally performed between **6–12** months of age
- Laparoscopic exploration and orchidopexy for intra-abdominal testes
- Hernia repair if associated inguinal hernia is present

Pharmacological Management

- Hormonal therapy (e.g., hCG or GnRH) may be used in selected cases, but surgical correction remains the standard treatment
- No routine pharmacological cure; used only in specific specialist settings

Follow-up:

- Monitor testicular position and size postoperatively.
- Long-term surveillance for fertility and malignancy risks.

21.11.5 Hypospadias

Hypospadias is a congenital malformation characterized by ectopic placement of the urethral meatus on the ventral side of the penis, often accompanied by chordee (ventral curvature) and abnormal foreskin development. It can cause difficulties in urination, sexual function, and fertility.
Early diagnosis and timely management of both conditions are essential to optimize outcomes, preserve fertility, and improve quality of life.

Clinical Presentation

- Abnormal urethral opening on the ventral surface of the penis
- Incomplete or “hooded” foreskin (dorsal prepuce)
- Ventral penile curvature (chordee)
- Abnormal urinary stream (spraying or downward deviation)
- Difficulty with standing urination in older children
- Usually identified at birth during newborn examination
- Associated cryptorchidism may be present (in severe cases)

Investigations

- Clinical examination (primary diagnostic tool)
- Assessment of severity and location of meatus (glanular, penile, penoscrotal, perineal)
- Renal Ultrasound (if associated urinary tract anomalies suspected)
- Karyotyping/hormonal studies (if ambiguous genitalia or bilateral cryptorchidism present)

Non-Pharmacological Management

Surgical Principles:

- Correction of chordee (if present).
- Urethroplasty to reconstruct a functional urethra with meatus at the tip of the glans.
- Glansplasty and cosmetic reconstruction of the penis.
- Use of tissue flaps or grafts depending on severity.
- Surgical repair is ideally performed between **6 and 18** months of age to minimize psychological impact and optimize outcomes.

Postoperative Care:

- Catheterization for urinary drainage for 5-7 days.
- Follow-up for complications such as fistula, meatal stenosis, or stricture.

Pharmacological Management

No definitive pharmacological cure

Antibiotics may be used:
Peri-operatively for infection prevention
C: cefazolin (IV)30 mg/kg single dose, Given at induction of anaesthesia (within 30–60 minutes before incision)

OR

B: ceftriaxone (IV)50 mg/kg single dose

If penicillin/cephalosporin allergy
S: clindamycin (IV) 10 mg/kg single dose

For associated urinary tract infections if present
Treat according UTI management section on this STG

Pain management post-surgery as per paediatric surgical protocol
A: paracetamol 10–15 mg/kg/dose every 6 hours (PO/IV)

NSAIDs (if not contraindicated)
Ibuprofen: 5–10 mg/kg/dose every 6–8 hours (max 30 mg/kg/day)

21.11.6 Phimosis

Inability to retract the foreskin over the glans penis.

Non-Pharmacological Management

- Gentle daily retraction and hygiene.
- Circumcision if conservative management fails or if recurrent infections/urinary obstruction.

Pharmacological Management

C: betamethasone 0.05% cream Apply thin layer to the preputial ring twice daily for 4–6 weeks (Gentle foreskin retraction after application) (if not painful)

OR

A: hydrocortisone 1% cream Apply twice daily 4–6 weeks

AND

B: lidocaine topical 2% gel: apply before procedure; or infiltration as per procedure

AND

A: paracetamol (PO) 10–15 mg/kg/dose orally every 6 hours as needed;

OR

A: Ibuprofen: 5–10 mg/kg/dose orally every 8 hours as needed.

21.11.7 Paraphimosis

Definition: Entrapment of retracted foreskin behind the glans, causing swelling and pain.

Non-Pharmacologic management

Emergency:

- Manual reduction after lubrication and local anesthesia.
- If manual reduction fails, dorsal slit or circumcision.

Pharmacological Management

Mainly Supportive:

Analgesics and antibiotics if infection is suspected.

B: lidocaine topical 2% gel: apply before procedure; or infiltration as per procedure

AND

A: paracetamol (PO) 10–15 mg/kg/dose orally every 6 hours as needed;

OR

A: ibuprofen: 5–10 mg/kg/dose orally every 8 hours as needed.

AND

B: amoxicillin + clavulanic acid 625 mg (PO) every 8 hours for 5–7 days (adult); adjust for child weight.

21.11.8 Hydrocele

Definition: Accumulation of fluid in the tunica vaginalis of the scrotum.

Non-Pharmacological Management

Observation:

- For small, asymptomatic hydroceles (especially in children).

Surgical:

- Hydrocelectomy is the definitive treatment.

Pharmacological Management

Mainly Supportive:

B: lidocaine topical 2% gel: apply before procedure; or infiltration as per procedure

AND

A: paracetamol (PO) 10–15 mg/kg/dose orally every 6 hours as needed;

OR

A: ibuprofen: 5–10 mg/kg/dose orally every 8 hours as needed.

AND

B: amoxicillin + clavulanic acid 625 mg (PO) every 8 hours for 5–7 days (adult); adjust for child weight.

21.11.9 Testicular Torsion

Definition: Twisting of the spermatic cord, compromising blood supply to the testis.

Non-Pharmacological Management

Surgical emergency.

- Immediate referral to surgical facility for detorsion and orchidopexy.

Pharmacological Management

Mainly Supportive:

B: lidocaine topical 1% infiltration as per procedure

AND

A: paracetamol (PO) 10–15 mg/kg/dose orally every 6 hours as needed;

OR

A: ibuprofen: 5–10 mg/kg/dose orally every 8 hours as needed.

AND

B: ceftriaxone: 1–2 g IV once pre-operatively (adult); 50–80 mg/kg IV for children

21.11.10 Varicocele

Introduction Varicocele is the abnormal dilation of the pampiniform venous plexus within the spermatic cord. It is most common on the left side (90%) due to the anatomical entry of the left renal vein. It is a significant cause of preventable male infertility and testicular atrophy.

Clinical Presentation

Usually asymptomatic but may present as a "bag of worms" sensation or a dull, aching pain in the scrotum that worsens with standing. Physical Examination: Should be performed in both standing and supine positions. Use the Valsalva Maneuver to accentuate dilated veins.

Grading: Grade 1: Palpable only with Valsalva.
Grade 2: Palpable without Valsalva but not visible.
Grade 3: Visible through the scrotal skin.

Differential Diagnosis

- Hydrocele: Transilluminates (Varicocele does not).
- Inguinal Hernia: Reducible mass with a cough impulse.
- Testicular Torsion: Acute, severe pain (Surgical emergency).
- Spermatocele: Cystic mass in the epididymis.

Investigations

- Scrotal Doppler Ultrasound: To confirm venous diameter >2.5mm and retrograde flow.
- Semen Analysis: To assess for oligospermia or decreased motility.

Non-Pharmacological Management

- Scrotal support
- Surgical (Varicocelectomy): Indicated for palpable varicocele with abnormal semen parameters, testicular atrophy, or chronic pain.
  Level B and C (District level): Diagnosis and referral.
  Level D (Regional): Inguinal or sub-inguinal ligation.
  Level S (Zona/ Special /National): Microsurgical varicocelectomy (Preferred).

Pharmacological Management

Analgesics for minor discomfort.

Adults

A: paracetamol 500 mg–1 g (PO) every 6–8 hours as needed

Children:

A: paracetamol 10–15 mg/kg/dose PO every 6 hours as needed

OR

Adults

A: ibuprofen 400 mg PO every 8 hours as needed

Children

A: ibuprofen 5–10 mg/kg/dose PO every 6–8 hours

Follow-up

- Post-operative semen analysis every 3 months for 1 year.
- Monitor for post-surgical hydrocele or recurrence.

21.11.11 Fournier's Gangrene

Definition: Rapidly progressive necrotizing fasciitis of the perineum and genitalia.

Non-Pharmacological Management

- Emergency resuscitation (fluids, oxygen).
- Urgent surgical debridement.
- Wound care.

Pharmacological Management

Broad-spectrum intravenous antibiotics

Adults
B: ceftriaxone 1–2 g IV once daily
Children:
B: ceftriaxone 50–80 mg/kg IV once daily
AND
Adults and children:
A: gentamicin 5–7 mg/kg IV/IM once daily
AND
Adults
A: metronidazole 500 mg IV every 8 hours
Children:
A: metronidazole 7.5 mg/kg IV every 8 hours

Supportive care: Analgesics for pain management

A: paracetamol 10–15 mg/kg/dose orally every 6 hours as needed
OR
A: ibuprofen 5–10 mg/kg/dose orally every 8 hours as needed

Fluid Resuscitation
Administer intravenous fluids according to resuscitation protocols:
A: sodium chloride 0.9% (IV)
OR
A: sodium lactate compound (IV)

Adjust fluid therapy based on haemodynamic status, urine output, and electrolyte balance.

21.11.12 Male Incontinence

Definition: Involuntary leakage of urine in males.

Non-Pharmacological Management

- Bladder training,
- pelvic floor exercises.
- Surgical: Reserved for refractory cases

Pharmacological Management

Adults
S: oxybutynin 5 mg (PO) 2–3 times daily

Children ≥6 years:
S: oxybutynin 5 mg (PO) once daily, increase by 5 mg/week according to response and tolerability
OR
Adults
S: tolterodine 2 mg (PO) twice daily
Adjust dose in renal or hepatic impairment

Pain Management
A: paracetamol 10–15 mg/kg/dose orally every 6 hours as needed
OR
A: ibuprofen 5–10 mg/kg/dose orally every 8 hours as needed

21.11.13 Urolithiasis

Stones formed in the urinary tract are a result of urine, which is supersaturated with respect to a stone-forming salt. Kidney stones have been associated with an increased risk for chronic kidney disease, end-stage kidney failure, and cardiovascular diseases.

Clinical Presentation

- Sudden onset of acute colic, localized to the flank, causing the patient to move constantly.
- Sweating, pallor, nausea and vomiting and blood in urine
- Referred pain to the scrotum or labium (L1) on the same side as the stone moves down the ureter
- Urinalysis with features of infection or microscopic haematuria

Investigations

- Plain abdominal X-ray
- Non-contrast CT-Scan of the Kidney Ureter and Bladder (CTKUB) – Gold Standard
- Ultrasonography – Kidney Ureter and Bladder (KUB)
- Chemical composition of the stone – most valuable test
- Urinalysis – Dipstick biochemistry +Microscopy
- Ultrasound with an acoustic shadow with features of obstructive uropathy e.g. Hydroureter or hydronephrosis
- Plain x-ray can pick up to 90% of calculi as they are radio-opaque
- Conventional intravenous urogram or CT urography confirms upper urinary tract lithiasis.

For First Stone

- Serum Calcium, magnesium, phosphate, uric acid, urea, K, Na, Cl, HCO3

Recurrent Stone

- Parathyroid hormone
- Urine dipstick – biochemistry
- 24-HR Urea, creatinine clearance, sodium, calcium, oxalate and uric acid

Table 21.33: Non-Pharmacological Management

Type of stone	Prevention strategy
All stones	Increase water intake to have at least 2L of urine/day
Hyperoxaluria	Low oxalate diet + increase dietary calcium intake Limit vitamin C supplementation
Calcium stones	Reduce salt intake, Restriction of animal protein (less meat, fish and poultry) Increase intake of fruits and vegetables
Calcium oxalate, cystine and uric acid	Diet high in fruits and vegetables, Prescription citrate,
Uric acid	Control gout
Calcium phosphate and struvite	Acidify urine

- Surgical intervention is indicated (Ureteroscopy, percutaneous nephrolithotomy and extracorporeal shockwave lithotripsy) for
  > Obstructive uropathy
  >Infection,
  >Urgent intervention (surgical or otherwise) if a patient has a solitary kidney emergency decompression is indicated by percutaneous nephrostomy placement or ureteric DJ Stenting
- Stone fragmentation with ureteroscopy stone fragmentation/ ultrasonic disaggregate/extracorporeal shock wave lithotripsy

Pharmacological Management

A: ibuprofen (PO) 400mg 8hourly for 3 days

OR

A: diclofenac (IM) 75mg stat then continue (PO) 50mg 8hourly

OR

B: tramadol (IV) 100mg stat then continue with (PO) 50mg 8hourly

OR

B: pethidine (IM) 100mg stat

Other management e.g. antiemetic for vomiting may be needed or IV fluids.

For distal ureteric calculi less than 7mm

D: tamsulosin (PO) 0.4mg 24hourly for a month may be prescribed for spontaneous stone expulsion.

OR

A: nifedipine (PO)10mg 24hourly for 30days (monitor blood pressure)

For prevention of stone

Thiazide diuretics for calcium stones ANY of the following

A: bendroflumethiazide (PO) 5mg 24hourly

OR

D: hydrochlorothiazide (PO) 12.5-50mg 24hourly

AND

For low uric acid levels

B: allopurinol (PO) 50-100mg 24hourly

21.11.14 Obstructive uropathy

Obstructive uropathy contribute to the burden of CKD, obstruction may occur anywhere along the urinary tract. Causes of obstruction vary based on the location of obstruction

- Obstruction within the kidney causing dilatation of individual calyces
- Obstruction at or distal to the renal pelvis causes diffuse caliectasis of hydronephrosis. Ureteral obstruction may result from stones, tumors, enlarged lymph nodes and retroperitoneal fibrosis
- Bladder tumors can obstruct one or both ureters or ureteric orifices

Clinical Presentation

Generally, patients present one or more of the following symptoms

- Pain
- Change in urine output
- Hypertension
- Hematuria
- Increased serum creatinine

Investigations

- Urinalysis
- Full blood count
- Serum creatinine
- KUB ultrasound
- Intravenous pyelography
- CT IVU
- MRI
- Examination under anaesthesia

Non-Pharmacological Management

Taking adequate fluids 2L/day for patients with renal stones

Pharmacological Management

For Pain Relief

C: diclofenac (PO) 100mg as initial dose followed by 50mg 6-8hourly

OR

C: morphine (IV/SC) 1-4mg 1-4hourly (may increase up to 10mg 4hourly as needed for acute pain

Referral of the patients

- The patient should be referred to the urologist for definitive treatment of the cause of obstruction
- Patient may need long term follow up if there is impaired renal function

21.12 Sexual Dysfunction

21.12.1 Female Sexual Dysfunction

Sexual dysfunction in women refers to sexual problems associated with personal distress and may take different forms including lack of sexual drive, impaired arousal, failure to achieve orgasm or dyspareunia. Diagnostic criteria are reached when a sexual problem is recurrent/ persistent and result in personal distress.

The causes of sexual dysfunction are multifactorial and may include psychological problem (depression or anxiety), relationship conflicts, fatigue, stress, prior physical or sexual abuse, medications or physical problems that make sexual activity uncomfortable (endometriosis, genitourinary symptoms of menopause).

Non-Pharmacological Management

Correction of contributing factor (genital lesion, systemic or hormonal factors and drugs e.g. SSRIs) Psychological therapies Use of antidepressants

21.12.2 Male sexual dysfunction

It is inability to attain and maintain an erect penis with sufficient rigidity for vaginal penetration and ability to ejaculate. Organic causes include neurogenic, vasculogenic, endocrinological as well as many systemic diseases and medications.

Non Pharmacological Management

- Education counselling
- Consider the removal of drugs that may be associated with the problem.
- A change in lifestyle or medications may resolve the problem, e.g. advise cessation of smoking and alcohol abuse.

CHAPTER TWENTY - TWO

MALIGNANT DISEASE CONDITIONS

22.1 Cancer Prevention, Screening, Early Detection and Registration

Cancer represents a unique public health opportunity. Unlike other non-Communicable diseases, it is possible to prevent most cancers that prevail in Sub-Saharan Countries, including Tanzania, by intervening at both Primary and secondary levels of the disease's natural history.

Primary prevention is mainly based on educating the public to modify their lifestyles (not limited to tobacco use, unhealthy diets, physical inactivity, overweight, obesity, harmful alcohol use, etc) to avoid risk factors for cancer, as well as ensuring the availability and affordability of prophylactic vaccines. Secondary prevention focuses on the availability of effective screening programs that reduce the incidence of cancer and downstage it.

Early detection detects (or diagnoses) the disease at an early stage, when it has a high potential for cure (e.g., cervical or breast cancer), reduces morbidity, improves quality of life, and increases survival due to good outcomes following treatment.

Key Interventions in Cancer Prevention

Primary Prevention
This is the most efficient and cost-effective form of cancer control. It involves preventive interventions that prevent a cancerous process from developing. These can be through behavior change through health counseling, education, environmental controls, or a biological mechanism, such as Vaccination.

Among the most important modifiable risk factors for cancer are: tobacco use; overweight and obesity; harmful alcohol use; sexually transmitted human papillomavirus (HPV) infection, HIV/AIDS; air pollution, both outdoor and indoor; and occupational carcinogens.

Public health education and promotion
Raising public awareness of risk factors for cancer and providing education on ways of avoiding and reducing exposure through behavior change is essential. However, this is a long-term intervention and may be difficult to quantify. Community education should also focus on raising awareness and knowledge of the benefits of early diagnosis, ways of detection, and screening. These preventive measures should be highly promoted by also raising awareness of warning symptoms and signs of cancer and taking prompt action, by the general public as well as physicians, nurses, and other health care providers, can have a significant impact on the disease through early diagnosis and hence more effective management.

Tobacco control: Tobacco use causes an estimated 22% of cancer deaths. Age is the single most significant avoidable risk factor for cancer mortality worldwide. Tobacco smoking causes many types of cancer, including cancers of the lung, esophagus, larynx (voice box), mouth, throat, kidney, bladder, pancreas, stomach, and cervix. Over 70% of the lung cancer burden can be attributed to smoking alone. Second-hand smoke (SHS), also known as environmental tobacco smoke, has been proven to cause lung cancer in nonsmoking adults and expose children to cancer. Health workers should inform patients of the dangers of smoking and encourage them to stop.

Healthy diets and physical activity: The incidence of Obesity is at an alarming rate, especially in developing countries like Tanzania, where the adoption of unhealthy lifestyles is especially prevalent among people living in urban settings. There is enough evidence that shows the link between overweight and obesity and many types of cancer, such as the esophagus, colorectal, breast, endometrium, and kidney. Health care professionals should inform clients that regular physical activity, combined with a healthy, balanced diet, prevents obesity and can reduce the risk of developing cancer.

Avoidance of alcohol use: little effort has been put into raising awareness of the effects of alcohol on cancer causation, even though harmful (excessive) use of alcohol is a risk factor for many cancer types, including cancer of the oral cavity, pharynx, larynx, esophagus, liver, colorectal, and breast.

The risk of cancer increases with the amount of alcohol consumed. Therefore, Health personnel should encourage their clients to stop or moderate alcohol consumption. Avoidance of environmental pollution: Many African countries, including Tanzania, are moving toward the Industrial Revolution, which goes hand in hand with increased environmental pollution.

Exposure to carcinogenic chemicals in the environment can occur through contaminated drinking water, pollution of indoor and ambient air, and the contamination of food by chemicals such as aflatoxins or dioxins. Environmental carcinogens (aflatoxins, asbestos, vehicle emissions, lead, ultraviolet (UV) light, and ionizing radiation) are also culprits. Indoor air pollution, such as smoke from using charcoal and firewood in poorly ventilated houses, car fumes, and dust and garbage pollution, increases the risk of lung cancer.

Prevention of Infections: More than 60% of Cancers that occur in Tanzania are Infectious diseases, which contribute a significant proportion of cancer deaths. Viral hepatitis B and C cause cancer of the liver; human papillomavirus infection causes cervical cancer; Helicobacter pylori increases the risk of stomach cancer. HIV/AIDS is associated with cancers, including aggressive lymphoma subtypes, Kaposi’s sarcoma, anorectal cancer, and cervical cancer. In Lake Region, schistosomiasis

increases the risk of bladder cancer, and liver fluke increases the risk of cholangiocarcinoma. Preventive measures include vaccination, prevention, and treatment of infection and infestation.

Vaccination

Approximately 60% of all cancers in Tanzania are attributed to infectious agents, including viruses and bacteria. Human papillomaviruses (HPVs) is among the most important infections associated with cancers, which can cause most cervical and anal cancers as well as a fraction of oral cancers; hepatitis B virus (HBV) and hepatitis C virus (HCV), which can cause liver cancer, and Helicobacter pylori, which is a bacterium that can cause stomach cancer. Highly eff vaccines against HBV have been available for several decades, and most countries include HBV vaccination in their childhood immunization programs; vaccination is also highly effective in preventing infection with the HPV types that cause the majority of cervical cancers.

Hepatitis Vaccination is recommended for the general population and high-risk groups, such as healthcare workers, and can be administered at all levels. The Vaccine is given in three doses over a period of six months. The second dose should be given one month after the first dose, and the third dose should be given six months after the first dose.

HPV vaccination is recommended for girls between the ages of 9 and 14. The vaccine is given in two doses, six months apart.

Secondary Prevention

Early Detection and Cancer Screening

The main aim of cancer screening is to prevent death from cancer. Screening can also make using less severe treatment methods possible if the cancer is detected early enough. Cervical, breast, skin, Prostate, and bowel cancer screening can prevent the cancer from developing. In Tanzania, screening is recommended for Cervical, Breast, Prostate, skin, and bowel cancer. However, only cervical cancer screening is offered as part of an organized program with adequate resources for high-quality care. Efforts must be made to include other screening services for other cancers in organized screening programs.

Breast Cancer: Screening for breast cancer includes breast self-examination (BSE), clinical breast examination (CBE), and breast imaging (mammogram and/or ultrasound scanning). BSE is recommended at day 10 of the menstrual cycle. For postmenopausal women, a monthly breast self-examination (BSE) schedule should be established.

All patients with clinically suspicious lesions should have imaging as part of early detection. Mammogram is recommended for women over 40 years, while ultrasound is the imaging for younger women. MRI may be used where possible for screening and early detection in patients at high risk of breast cancer, such as those with BRCA1 & BRCA2 gene mutations.
For prevention and early detection, all women aged 25 years and above should be taught on breast self–examination and advised to have regular physical checks with a health provider and a regular annual Mammography. They should also be encouraged to exercise physically and properly diet.

Skin Cancer: Prevention or early detection is through frequent self–health check–ups or screening exercises and prompt treatment of early skin lesions. For light-skinned people, avoid UV light, especially people with Albinism.

Colon: Colorectal cancers are usually asymptomatic until an advanced stage; hence, regular screening with an annual digital rectal examination, stool for occult blood, and colonoscopy is recommended starting at 45 years of age.

Prostate: Routine screening is not recommended, but when done, it should begin with a PSA at age 50 if the life expectancy is greater than 10 years. It is recommended that screening of the high-risk group should take place starting at age 45.

Cancer registration and surveillance

As a fundamental element of any cancer prevention strategy, Surveillance provides the foundation for advocacy and policy development. This strategy will ensure national cancer data collection, monitoring, and reporting to facilitate cancer control interventions, including establishing a population-based cancer registry. Currently, the country has established National population-based cancer registries in four zones: the Lake Region (Bugando Medical Centre), the Northern Zone (KCMC), the Southern Highlands (Mbeya Referral Hospital), the Central Zone (Benjamin Mkapa Hospital-Dodoma), and the Eastern Zone (Ocean Road Cancer Institute - Dar es Salaam).

22.2 Gynecological Malignancies

22.2.1 Cancer of the Uterine Cervix

- Cervical cancer is the second most common cancer among women worldwide.
- It is the most common cause of cancer deaths among women in developing countries.
- Ranks as the first most frequent cancer among women in Tanzania.
- Accounted for 24.2% of all new cancer cases and 23.0% cancer case deaths in Tanzania, according to GLOBOCAN 2022
- Screening, early detection, and vaccination have proved successful prevention methods.
- ~64% of invasive tumors are squamous cell, and ~28% are adenocarcinomas.

Risk Factors

- Human papillomavirus (HPV) is the main causative agents for cervical cancer.
- Persistent infection of HPV result in cervical intraepithelial neoplasia (CIN).
- HPV 16 and 18 that are most clearly linked to CIN.
- HPV infection is associated with early first intercourse, multiple partners, history of other STDs, and high parity.
- It is a recognized HIV related malignancy
- Other factors include smoking, immunosuppression, and prenatal diethylstilbestrol (DES) exposure (clear-cell carcinoma).

Clinical Presentation

- Asymptomatic in the early stages of the disease.
- Majority present with abnormal vaginal bleeding (post coital, inter-menstrual or postmenopausal vaginal bleeding).
- Advanced disease: pelvic pain, lower back pain, bowel symptoms, and/or urinary symptoms.
- Foul-smelling discharge, pain, and incontinence (VVF or RVF) are symptoms of late disease
- Physical examination: pelvic examination, which includes a speculum exam, bimanual examination, rectovaginal examination, and groin and supraclavicular node examinations.

Investigations

- FBC, LFT, RFT, and HIV test.
- CXR, CT Chest
- Abdomen and Pelvis USS.
- Pelvic MRI, CT scan of the abdomen and pelvis.
- PET/CT
- Bimanual Examination under Anesthesia (EUA) and Biopsy.
- Cystoscopy, and Sigmoidoscopy for Advanced disease or symptoms.

Staging: FIGO 2018

Table 22.1 Management of Cervical cancer by disease stage.

Stage of Cervical Cancer	Recommended Management
Pre-invasive disease (CIN3/CIS)	• Conization or • Loop electrosurgical excision procedure (LEEP) or • Laser ablation or • Cryotherapy ablation or • Simple hysterectomy
Stage IA1–IA2 (Fertility-sparing)	**No LVSI:** • Cone biopsy • If positive margins → repeat cone biopsy or trachelectomy • Add pelvic lymph node dissection (PLND) for Stage IA2 **LVSI present:** • Cone biopsy or trachelectomy + PLND • If positive margins in Stage IA1 → trachelectomy • Stage IA2 → radical trachelectomy + PLND
Stage IA1 (Non-fertility-sparing)	**No LVSI:** • Cone biopsy • If positive margins → extrafascial hysterectomy or pelvic external beam radiotherapy (EBRT) 50 Gy + brachytherapy (HDR 8 Gy × 3 fractions) **LVSI present:** • Modified radical hysterectomy + PLND or pelvic EBRT (50 Gy) + concurrent platinum-based chemotherapy (C: Cisplatin 40 mg/m² weekly) + brachytherapy (HDR 8 Gy × 3 fractions)
Stage IA2 (Non-fertility-sparing)	• Modified radical hysterectomy + PLND (regardless of LVSI status)

Stage of Cervical Cancer	Recommended Management
Stage IB1 (Fertility-sparing)	• Radical trachelectomy + PLND ± para-aortic lymph node assessment if: - No LVSI - Tumor size ≤2 cm - Depth of invasion ≤10 mm - Negative imaging for metastatic disease
Stage IB1 (Non-fertility-sparing)	• Radical hysterectomy + PLND ± para-aortic lymph node assessment **OR** • Pelvic EBRT (50 Gy) + concurrent platinum-based chemotherapy (C: Cisplatin 40 mg/m² weekly) + brachytherapy (HDR 8 Gy × 3 fractions)
Stages IB2 and IIA1	• Radical hysterectomy + PLND ± para-aortic lymph node assessment **OR** • Pelvic EBRT (50 Gy) + concurrent platinum-based chemotherapy (**C:** Cisplatin 40 mg/m² weekly) + brachytherapy (HDR 8 Gy × 3 fractions)
Stages IB3, IIA2, III, and IVA (Good performance status; no VVF/RVF)	• Pelvic or extended-field radiotherapy (50 Gy) + concurrent platinum-based chemotherapy (**C:** Cisplatin 40 mg/m² weekly) + brachytherapy (HDR 8 Gy × 3 fractions)
Stages IIIB and IVA (Poor performance status with VVF/RVF)	• Palliative radiotherapy: 20 Gy/5 fractions or 30 Gy/10 fractions or 10 Gy single fraction monthly × 2 fractions
Stage IVB	• Systemic therapy ± Bevacizumab and/or best supportive care, including palliative radiotherapy

Pharmacological Management
Chemotherapy is given as a radiotherapy sensitizer or on palliative intent.

S: cisplatin (IV) 40 mg/m2 to max of 70 mg is given weekly during radiation therapy.

If patient is HIV positive or has mild renal impairment, consider 30 mg/m2 to max of 60 mg weekly.

Available preferred palliative chemotherapy drugs for metastatic, recurrent or persistent cancer after RT, given in single or combination regimen include: cisplatin, paclitaxel, bevacizumab, carboplatin, docetaxel and gemcitabine.

S: carboplatin (IV) AUC 5–6 1-hour infusion day 1
AND
paclitaxel (IV) 175 mg/m2 over 3hours on day 1
AND
S: bevacizumab 15mg/kg repeat every 21 days for 4-6 cycles.

Alternatively
S: cisplatin 25mg/m2 (IV) infusion day 1over 2 hours
AND
S: 5-Fluoruracil 1000mg/m2 over 22 hours every 21 days for 4-6 cycle.

Do FBC, urea and creatinine before each cycle of chemotherapy.

Follow up:
First visit at 4–6 weeks post treatment then 3–6 months in the first 2 years, there after yearly. *This follow-up schedule applies to all malignancies with few exceptions*

Note
- All patients suspected or confirmed to have cervical cancer should be referred to cancer-specialized centers for definitive management.
- All women aged 25 and above are advised to have regular cervical screening with VIA and VILI or a Pap smear annually for 3 years and then every 3 years.

22.2.2 Endometrial Cancer

This is predominantly a disease of old women. Traditionally, EC is classified into Type I (estrogen-related, precursor: atypical endometrial hyperplasia) and Type II (de novo, i.e., due to mutations, no precursor). Type I includes endometrioid (most common), while other histologies are classified as type II (serous, clear cell carcinoma, and mucinous adenocarcinoma).

Risk factors

Risk factors for endometrial carcinoma include high BMI, hyperinsulinemia (diabetes), prolonged exposure to unopposed estrogen (often related to nulliparity and infertility associated with PCOS or tamoxifen use, early age at menarche, and late age at menopause), and hypertension.

Clinical Presentation

- Abnormal uterine bleeding, especially in postmenopausal women. The bleeding can be persistent intermenstrual bleeding or irregular or infrequent heavy bleeding in women who are obese/PCOS or those using tamoxifen
- Vaginal discharge
- Thickened endometrium incidentally noted on USS for other condition
- Symptoms of intraperitoneal disease (abdominal distension, pelvic pressure, and pain) are similar to ovarian cancer
- Pap smear: not designated to identify EC but may occasionally show abnormal cervical pathology, i.e., atypical glandular cells of undetermined significance (AGUS) or adenocarcinoma in situ.

Investigations

- FBC, LFT, Urea, Creatinine
- Cancer Antigen 125 (CA 125)
- CXR
- Abdomen and Pelvis USS or transvaginal
- Abdomen and Pelvic CT scan
- Pelvic MRI
- Endometrial biopsy to confirm the diagnosis: Histological diagnosis should be made by sampling the endometrium: (office endometrial biopsy by pipelle, hysteroscopy-directed biopsy, or endometrial curettage)
- Cystoscopy, and /or sigmoidoscopy as clinically indicated
- PET/CT scan

Staging: FIGO Endometrial cancer staging 2023

Table 22.2 Management of Endometrial Cancer by disease stage

Stage	Recommended Management
All medically operable patients	• Surgery is the primary treatment. • Perform total abdominal hysterectomy (TAH) + bilateral salpingo-oophorectomy (BSO). • Perform radical hysterectomy if there is cervical stromal involvement. • Obtain peritoneal cytology. • Consider selective pelvic and para-aortic lymph node dissection if: - Myometrial invasion present - Grade 2–3 disease • Lymph node dissection may include: para-aortic, common iliac, external iliac, internal iliac, and obturator nodes.
Stage IA/IB – Grade 1	• Observation after surgery
Stage IA/IB – Grade 2–3 or other adverse features	• Vaginal brachytherapy (VBT): 7 Gy × 3 fractions
Stage IA/IB with adverse features (high-risk histology)	• Adjuvant chemotherapy + vaginal brachytherapy (7 Gy × 3 fractions) **OR** • Pelvic external beam radiotherapy (EBRT): 46 Gy
Stage II (clear cell/serous carcinoma) or Stage IB high-grade disease	• Adjuvant chemotherapy + radiotherapy • High-risk disease: EBRT (46 Gy) + VBT (7 Gy × 3 fractions)
Stage III	• Adjuvant chemotherapy + radiotherapy • EBRT (46 Gy) + VBT (7 Gy × 3 fractions)
Stage IV	• Chemotherapy
Medically inoperable – Stage I (deep myometrial invasion on MRI)	• EBRT to uterus, cervix, upper vagina, pelvic lymph nodes, and other involved areas (45–50.4 Gy) • Followed by intracavitary brachytherapy boost (7 Gy × 3 fractions)
Medically inoperable – Stage II–III	• EBRT (45–50 Gy) + brachytherapy boost (7 Gy × 3 fractions) to uterus and cervix
Recurrent disease	• If no prior radiotherapy: EBRT + intracavitary (IC) or interstitial (IS) brachytherapy boost to total dose of 60–70 Gy

Note: For inoperable disease stage IIb – IVA, radiotherapy and or chemotherapy can be offered as neo-adjuvant prior to surgery

Pharmacological Management

Cytotoxic therapy for inoperable, metastatic or recurrent disease is given with palliative intent. Recommended regimens are;

S: doxorubicin (IV) 60 mg/m2 over 30 minutes

AND

S: cisplatin (IV) 50 mg/m2 1 hour (IV) infusion on day 1; repeat every 21days for 4 – 6 cycles

OR

S: cisplatin (IV) 50 mg/m21-hour infusion on day 1

AND

S: doxorubicin (IV) 45 mg/m2 over 20 minutes on day 2

AND

S: paclitaxel (IV) 160 mg/m2 over 3hours on day 2

AND

S: filgrastim (SC) 5 µg/kg on days 3–12; repeat every 21days for 4-6 cycles

OR

S: carboplatin (IV) AUC 5–6 1-hour infusion day 1

AND

S: paclitaxel (IV) 175 mg/m2 over 3hours on day 1 repeat every 21 days for 4-6 cycles

Note

- All patients should be referred to a gynecologist for evaluation and surgical management.
- All surgical specimens should be sent for histopathology diagnosis and staging.
- After surgery and histopathology report, all patients should be referred to a cancer-specialized center for management and follow-up.

22.2.3 Cancer of the Vulva

Vulva cancer is predominantly a disease of older women. Squamous cell carcinoma is the most common histological type, usually arising from premalignant lesions, such as vulva intraepithelial neoplasia (VIN). Risk factors contributing to the development of VIN and later vulva cancer include HPV infection, immunosuppression, including infection with HIV, history of genital warts, multiple sexual partners, and cigarette smoking.

Clinical Presentation

- Persistent itching in the vulva is often the earliest and most common symptom.
- Vulvar mass or lesion—a lump, wart, or ulcerated or raised area.
- Skin changes—thickening or discoloration (red, white, or dark spots)
- Abnormal vulvar/vaginal bleeding—bleeding is due to ulceration or tumor involvement.
- Abnormal vulvar/vaginal discharge and may be foul-smelling.
- Groin swelling—enlarged inguinal femoral nodes indicate possible spread of advanced disease.

Investigations

- FBC, LFT, Urea, Creatinine, HIV test
- Pap smear of cervix and vagina
- CXR
- CT scan / MRI of the Abdomen and Pelvis
- Colposcopy to determine presence of other lesions in the vagina and cervix
- Cystoscopy and urethroscopy may be indicated for advanced stages
- Biopsy—excisional if tumor ≤2 cm, incisional wedge/punch biopsy.
- PET/CT scan

Table 22.3 Management of vulva cancer by disease stage.

Stage	Recommended Management
Carcinoma in situ (CIS)	• Local excision
Stage IA	• Wide local excision (WLE) • Sample lymph nodes if depth of invasion >1 mm • Post-operative EBRT to vulva (50 Gy) if: - Positive surgical margins - Margin <8 mm - Lymphovascular space invasion (LVSI) - Depth of invasion >5 mm
Stage IB / II	• WLE + ipsilateral superficial inguinal lymph node dissection or sentinel lymph node biopsy for lateralized lesions • Bilateral superficial inguinal lymph node dissection for central lesions, lesions >5 mm deep, LVSI, or poorly differentiated tumors • If lymph nodes positive → add deep inguinal lymph node dissection • Post-operative EBRT to vulva for: positive margins, margin <8 mm, LVSI, or lesions >5 mm deep • Post-operative radiotherapy to inguinal and pelvic nodes for >1 positive lymph node or extranodal extension (ECE)

Stage	Recommended Management
Stage IB / II (when surgery may compromise function)	• Consider pre-operative chemoradiotherapy: - 50 Gy for cN0 disease - 54 Gy for cN+ disease • Recommended for lesions close to urethra, clitoris, or rectum where adequate margins may be difficult • If complete response (CR) → biopsy; if negative → observation • If persistent disease → resection with functional preservation if feasible or boost primary lesion to 65–70 Gy or radical vulvectomy
Stage III / IVA (cN0)	• Bilateral inguinal lymph node dissection followed by chemoradiotherapy to vulva • Include inguinal/pelvic nodes if extranodal extension (ECE) or >1 positive lymph node
Stage III / IVA (cN+ fixed/ulcerated nodes)	• Pre-operative chemoradiotherapy (45–50 Gy) with Cisplatin + Fluorouracil (5-FU) • Followed by bilateral lymph node dissection • Surgical salvage for persistent/recurrent disease • If nodal ECE → boost EBRT to 60 Gy • If gross residual disease → boost to 65–70 Gy
Stage IVB	• Platinum-based chemotherapy: Cisplatin 50 mg/m² IV + Paclitaxel 175 mg/m² IV for 6 cycles • Immunotherapy for PD-L1 positive disease: Pembrolizumab 200 mg IV • Palliative resection/debulking for symptom control (e.g., bleeding, obstruction) • Limited role for metastasectomy • Inguinofemoral lymph node dissection (IFLND) only for symptomatic nodal disease

Pharmacological Management

Chemotherapy is given as a radiotherapy sensitizer or on palliative intent.

S: cisplatin (IV) 40 mg/m2 to a max of 70 mg is given weekly during radiation therapy.

If the patient is HIV positive or has mild renal impairment, consider 30 mg/m2 to a max of 60 mg weekly.

S: cisplatin (IV) 50 mg/m21-hour infusion on day 1

AND

S: 5-FU (IV) 500 mg/m2 over 120 minutes on day 1

AND

S: filgrastim (SC) 5 µg/kg on days 3–12; repeat every 21days for 4-6 cycles

Alternatively

S: carboplatin (IV) AUC 5–6 1-hour infusion day 1

AND

S: paclitaxel (IV) 175 mg/m2 over 3hours

On day 1, repeat every 21 days for 4-6 cycles

22.2.4 Vaginal Cancer

Majority are Squamous Cell Carcinoma, and are located in the upper posterior 1/3 of the vagina.

Risk factors: carcinoma in situ, HPV, chronic vaginal irritation, previous abnormal Pap smears, early hysterectomy, multiple lifetime sex partners, early age at first intercourse, current smoker, in utero exposure to DES, partner with penile cancer.

Clinical Presentation

- Irregular vaginal bleeding or discharge (Often postcoital)
- Dysuria
- A lump or mass on the vaginal wall

Investigations

- FBC, LFT, Urea, Creatinine, HIV test
- Pap smear of the cervix
- CXR
- CT scan / MRI of the Abdomen and Pelvis
- Colposcopy to determine the presence of other lesions
- Cystoscopy and urethroscopy may be indicated for advanced stages
- Biopsy of the vaginal lesion to confirm the diagnosis
- PET/CT

Table 22.4: Management of Vaginal Cancer by disease stage

Stage	Recommended Management
Carcinoma in situ (CIS)	• Wide local excision • For recurrent disease: intracavitary (IC) brachytherapy to entire vaginal mucosa (60–70 Gy)
Stage I	• Wide local excision **OR** • Total vaginectomy with vaginal reconstruction **OR** • Radical vaginectomy with lymphadenectomy: - Pelvic lymphadenectomy if upper 2/3 vaginal involvement - Inguinal lymphadenectomy if lower 1/3 involvement • Post-operative radiotherapy for close or positive margins
Stage I – Radiation-based options (alternative definitive treatment)	• Intracavitary brachytherapy: treat entire vagina (65 Gy, 60–70 Gy range) • Boost to 75–80 Gy with 2 cm radial margin **OR** • EBRT to pelvis ± inguinal nodes (45 Gy) • Boost to 75–80 Gy with intracavitary brachytherapy
Stage II	• External beam radiotherapy (EBRT) to whole pelvis ± inguinal lymph nodes (45 Gy) • Midline block after 20 Gy (non-IMRT techniques)
Stage III	• EBRT to pelvis (45–50 Gy) • Midline block after 40 Gy (non-IMRT plans) • If lower 1/3 involvement: include inguinal nodes (45–50 Gy) • Boost disease to 75–80 Gy with intracavitary brachytherapy (2 cm margin) • Parametrial/paravaginal extension: EBRT or interstitial boost to 65–70 Gy • If fistula or high risk of fistula: consider total vaginectomy, pelvic exenteration, or fistula repair; avoid primary radiotherapy especially brachytherapy
Metastatic disease	• Palliative radiotherapy ± chemotherapy
Recurrent disease	• Pelvic exenteration if no pelvic sidewall invasion • Intracavitary brachytherapy ± EBRT for vaginal recurrence salvage

Pharmacological Management

Chemotherapy is given as a radiotherapy sensitizer or for a palliative intent.

S: cisplatin (IV) 40 mg/m2 to a max of 70 mg is given weekly during radiation therapy.

If the patient is HIV positive or has mild renal impairment, consider 30 mg/m2 to a max of 60 mg weekly.

S: cisplatin (IV) 50 mg/m21-hour infusion on day 1

AND

S: 5-FU (IV) 500 mg/m2 over 120 minutes on day 1

AND

S: filgrastim (SC) 5 µg/kg on days 3–12; repeat every 21days for 4-6 cycles

22.2.5 Gestational Trophoblastic Disease

Gestational trophoblastic diseases (GTDs) are a group of rare premalignant and malignant diseases characterized by their origin in trophoblastic cells.

i. Premalignant forms are complete hydatidiform mole (CHM), partial hydatidiform moles (PHM), and atypical placental site nodules (APSNs).

ii. Malignant forms are called gestational trophoblastic neoplasia (GTN) and include invasive mole, choriocarcinoma, placental site trophoblastic tumor (PSTT), and epithelioid trophoblastic tumor (ETT).

22.2.5.1 Premalignant gestational trophoblastic disease

Diagnostic criteria

abnormal vaginal bleeding or being asymptomatic and undergoing first trimester ultrasound (US), uterine enlargement disproportionate to gestational age.

Investigations

- Serum B-hCG, FBP, blood grouping and crossmatching
- RFT, LFT
- Thyroid function tests if suspicious of hyperthyroidism TSH, T3, T4
- Pelvic and/or abdominal Ultrasound
- CXR
- PET CT scan
- MRI Brain

Table 22.5: Management of Premalignant gestational trophoblastic disease

Category	Management
Non-Pharmacological Management	• Suction curettage under anesthesia • Ultrasound guidance may be used to ensure complete evacuation • Prepare and cross-match blood; transfusion may be required if indicated • Send evacuated tissue for histological examination • Hysterectomy may be considered in women with no desire for future fertility or when evacuation is unsafe/failed
Pharmacological Management	**A:** oxytocin infusion: 10–40 IU in 1 L normal saline, titrated IV infusion during and after procedure once cervical dilatation is achieved to promote uterine contraction and reduce bleeding **B:** Recombinant Monoclonal anti-D Immunoglobulin (for Rh-negative women): 250 IU (50 µg) IM within 72 hours of procedure (dose may vary by gestational age per protocol)

Follow-up: After suction curettage or hysterectomy, the patient should be followed up by measurement of B-hCG level at least once every 2 weeks until normalized in 3 readings (defined as 3 consecutive normal assays), then monthly B-hCG levels until levels are normal for 6 months. Provide a contraceptive method, preferably combined oral contraceptives.

22.2.5.2 Malignant type (Gestational Trophoblastic neoplasia—GTN)

GTNs are highly sensitive to chemotherapy, with cure rates approaching 95%. Cure is possible even in metastatic disease. All patients with GTN should be referred to a gynecologic oncologist for a careful pre-treatment evaluation (proper staging and risk stratification) as well as for definitive management.

Clinical Presentation

- Abnormal vaginal bleeding
- Uterine enlargement disproportionate to gestational age
- Pelvic pain or pressure
- Metastatic symptoms, e.g., chest pain, hemoptysis, jaundice, and seizures.
- Persistently raising or plateauing β-hCG post molar pregnancy

Investigations

- Serum β-hCG level, LFT, RFT, Thyroid function tests if suspicious of hyperthyroidism
- Abdomen and Pelvis USS, CXR, and/or CT Scan
- PET/CT scan
- Brain MRI/CT
- Biopsy is avoided due to risk of significant hemorrhage. Histologic confirmation is not required for treatment of GTN. Review a uterine curettage or other biopsy specimen if available prior to treatment.
- PDL-1 Receptor status

Diagnostic Criteria

The criteria for diagnosis of post-molar GTN are based on the following FIGO guidelines as shown below:

i. When the plateau of hCG lasts for four measurements over a period of 3 weeks or longer; that is, days 1, 7, 14, and 21,
ii. When there is a rise in hCG for three consecutive weekly measurements over at least a period of 2 weeks or more (days 1, 7, and 14)
iii. If there is a histologic diagnosis of choriocarcinoma

Staging and WHO risk assessment

Stage I—tumor confined to the uterine corpus
Stage II—Tumors extending to the adnexa or to the vagina, but limited to the genital structures
Stage III—Pulmonary metastases on chest radiograph, with or without uterine, pelvic, or vaginal involvement
Stage IV—Metastatic disease outside of the lungs and pelvis and/or vagina

Table 22.6 WHO Prognostic Scoring System for Gestational Trophoblastic Neoplasia (GTN)

Prognostic Factor	Score 0	Score 1	Score 2	Score 4
Age (years)	< 40	≥ 40	—	—
Antecedent pregnancy	Hydatidiform mole	Abortion	Term pregnancy	—
Interval from index pregnancy (months)	< 4	4–6	7–12	> 12
Pretreatment hCG (IU/mL)	$<10^3$	10^3 to $<10^4$	10^4 to 10^5	$>10^5$
Largest tumor size (including uterus) (cm)	<3	3–5	>5	—
Site of metastasis	Lung	Spleen, kidney	Gastrointestinal tract	Brain, liver
Number of metastases identified	0	1–4	5–8	>8
Previous failed chemotherapy	None	—	Single-drug chemotherapy	Two or more drugs

Total Risk Score Interpretation	Risk Category
≤ 6	Low-risk GTN
≥ 7	High-risk GTN

Table 22.7 Risk Stratification (FIGO) and Treatment Recommendation

Stage	Recommended Management
Low-risk GTN(Stage I–III with WHO risk score ≤6)	Single-agent chemotherapy: **S:** methotrexate 50 mg IM on days 1, 3, 5, and 7 **AND** **S:** folinic acid 15 mg PO/IM on days 2, 4, 6, and 8 **OR** **S:** dactinomycin 1.25 mg/m² IV every 14 days (or 0.5 mg IV daily for 5 days)
High-risk GTN(Stage IV or Stage II–III with WHO risk score ≥7)	Combination chemotherapy: EMA-CO regimen: **S:** etoposide 100 mg/m² IV days 1–2 **AND** **S:** methotrexate 100 mg/m² IV bolus **THEN** **S:** methotrexate 200 mg/m² IV infusion over 12 hours' day 1 **AND** **S:** dactinomycin 0.5 mg IV days 1–2 **AND** **S:** folinic acid 15 mg PO/IM every 12 hours for 4 doses starting 24 hours after methotrexate **AND** **S:** cyclophosphamide 600 mg/m² IV day 8 **AND** **S:** vincristine 1 mg/m² IV (max 2 mg) day 8
	EMA-EP regimen: **S:** etoposide 100 mg/m² IV days 1–2 **AND** **S:** methotrexate 300 mg/m² IV infusion day 1 **AND** **S:** dactinomycin 0.5 mg IV days 1–2 **AND** **S:** cisplatin 75 mg/m² IV day 8 **AND** **S:** folinic acid 15 mg every 12 hours × 4 doses
Ultra-high-risk GTN (WHO score ≥12)	**S:** etoposide 100 mg/m² IV days 1–2 **AND** **S:** cisplatin 20 mg/m² IV days 1–2 weekly for 1–3 cycles, followed by EMA-CO/EMA-EP
Brain metastasis	• EMA-CO/EMA-EP with high-dose **S:** methotrexate 1000 mg/m² IV infusion over 24 hours **AND** **S:** folinic acid 15 mg PO every 6 hours × 12 doses, starting 32 hours after methotrexate **AND** **S:** filgrastim 5 mcg/kg SC 3–4 days/week each cycle • Whole brain radiotherapy: 20–30 Gy in 2 Gy daily fractions
Methotrexate-resistant / Relapsed GTN	TP/TE regimen (every 2 weeks): **S:** paclitaxel 135 mg/m² IV day 1 **AND** **S:** cisplatin 60–75 mg/m² IV day 1 Alternating with: **AND** **S:** paclitaxel 135 mg/m² IV day 15 **AND** **S:** etoposide 150 mg/m² IV day 15 **AND** **S:** filgrastim 5 mcg/kg SC for 6 doses/cycle
	BEP regimen (every 3 weeks): **S:** bleomycin 30 IU IV days 1, 8, and 15 **AND** **S:** etoposide 100 mg/m² IV days 1–5 **AND** **S:** cisplatin 20 mg/m² IV days 1–5
	ICE regimen (every 3 weeks): **S:** Ifosfamide 1.2 g/m²/day IV days 1–3 **AND** **S:** mesna 120 mg/m² IV bolus before ifosfamide, **THEN** **S:** mesna 1200 mg/m² over 12 hours **AND**

	S: carboplatin AUC 4 IV day 1 **AND** **S:** etoposide 75 mg/m²/day IV days 1–3 **AND** **S:** pegfilgrastim 6 mg SC day 4 **OR** **S:** filgrastim 5 mcg/kg SC days 4–14
	TIP regimen (every 3 weeks): **S:** paclitaxel 135–175 mg/m² IV day 1 **AND** **S:** ifosfamide 1500 mg/m²/day IV days 2–5 **AND** **S:** mesna uroprotection **AND** **S:** cisplatin 25 mg/m²/day IV days 2–5
Multi-agent chemotherapy-resistant GTN	**S:** pembrolizumab 200 mg IV every 3 weeks **AND** **S:** nivolumab 240 mg IV every 2 weeks or 480 mg IV every 4 weeks **AND** **S:** capecitabine 1250 mg/m² PO twice daily for 14 days, then 7 days **AND** **S:** gemcitabine 600–800 mg/m² IV days 1, 8, and 15 **AND** ± **S:** cisplatin 25–30 mg/m² IV days 1, 8, and 15 every 4 weeks

Note: Perform serial measurements of β-hCG at the start of treatment and weekly during therapy.

Table 22.7 Recommended Chemotherapy regimens for Single agent

Single Agent	
1	**S:** dactinomycin (IV) 12µg/Kg daily for 5 days with response: Repeat same dose Without response: add 2µg/Kg to the initial dose or switch to methotrexate protocol
2	**S**: methotrexate (IV) or (IM) 0.4mg/Kg daily for 5 days with response: Repeat same dose Without response: add 0.6mg/Kg to the initial dose or switch to actinomycin D protocol

Note:
- Do serial measurement of BhCG at start of treatment and weekly during therapy.
- Do FBC, Platelet count, LFT daily.
- If no response to single agent, give combination drugs.

Table 22.8 Recommended Chemotherapy regimens for Combination therapy

Combination Therapy (EMACO – Regimen)		
Course 1 (EMA)	Day 1	**S:** VP – 16 (etoposide) (IV) 100mg/m2 infusion over 30 minutes AND actinomycin D (IV) 0.5mg bolus AND methotrexate (IV) 100mg/m2 bolus, followed by a 200mg/m2 IV infusion over 12 hours
	Day 2	**S**: VP – 16 (etoposide) (IV) 100mg/m2 infusion in 200ml of saline over 30 minutes **AND** **S:** dactinomycin (IV) 0.5mg bolus **S:** folinic acid (IM) 15mg OR orally every 12 hours for 4 doses beginning 24 hours after start of methotrexate (IV)
Course 2 (CO)	Day 8	**S:** vincristine (IV) 1mg/m2 (IV) bolus AND cyclophosphamide 600mg/m2 1 hour (IV) infusion.

Note: Cycles are repeated after every 14 days until β–hCG is normal

Follow-up
- Weekly measurement of hCG level until they are normal for three consecutive weeks
- Monthly hCG levels until levels are normal for 12 consecutive months
- Effective contraception during the entire period of hormonal follow–up

22.2.6 Cancer of the Ovary

There are three (3) types of ovarian cancer. These are epithelial ovarian cancers, which develop from the ovarian epithelial layer; germ cell tumors, which arise from the ovarian cortex; and sex cord stromal tumors, which arise from stromal cells within the cortex. Management of the three histological types of ovarian cancer differs. Epithelial tumors comprise 90% of all ovarian malignancies. Due to anatomical location, most patients present with advanced disease.

Risk factors

- The majority of ovarian cancers are sporadic, with about 10% being hereditary.
- Incessant ovulation
- Excess gonadotropin secretion, promoting high estrogen concentrations, which lead to epithelial proliferation, and, possibly, malignant transformation.
- Advanced age
- Nulliparity
- Infertility
- Diet –saturated fats
- Obesity
- Exposure to talc powder
- Genetics account 10-12 %. A link with the breast cancer-associated genes BRCA1 and BRCA2, as well as with HNPCC, is recognized.

Clinical Presentation

- Minimal or no symptoms in early stage
- Abdominal distension with palpable mass, pain and ascites are all late signs

Investigations

- Inspection and bimanual examination under anesthesia (EUA) recto–vagina are mandatory to exclude primary disease or extension from other sites such as cancer of the cervix
- FBC, RFT, LFT, CA 125 & CEA
- CXR
- Abdomen and Pelvis CT scan / MRI
- Histology of the Oophorectomy specimen or biopsy obtained at laparotomy
- Ascitic fluid/peritoneal and pelvic washing cytology

Table 22.9: Surgical Management of ovarian cancer

Stage	Recommended Management
Stage I–II	• Perform total abdominal hysterectomy with bilateral salpingo-oophorectomy (TAH + BSO) AND omentectomy for resectable tumors • If complete tumor removal is not feasible → perform maximum debulking (cytoreductive) surgery, followed by adjuvant chemotherapy • Unilateral salpingo-oophorectomy may be considered only for Stage IA tumors with favorable histology (fertility preservation option)
Stage III	• Neoadjuvant chemotherapy followed by surgery AND then adjuvant chemotherapy
Stage IV	• Manage as Stage III (neoadjuvant chemotherapy → surgery → adjuvant chemotherapy) ± palliative care

Pharmacological Management
Adjuvant chemotherapy

Indicated in all patients at high risk, i.e., stage IC or II, high grade or clear cell cancers of any stage. Recommended regimens are;
S: carboplatin (IV) AUC 6 1-hour infusion Day 1
AND
S: paclitaxel (IV) 175 mg/m2 over 3 hours day1; repeat every 21days for 6 cycles.

For recurrent disease: give the same regimen if tumor is platinum sensitive (recurrence after 6 months since the last chemotherapy cycle)

For platinum-resistant disease, give gemcitabine or bevacizumab as a single agent or in combination with taxanes. When available, liposomal doxorubicin is active and indicated in recurrent disease.

Regimen	Recommended Management
Chemotherapy ± Anti-angiogenic therapy (preferred regimen)	**S:** gemcitabine 1000 mg/m² IV infusion over 30 minutes on Days 1, 8, and 15 **AND** **S:** bevacizumab 15 mg/kg IV over 1 hour on Day 1 every 3 weeks until disease progression
Alternative regimen (non-platinum option)	**S:** liposomal doxorubicin 40 mg/m² IV over 60 minutes on Day 1 every 3 weeks for 6 cycles
Endocrine therapy (selected recurrent cases e.g. hormone-sensitive disease)	**S:** tamoxifen 20 mg PO once daily **AND** **S:** goserelin 3.6 mg SC every 4 weeks OR 10.8 mg SC every 12 weeks

Note: All patients must be referred to a gynecologist and cancer specialized center for evaluation and proper management

22.3 Breast Cancer

Breast cancer is the second most common malignancy among women in Tanzania, with an incidence of 15%. It is the second most common cause of death in women aged 45-55 years after cervical cancer. The incidence is expected to rise in recent years due to screening programs around the country and increased awareness among the general population.

Screening and Early Detection

- Screening for early detection is recommended as lesions treated in the early stages have a high cure rate. Screening for breast cancer includes breast self-examination (BSE), clinical breast examination (CBE), and breast imaging (mammogram and/or ultrasound scanning).
- BSE is recommended at day 10 of the menstrual cycle. For post-menopausal women, a monthly
- BSE schedule should be established.
- All patients with clinically suspicious lesions should have imaging as part of early detection.
- Mammogram is recommended for women over 40 years, while ultrasound is the imaging of choice for younger women.
- MRI may be used where possible for screening and early detection in patients at high risk of breast cancer, such as those with BRCA1 & BRCA2 gene mutations

Risk factors

- Age at menarche
- Nulliparity
- Not breastfeeding
- First pregnancy above of 35 years
- Obesity
- Previous radiation exposure
- Family history of breast cancer
- Smoking and alcohol consumption
- Use of exogenous estrogen
- Approximately 10% of breast cancer cases are associated with germline mutations, including p53 (Li-Fraumeni), Cowden syndrome, BRCA1, BRCA2, and PALB2

Diagnostic criteria

Table22.10: Standard Clinical Diagnostic Criteria for Suspected Breast Cancer

S/N	Category	Clinical Features / Findings Suggestive of Breast Cancer
1	Symptoms (Patient-reported changes)	• Change in breast size or shape • Nipple discharge (especially blood-stained) • Recent nipple inversion or other nipple abnormalities (ulceration, retraction, spontaneous discharge) • Axillary lump
2	Skin and breast contour changes (seen on inspection, including upright exam with arms raised)	• Breast lump or contour change • Skin dimpling or tethering • Skin thickening, swelling, or redness • Nipple inversion • Dilated superficial veins • Ulceration • Eczematous nipple/areolar changes (suggestive of mammary Paget disease) • Edema or peau d'orange
3	Suspicious features of palpable breast lump (on examination)	• Hard consistency • Irregular borders • Focal nodularity • Asymmetry compared with contralateral breast • Fixation to skin or underlying muscle (assess by moving lump along pectoral muscle fibers with patient bracing arms against hips)
4	Features suggestive of metastatic disease	• Bone pain • Respiratory symptoms (breathing difficulty, cough) • Abdominal distention • Jaundice • Neurological deficits (localizing signs) • Altered cognitive function • Headache

Investigations

- Complete blood count (CBC) with differential
- Comprehensive metabolic panel, with liver function tests (LFTs) and alkaline phosphatase
- Diagnostic bilateral mammogram
- Breast Ultrasound as necessary
- Abdominal and Pelvic USS
- Open biopsy for histopathology
- A core needle biopsy done manually, or preferably by ultrasound or stereotactic guidance is recommended.
- Immunohistochemistry Determination of tumor estrogen/ progesterone receptor (ER/PR) status and HER2 status – (biopsy determined)
- PDL-1 Receptor status
- Axillary assessment with exam

- Consider ultrasound
- Percutaneous biopsy* of suspicious nodes
- Additional tests to consider as clinically indicated
- Chest x-ray and abdominal ultrasound
- Chest diagnostic CT ± contrast
- Abdomen ± pelvis diagnostic CT with contrast or MRI with contrast
- Bone scan or sodium fluoride PET/CT (category 2B) •
- FDG-PET/CT Useful in certain circumstances (consider FES-PET/CT for ER-positive disease)
- Breast MRIb (optional), with special consideration for mammographically occult tumors, if not previously done and may be of value in select group of women who have had equivocal mammogram/ ultrasound
- Brain MRI / CT with contrast if suspicious CNS symptoms
- Spine MRI with contrast if back pain or symptoms of cord compression
- Breast MRI.
- Pregnancy test in all patients of childbearing potential
- Genetic counseling and testing if patient is at risk for hereditary breast cancer, ** has triple negative breast cancer (TNBC) (at any age) also for considering Risk reduction strategies including prophylactic mastectomies
- Echocardiography (Baseline Ejection Fraction and follow up)

Table 22.11: Management by Multidisciplinary care and various modalities

Domain	Recommendations
Multidisciplinary care	• Management should be planned by a multidisciplinary team (MDT) including: breast surgeon, radiologist, pathologist, clinical oncologist, and radiation oncologist • Integrate local and systemic therapies with optimal sequencing
Overall treatment modalities	• Surgery • Chemotherapy • Radiotherapy • Hormonal (endocrine) therapy • Targeted therapy
Goals of surgery	• Complete excision of primary tumor with negative margins • Accurate staging of tumor and axillary lymph nodes for prognosis
Surgical options	• Modified radical mastectomy (total mastectomy + axillary lymph node dissection) • Breast-conserving surgery (lumpectomy/quadrantectomy) • Radical mastectomy (total mastectomy + pectoralis major resection + ALND) • Extended radical mastectomy (radical mastectomy + internal mammary node dissection) • Skin-sparing mastectomy (SSM) • Nipple-sparing mastectomy (NSM) • Toilet mastectomy (palliative)
Axillary management	• Axillary lymph node dissection (levels I–II) with >10 lymph nodes sampled
Reconstruction after mastectomy	• Immediate or delayed reconstruction • Implant-based methods: expanders, saline or silicone implants • Autologous flaps: TRAM, latissimus dorsi, DIEP flap • Combined techniques
Selection of surgical approach	• Breast-conserving surgery only if radiotherapy is available • If radiotherapy not available → Modified radical mastectomy preferred
Indications for radiotherapy	• After breast-conserving surgery • T3–T4 tumors • Positive surgical margins • ≥4 positive axillary lymph nodes • Palliative: fungating/bleeding tumors, bone or brain metastases
Radiotherapy dose (curative)	• 50 Gy in 25 fractions over 5 weeks **OR** 40.05 Gy in 15 fractions (hypofractionation) • Tumor bed boost: 10 Gy in selected cases
Radiotherapy dose (palliative)	• 30 Gy in 10 fractions over 2 weeks

Table 22.12: Management of Breast Cancer by Disease stage

Stage	Recommended Management
Ductal carcinoma in situ (DCIS)	• Breast-conserving therapy (BCT): lumpectomy ± radiotherapy (RT) • RT generally indicated to reduce local recurrence • RT may be omitted in selected low-risk patients (e.g., age >70 years, tumor <0.5 cm, unicentric, low grade, wide margins ≥1 cm, ER+) • Alternative: total mastectomy (TM) for diffuse microcalcifications, multicentric disease, persistent positive margins, or patient preference • Consider adjuvant Tamoxifen for ER+ disease
Lobular carcinoma in situ (LCIS)	• Lifelong surveillance (close observation) • Risk reduction with Tamoxifen (reduces invasive cancer risk ~56%) • Consider prophylactic bilateral mastectomy in high-risk patients (strong family history, diffuse disease, or genetic predisposition)

Stage	Recommended Management
Stage I – IIB (± T3N0)	• Breast-conserving surgery (lumpectomy) + axillary staging + RT • RT may be omitted in selected low-risk patients (≥70 years, T1N0, ER+, low grade, no Lymphovascular invasion, on endocrine therapy) • Alternative: total mastectomy ± axillary staging ± RT • Adjuvant therapy as indicated: chemotherapy, endocrine therapy, and/or HER2-targeted therapy (e.g., Trastuzumab ± Pertuzumab)
Stage IIB (T3N0) and IIIA	• Neoadjuvant chemotherapy → surgery (mastectomy or BCT) + axillary staging + RT as indicated • Alternative: total mastectomy + axillary staging + RT • Adjuvant therapy: chemotherapy, endocrine therapy, and/or immunotherapy (Pembrolizumab), HER2-targeted therapy (Trastuzumab ± Pertuzumab)
Stage IIIB – IIIC	• Neoadjuvant chemotherapy → mastectomy + axillary staging + RT • Adjuvant therapy: chemotherapy, endocrine therapy, immunotherapy (Pembrolizumab), and HER2-targeted therapy (Trastuzumab ± Pertuzumab)
Stage IV (Metastatic disease)	• Systemic therapy: chemotherapy, endocrine therapy, HER2-targeted therapy (Trastuzumab ± Pertuzumab), and/or immunotherapy (Pembrolizumab) as indicated • Consider bisphosphonates for bone metastases • Palliative radiotherapy for symptom control • Selected patients may benefit from surgical resection of primary tumor

Pharmacological Management

Chemotherapy is indicated for almost all patients as neo-adjuvant, adjuvant, or palliative. Patients who are planned for surgery and have ≥ T3 tumors should receive neoadjuvant chemotherapy before surgery.

Table 22.13 Chemotherapy Regimens for HR-Positive, HER2-Negative Breast Cancer

Regimen	Drugs (Dosing Schedule)	Cycle
1. Dose-dense AC → weekly Paclitaxel	**S:** doxorubicin (IV) 60 mg/m² over 30 minutes Day 1 **AND** **S:** cyclophosphamide (IV) 600 mg/m² 1-hour infusion Day 1, given every 14 days × 4 cycles **THEN** **S:** paclitaxel (IV) 80 mg/m² 1-hour infusion weekly × 12 weeks	AC: q14 days × 4 Paclitaxel: weekly × 12
2. Standard AC → 3-weekly Paclitaxel	**S:** doxorubicin (IV) 60 mg/m² over 30 minutes Day 1 **AND** **S:** cyclophosphamide (IV) 600 mg/m² 1-hour infusion Day 1, given every 21 days × 4 cycles **THEN** **S:** paclitaxel (IV) 175 mg/m² 3-hour infusion Day 1, given every 21 days × 4 cycles	AC: q21 days × 4 Paclitaxel: q21 days × 4
3. TC Regimen (Docetaxel + Cyclophosphamide)	**S:** docetaxel (IV) 75 mg/m² 3-hour infusion Day 1 **AND** **S:** cyclophosphamide (IV) 600 mg/m² 1-hour infusion Day 1, given every 21 days × 4–6 cycles	q21 days × 4–6
4. TAC Regimen (Triple combination)	**S:** docetaxel (IV) 75 mg/m² 3-hour infusion Day 1 **AND** **S:** doxorubicin (IV) 50 mg/m² 30-minute infusion Day 1 **AND** **S:** cyclophosphamide (IV) 500 mg/m² 1-hour infusion Day 1, given every 21 days × 6 cycles	q21 days × 6

Table 22.14: Chemotherapy Regimens for HR-Positive/Negative, HER2-Positive Breast Cancer

Regimen	Drugs (Dosing Schedule)	Cycle
1. AC → Paclitaxel + Trastuzumab (Sequential HER2 therapy)	**S:** doxorubicin (IV) 60 mg/m² over 30 minutes Day 1 **AND** **S:** cyclophosphamide (IV) 600 mg/m² 1-hour infusion Day 1, given every 21 days × 4 cycles **THEN** **S:** paclitaxel (IV) 80 mg/m² 1-hour infusion weekly × 12 weeks **AND** (start with paclitaxel): **S:** trastuzumab (IV) 4 mg/kg loading dose with first paclitaxel dose, then 2 mg/kg weekly × 17 weeks OR 6 mg/kg every 21 days to complete 1 year total therapy	AC: q21 days × 4 Paclitaxel: weekly × 12 Trastuzumab: up to 1 year
Alternative trastuzumab schedule (post-paclitaxel option)	**S:** trastuzumab (IV) 6 mg/kg every 21 days, initiated after completion of paclitaxel and continued to complete 1 year total therapy	q21 days to 1 year

Regimen	Drugs (Dosing Schedule)	Cycle
2. TCH Regimen (Docetaxel + Carboplatin + Trastuzumab)	**S:** docetaxel (IV) 75 mg/m² 3-hour infusion Day 1 **AND** **S:** carboplatin (IV) AUC 6 1-hour infusion Day 1, given every 21 days × 6 cycles **AND** **S:** trastuzumab (IV or SC) 4 mg/kg loading dose with first taxane dose, then 2 mg/kg weekly × 17 weeks, followed by 6 mg/kg every 21 days to complete 1-year therapy **OR:** **S:** trastuzumab (IV or SC) 8 mg/kg loading dose, then 6 mg/kg every 21 days to complete 1 year therapy	q21 days × 6 (chemo) Trastuzumab: 1 year
3. TCH + Pertuzumab Regimen	**S:** docetaxel (IV) 75 mg/m² 3-hour infusion Day 1 **AND** **S:** carboplatin (IV) AUC 6 1-hour infusion Day 1, given every 21 days × 6 cycles **AND** **S:** trastuzumab (IV or SC) 8 mg/kg Day 1 **AND** **S:** pertuzumab (IV or SC) 840 mg Day 1, followed by Trastuzumab 6 mg/kg Day 1 PLUS Pertuzumab 420 mg Day 1, every 21 days to complete 1 year therapy	q21 days × 6 (chemo) HER2 therapy: 1 year

Table 22.15: Chemotherapy Regimens for HR-Negative, HER2-Negative Breast Cancer

Stage	Regimen	Drugs (Dosing Schedule)	Cycle
Stage I	1. Dose-dense AC → Weekly Paclitaxel	**S:** doxorubicin (IV) 60 mg/m² over 30 minutes Day 1 **AND** **S:** cyclophosphamide (IV) 600 mg/m² 1-hour infusion Day 1, given every 14 days × 4 cycles **THEN** **S:** paclitaxel (IV) 80 mg/m² 1-hour infusion weekly × 12 weeks	AC: q14 days × 4 Paclitaxel: weekly × 12
	2. Standard AC → 3-weekly Paclitaxel	**S:** doxorubicin (IV) 60 mg/m² over 30 minutes Day 1 **AND** **S:** cyclophosphamide (IV) 600 mg/m² 1-hour infusion Day 1, given every 21 days × 4 cycles **THEN** **S:** paclitaxel (IV) 175 mg/m² 3-hour infusion Day 1, given every 21 days × 4 cycles	AC: q21 days × 4 Paclitaxel: q21 days × 4
	3. TC Regimen (Docetaxel + Cyclophosphamide)	**S:** docetaxel (IV) 75 mg/m² 3-hour infusion Day 1 **AND** **S:** cyclophosphamide (IV) 600 mg/m² 1-hour infusion Day 1, given every 21 days × 4–6 cycles	q21 days × 4–6
Stage II–III	4. Pembrolizumab + Chemotherapy (Neoadjuvant → Adjuvant)	Neoadjuvant Phase: **S:** pembrolizumab (IV) 200 mg OR 2 mg/kg Day 1 **AND** **S:** paclitaxel (IV) 80 mg/m² Days 1, 8, 15 **AND** **S:** carboplatin (IV) AUC 5 Day 1, every 21 days × 4 cycles **THEN** **S:** pembrolizumab + doxorubicin 60 mg/m² + cyclophosphamide 600 mg/m² Day 1, every 21 days × 4 cycles (cycles 5–8) Adjuvant Phase: **S:** pembrolizumab (IV) 200 mg OR 2 mg/kg Day 1, every 21 days × 9 cycles	Neoadjuvant: 8 cycles Adjuvant: 9 cycles
	5. Capecitabine (Adjuvant therapy)	**S:** capecitabine PO 1000–1250 mg/m² daily on Days 1–14, given every 21 days × 6–8 cycles	q21 days × 6–8

Note

- All cycles are with myeloid growth factor support.
- FBC, RFT, LFT before each cycle.
- Cardiac monitoring at baseline, 3, 6, and 9 months.

Table 22.16: Other Chemotherapy Regimens, Metastatic Breast Cancer & Endocrine Therapy

Category	Regimen	Drugs (Dosing Schedule)	Cycle
A. Additional Standard Chemotherapy	CAF Regimen	**S:** cyclophosphamide + doxorubicin (adriamycin) + 5-fluorouracil (IV), given every 21 days	q21 days (protocol-based)
	CEF Regimen	**S:** cyclophosphamide + epirubicin + 5-Fluorouracil (IV), given every 21 days	q21 days
	CMF Regimen (Elderly / Cardiac risk)	**S:** cyclophosphamide + methotrexate + 5-Fluorouracil (IV/PO), for patients >65 years or poor cardiac function, given every 21–28 days	q21–28 days
	AC Regimen	**S:** cyclophosphamide + doxorubicin (adriamycin) (IV), given every 21 days	q21 days
B. Metastatic Breast Cancer (Stage IV)	Combination Chemotherapy	**S:** CAF or CEF regimens OR gemcitabine + paclitaxel (IV), per STG dosing schedules	Palliative (q21 or weekly)
	HER2-Targeted Combinations	**S:** trastuzumab + paclitaxel OR trastuzumab + carboplatin + paclitaxel **OR t**rastuzumab + docetaxel **OR** Trastuzumab + Capecitabine (IV/PO combinations)	Until progression/toxicity
	Single-Agent Therapy	**S:** trastuzumab OR Taxanes (paclitaxel/docetaxel) **OR** capecitabine **OR** gemcitabine (IV/PO)	Palliative monotherapy
C. Endocrine Therapy	Premenopausal ER/PR+	**S:** tamoxifen (PO) 20 mg once daily	5 years
	Postmenopausal ER/PR+	**S:** anastrozole (PO) 1 mg once daily	5 years
	Sequential endocrine therapy	**S:** tamoxifen 20 mg daily for 2 years → then Anastrozole 1 mg daily for 3 years	Total 5 years

Note: All patients must be referred to a specialized oncology center for proper management

22.4 Cancer of The Skin

Skin cancers are classified into non melanoma and malignant melanoma.

22.4.1 Non-melanoma Skin Cancers

Basal cell carcinoma (BCC) and squamous cell (SCC) are the most common non melanoma skin cancers. SCC is more aggressive than BCC and has the potential to metastasis. The main cause of these skin cancers is overexposure to Ultraviolet radiation. Risk factors include light-colored skin (e.g. albinism), previous burn and immunosuppression e.g. after transplant or HIV infection

Prevention or early detection; is through frequent self–health check–up or screening exercise and prompt treatment of early skin lesions. For light skinned people–avoid UV light especially people with Albinism.

Clinical Presentation
The most common warning sign of skin cancer is a change in the appearance on exposed areas of the skin, such as a new growth or a sore that will not heal. Occasionally, such changes may appear on an old burn area.

Investigations
- None if the lesion is small
- Local X-ray if bone involvement is suspected
- CXR
- Biopsy – preferably excisional biopsy, where possible, for histology
- CT or MRI is needed for suspected nodal and bone involvement.
- PET/CT when indicated

Management
Surgery is the primary treatment. Wide local excision that achieves negative surgical margins is adequate. For Node positive BCC or SCC Resection with Lymph node dissection. Skin grafting may be required after surgery. Amputation is sometimes done for palliation. Locally destructive methods such as curetting or cryotherapy may be employed.

Radiotherapy
Indication: Positive margin, high-grade disease, or inoperable tumour.
Dose: 60-66/ in 30-33 Fractions EBRT for Radical Treatment, 30Gy in 10 Fractions for palliative treatment

Pharmacological Management
S: 5-fluorouracil topical cream, apply every 12 -24 hours, for very superficial lesions or carcinoma in situ

Systemic chemotherapy is given during radiotherapy as a radiosensitizer.
S: cisplatin (IV) 40 mg/m2 to a maximum of 70 mg is given weekly during radiation therapy.

Metastatic or Unresectable disease SCC/BCC
S: cisplatin 25mg/m2 (IV) infusion day 1over 2 hours
AND
S: 5-Fluorouracil 1000mg/m2 over 22 hours every 21 days for 4-6 cycles.

22.4.2 Malignant Melanoma

Clinical Presentation
History of a pre-existing naves which has changed recently –itching, colour change, increase in size, satellite lesions, elevated surface, ulceration and/or oozing.

Investigations
- FBC, RFT, LFT and LDH
- CXR
- Abdomen and Pelvic CT-Scan or USS
- MRI
- PET CT
- Excisional biopsy of a suspicious lesion for histopathology
- Consider Sentinel Lymph Node Biopsy (SLNB) if available (Node negative Patients)
- c-KIT and BRAF Mutation testing, PDL-1 testing is required
- Chemoport /PICC line insertion for chemotherapy delivery (When indicated)

Table 22.17: Malignant Melanoma management by disease stage

Stage	Modality	Management	Drugs (Dosing Schedule)	Cycle
Localized disease	Surgery	Surgical management	• Node negative: Sentinel lymph node biopsy (SLNB) + wide local excision (WLE) • Node positive: Therapeutic lymph node dissection + WLE • Amputation: Consider in advanced non-functional limb	One-time
	Radiotherapy	Definitive / palliative RT	• Primary RT (except lentigo maligna melanoma of face) • Medically inoperable: 30 Gy / 6 fractions / 1 week • Palliative: 30 Gy / 10 fractions OR 20 Gy / 5 fractions (brain metastasis, bleeding, fungation, bone pain)	Short-course
	Chemotherapy	Systemic chemotherapy	**S:** cisplatin 20 mg/m² IV Day 1–4 **AND** **S:** vinblastine 1.6 mg/m² IV Day 1–5 **AND** **S:** dacarbazine 800 mg/m² IV Day 1, every 21 days × 6 cycles **OR** **S:** dacarbazine 250 mg/m² IV Day 1–5, every 21 days × 4–6 cycles **OR** **S:** paclitaxel 175 mg/m² IV 3-hour infusion Day 1, every 21 days × 4–6 cycles	q21 days × 4–6
	Targeted therapy (BRAF/c-KIT mutation)	Molecular targeted therapy	**S:** dabrafenib 150 mg PO twice daily **OR** **S:** trametinib 2 mg PO once daily	8–12 months
	Immunotherapy (PD-L1 positive)	Immune checkpoint inhibitors	**S:** pembrolizumab 200 mg IV every 3 weeks OR 400 mg every 6 weeks **OR** **S:** nivolumab 240 mg IV every 2 weeks OR 480 mg every 4 weeks **OR** **S:** ipilimumab 3 mg/kg IV every 3 weeks × 4 doses	8–12 months
Metastatic disease	Surgery	Metastasectomy	Consider resection for limited resectable metastases	Case-based
	Radiotherapy	Palliative radiotherapy	• 30 Gy / 6 fractions (1 week) • 30 Gy / 10 fractions OR 20 Gy / 5 fractions (brain metastasis, bleeding, pain, fungation)	Palliative
	Chemotherapy	Systemic chemotherapy	**S:** dacarbazine 250 mg/m² IV Day 1–5, every 21 days × 4–6 cycles **OR** **S:** temozolomide 200 mg/m² PO Day 1–5 every 28 days (brain metastases) **OR** **S:** carboplatin AUC 5–6 IV Day 1 **AND**	q21 or q28 cycles

			S: paclitaxel 175 mg/m² IV Day 1 **AND** **S:** bevacizumab 15 mg/kg IV, every 21 days × 4–6 cycles	
	Targeted therapy (BRAF/c-KIT mutation)	Molecular targeted therapy	**S:** dabrafenib 150 mg PO twice daily **OR** **S:** trametinib 2 mg PO once daily	8–12 months
	Immunotherapy (PD-L1 positive)	Immune checkpoint inhibitors	**S:** pembrolizumab 200 mg IV every 3 weeks OR 400 mg every 6 weeks **OR** **S:** nivolumab 240 mg IV every 2 weeks OR 480 mg every 4 weeks **OR** **S:** ipilimumab 3 mg/kg IV every 3 weeks × 4 doses	8–12 months

22.4.3 Kaposi's sarcoma (KS)

It is a malignant tumour of angio–formative cells usually starting from the skin but occasionally involving many other body organs. Kaposi sarcoma can be primarily categorized into four types: epidemic of AIDS–related, immunocompromised, classic or sporadic, and endemic (African). Here we have non-AIDS related (endemic) KS and AIDS related (epidemic) KS, where the latter is more common, 80–85%.

Clinical Presentation

- KS presents as firm, dark brown nodules or plaques in the skin. Usually, more on the limbs
- It presents as widespread lymphadenopathy with or without skin lesions in young children and those with immunodeficiency.
- B symptoms (fever, sweating, and weight loss) are commonly associated with the epidemic type.

Investigations

- FBC, LFT, Urea & Creatinine, HIV test (if positive CD4 count and viral load)
- Immunohistochemistry (IHC) panel: KSHC 8 (HHV-8)
- CXR
- Abdomen and Pelvis ultrasound, CT scan / MRI
- Chest CT scan
- Bronchoscopy and Endoscopy
- PET CT scan
- Skin biopsy for histological confirmation

Staging of KS: Epidemic Kaposi sarcoma uses the AIDS Clinical Trials Group (ACTG) system, and for endemic/classical Kaposi sarcoma uses the Mitsuyasu classification system.

Management:

- Treatment is palliative regardless of type and stage; hence, careful assessment and decision-making are required to choose the best palliative treatment.
- ARVs should be initiated in epidemic KS patients who have not started the treatment.
- The choice of palliation depends on the patient's Clinical Presentation and general condition.

Radiotherapy

Is the best palliative treatment in a symptomatic patient with local or extensive disease.

- 8Gy single fraction for disease on limbs or lower half of the body
- 6Gy single fraction for upper half of the body
- A dose of 9Gy/3Fractions or 22Gy/11 Fractions can be prescribed for lesions elsewhere.

Pharmacological Management

First-line palliative chemotherapy (generalized disease)

S: liposomal doxorubicin 20 mg/m² IV every 2–3 weeks for 6 cycles
OR
S: doxorubicin (IV) 25 mg/m² over 30 minutes Day 1
AND
S: bleomycin (IV) 10 IU/m² over 10 minutes Day 1
AND
S: vincristine (IV) 1.4 mg/m² over 10 minutes (maximum 2 mg) Day 1, given every 21 days for 6–8 cycles
OR
S: paclitaxel (IV) 100 mg/m² Day 1, given every 14 days for 6 cycles
OR
S: docetaxel (IV) 75 mg/m² Day 1, given every 21 days for 6 cycles (for persistent or recurrent disease after ABV)

Relapsed/Refractory therapy

These agents are generally used as individual salvage options, not routinely combined together unless under specific specialist protocols/clinical trials.

S: gemcitabine 1000 mg/m² IV every 2 weeks OR 1000 mg/m² IV on Days 1 and 8 every 21 days
OR
S: bortezomib 1.6 mg/m² IV/SC on Days 1, 8, and 15 of each 28-day cycle
OR
S: lenalidomide 25 mg PO daily for 21 days of each 28-day cycle
OR
S: nivolumab 480 mg IV every 4 weeks for 6 months
OR
S: pembrolizumab 200 mg IV every 3 weeks for up to 6 months

22.5 Head and Neck Cancers

Cancers of the head and neck include the oral cavity, pharynx, larynx, nasal cavity, paranasal sinuses, salivary glands, and thyroid. Squamous cell carcinoma is the most common histological type of malignancy, but salivary gland tumors are mostly adenocarcinoma.

Risk factors
Important etiological factors are smoking, excessive alcohol, viral infections (eg, HPV and EBV), genetic predisposition, previous radiation exposure, and industrial chemicals.

22.5.1 Nasopharyngeal Cancer

Nasopharyngeal carcinoma is the predominant tumor type arising in the epithelium of the nasopharynx.

Clinical Presentation:
Neck mass, unilateral hearing loss, tinnitus, nasal obstruction, epistaxis, and cranial nerve palsies

Investigations
- FBC, RFT, LFT, and HIV
- CXR
- Abdominal ultrasound
- CT scan and/or MRI of the nasopharynx, skull base, and neck
- Nasopharyngoscopy
- Endoscopic-guided biopsy of the primary tumor for histology
- PET CT
- Immunohistochemistry to further confirm the diagnosis
- Preventive dental care and extractions should occur 10-14 days before RT
- Feeding tube (GFT) when indicated
- Tracheostomy placement when indicated
- Speech, swallow, and audiology evaluations when indicated

Management
Due to the deep location of the nasopharynx and its anatomic proximity to critical structures, radical surgery is typically not used. The role of surgery is initially for biopsy for histological confirmation. It may also be used for management of the neck for persistently enlarged lymph nodes.
Nasopharyngeal cancer is mainly treated by radiotherapy, either alone or in combination with chemotherapy.

Table 22.18: Management of Nasopharyngeal Cancer by Stage

Stage	Treatment Modality	Management / Drugs (Dosing Schedule)	Cycle
Stage I	Radiotherapy	Radiotherapy alone to primary disease: 70 Gy/35 fractions Prophylactic neck radiotherapy for node-negative disease: 50 Gy/25 fractions	As scheduled
Stage II–IVB	Concurrent chemoradiotherapy + adjuvant chemotherapy	**S:** concurrent chemoradiotherapy: 70 Gy (2 Gy/fraction) **AND** **S:** cisplatin (IV) 75 mg/m² Day 1, Day 21, and Day 42 Followed by adjuvant chemotherapy: **S:** cisplatin (IV) 75 mg/m² **AND** **S:** 5-Fluorouracil (IV) 1000 mg/m², given every 21 days for 3 cycles	Concurrent phase → Adjuvant q21 days × 3
	Surgery	Neck dissection for persistent or recurrent neck nodes	As indicated
	Radiotherapy technique	Use IMRT (Intensity-Modulated Radiotherapy) where available to improve locoregional control and reduce severe xerostomia (80% → 35–40%)	Preferred technique

Stage	Treatment Modality	Management / Drugs (Dosing Schedule)	Cycle
Stage IVC	Platinum-based chemotherapy	**S:** carboplatin (IV) AUC 5–6 over 1 hour Day 1 **AND** **S:** paclitaxel (IV) 175 mg/m² over 3 hours Day 1, repeated every 21 days for 4–6 cycles	q21 days × 4–6
	Palliative care	Palliative and best supportive care (may include chemotherapy and/or radiotherapy)	Individualized
Stage III–IVB (if delay in chemoradiotherapy anticipated)	Induction chemotherapy	**S:** cisplatin (IV) 75 mg/m² over 1 hour Day 1 **AND** **S:** docetaxel (IV) 75 mg/m² over 3 hours Day 1 **AND** **S:** 5-Fluorouracil (IV) 1000 mg/m² over 22 hours, repeated every 21 days for 4 cycles	q21 days × 4
Local recurrence	Salvage treatment	Chemotherapy OR surgery OR re-irradiation (preferably IMRT)	As indicated

22.5.2 Laryngeal Cancer

Laryngeal cancer is one of the most common cancers of the head and neck. It is divided into three major anatomic regions; supraglottis, glottis and subglottic.

Risk factors

It is predominantly found in men and mostly in those with history of tobacco smoking and alcohol intake.

Clinical Presentation

Hoarseness, pain, stridor, difficulty in breathing, otalgia, neck mass, odynophagia, cough.

Investigations

- FBC, RFT and LFT
- CXR
- CT scan and/or MRI of the Head and Neck
- Consider PET/CT scan for stages 3 and 4
- Nasopharyngolaryngoscopy
- Esophagoscopy
- Bronchoscopy if clinically indicated
- Pathology: Definitive diagnosis is confirmed by laryngoscopy-guided biopsy of the primary tumor
- Preventive dental care and extractions should occur 10-14 days before RT
- Feeding tube (GFT) when indicated
- Speech, swallow, and audiology evaluations when indicated
- Tracheostomy placement when indicated

Table: 22.19: Management of Laryngeal Cancer by Stage

Stage	Treatment Modality	Management / Drugs (Dosing Schedule)	Cycle
Stage I–II	Surgery	Primary site management with partial or total laryngectomy ± selective neck dissection	As indicated
	Post-operative radiotherapy / chemoradiotherapy	Indicated for close/positive margins, perineural invasion (PNI), or Lymphovascular space invasion (LVSI) Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly **OR** **S:** cetuximab (IV) 400 mg/m² weekly during radiotherapy	Weekly during RT
	Definitive radiotherapy / chemoradiotherapy	Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly **OR** **S:** cetuximab (IV) 400 mg/m² weekly during radiotherapy	Weekly during RT
Stage III–IVB	Surgery	Total laryngectomy + neck dissection	As indicated
	Concurrent chemoradiotherapy / adjuvant therapy	Concurrent chemoradiation OR surgery followed by adjuvant radiotherapy/chemoradiotherapy Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly **OR** **S:** cetuximab (IV) 400 mg/m² weekly during radiotherapy	Weekly during RT
Stage IVC	Palliative care	Best supportive and palliative care	Individualized

22.5.3 Hypopharyngeal Cancers

Hypopharyngeal cancer includes tumors arising from the pyriform sinus, posterior pharyngeal wall, post-cricoid region.

Risk factors

It is associated with tobacco use, alcohol consumption, and Plummer–Vinson syndrome.

Clinical Presentation

Dysphagia, odynophagia, change in speech (dysarthria), neck mass, referred otalgia, throat pain, weight loss, sensation of mass in throat and hoarseness of voice.

Investigations

- FBC, RFT and LFT
- CXR
- CT scan and/or MRI of the Head and Neck
- Consider PET/CT scan
- Nasopharyngolaryngoscopy
- Esophagoscopy
- Bronchoscopy if clinically indicated
- Pathology: Definitive diagnosis is confirmed by pharyngoscopy-guided biopsy of the primary tumor
- PET/CT scan
- Preventive dental care and extractions should occur 10-14 days before RT
- Feeding tube (GFT) when indicated
- Speech, swallow, and audiology evaluations when indicated

Management

Radiation therapy is the mainstay of first-line local treatment for early stage hypopharyngeal carcinoma. For more advanced disease, concurrent chemoradiation reduces the rate of distant metastasis, and improves local control.

Table: 22.20 Management of Hypopharyngeal Cancer by Stage

Stage	Treatment Modality	Management / Drugs (Dosing Schedule)	Cycle
Early T1–T2 disease	Definitive chemoradiotherapy	Definitive radiotherapy. If incomplete response → salvage surgery ± neck dissection as indicated. If complete response → consider neck dissection for N2–N3 disease. Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly **OR** **S:** cetuximab (IV) 400 mg/m² weekly during radiotherapy	Weekly during RT
Early T1–T2 disease (alternative approach)	Surgery + adjuvant therapy	Partial laryngopharyngectomy + ipsilateral/bilateral selective neck dissection (N0) OR comprehensive neck dissection (N+) Post-operative chemoradiotherapy for positive margins or nodal extracapsular extension (ECE) Post-operative radiotherapy (± chemotherapy if multiple risk factors) for pN2–3, close margins, PNI, LVSI, or cartilage invasion Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin 40 mg/m² weekly **OR** **S:** cetuximab 400 mg/m² weekly	As indicated
T2–T4 requiring total laryngectomy	Concurrent chemoradiotherapy	Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly **OR** **S:** cetuximab (IV) 400 mg/m² weekly	Weekly during RT
T2–T4 requiring total laryngectomy (alternative)	Surgery + adjuvant therapy	Laryngopharyngectomy + selective neck dissection (N0) OR comprehensive neck dissection (N+/T4) Post-operative chemoradiotherapy for positive margins or nodal ECE Post-operative RT (± chemotherapy for multiple risk factors) for pT3–4, pN2–3, close margins, PNI, LVSI, cartilage invasion	As indicated
Organ preservation strategy	Induction chemotherapy → response-adapted treatment	Consider induction chemotherapy: **S:** cisplatin (IV) 75 mg/m² over 1 hour Day 1 **AND** **S:** docetaxel (IV) 75 mg/m² over 3 hours Day 1 **AND** **S:** 5-Fluorouracil (IV) 1000 mg/m² over 22 hours, repeated every 21 days × 4 cycles • Complete response (CR): proceed to definitive RT • Partial response (PR): concurrent chemoradiotherapy • Non-response: surgery → post-operative RT/CRT • Residual neck mass after RT or initial N2–3: consider neck dissection	q21 days × 4
Unresectable disease	Concurrent chemoradiotherapy	Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during RT	Weekly during RT
Unresectable disease (if unable to tolerate cisplatin)	Definitive radiotherapy ± targeted therapy	Definitive radiotherapy with consideration of: **S:** cetuximab (IV) 400 mg/m² weekly during radiotherapy	Weekly during RT

22.5.4 Salivary Gland Cancer

Salivary gland cancers arise from major or minor salivary glands in the head and neck region. The most common malignant salivary gland tumors are mucoepidermoid carcinoma and adenocarcinoma.

Clinical Presentation

Depends on the primary site involved: Mass, pain, nerve palsies, neck mass

Investigations

- FBC, LFT, and RFT
- CXR
- CT scan and/or MRI of the Head and Neck
- PET/CT scan indicated for distant staging
- Biopsy of the primary tumor for histology.
- Preventive dental care and extractions should occur 10-14 days before RT
- Feeding tube (GFT) when indicated
- Speech, swallow, and audiology evaluations when indicated Treatment:

Table 22.21: Salivary Gland Tumours Management by disease stage

Stage	Treatment Modality	Management / Drugs (Dosing Schedule)	Cycle
Resectable T1–T2, N0 (Superficial disease)	Surgery	Surgical resection followed by observation for low-grade tumours	As indicated
Resectable T1–T2, N0 (High-risk features)	Post-operative chemoradiotherapy	Consider post-operative radiotherapy for: close/positive margins, adenoid cystic histology, intermediate/high-grade disease, perineural invasion (PNI), or Lymphovascular space invasion (LVSI). Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT
Resectable T3–T4 with lymph node involvement	Surgery + adjuvant chemoradiotherapy	Surgery with neck dissection for node-positive disease (N+) or high-grade tumours, followed by post-operative radiotherapy. Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT
Unresectable disease	Definitive chemoradiotherapy	Definitive radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT
Pleomorphic adenoma	Surgery	Parotidectomy	One-time procedure
Pleomorphic adenoma (high-risk features)	Post-operative chemoradiotherapy	Consider post-operative radiotherapy for multifocal disease, recurrent disease, perineural invasion (PNI), or residual disease. Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT

22.5.5 Nasal Cavity and Paranasal Sinus Cancer

These tumors arise from the nasal cavity and the four paired paranasal sinuses (frontal, ethmoid, maxillary, and sphenoid). Most common histological type is Squamous Cell Carcinoma (70%). Other histologies are Adenocarcinoma, adenoid cystic, mucoepidermoid carcinoma, neuroendocrine, plasmacytoma, melanoma, lymphoma and sarcoma,

Clinical Presentation

Nasal obstruction, epistaxis, proptosis, double vision, cheek mass, loss of sensation of the cheek, and loosening or pain of the teeth

Investigations

- FBC, RFT, and LFT
- Pretreatment baseline Free Thyroxin. Cortisol and Prolactin.
- CXR
- Abdominal Ultrasound
- CT scan and/or MRI of the Para nasal sinuses and neck
- PET CT for Stage 3 and 4
- Direct fibre-optic endoscopy
- Endoscopic guided biopsy of the primary tumor for histopathology
- Preventive dental care and extractions should occur 10-14 days before RT
- Feeding tube (GFT) when indicated
- Speech, swallow, and audiology evaluations when indicated

Table 22.22: Management of Nasal Cavity and Paranasal Sinus Cancers by disease stage

Type	Stage	Treatment Modality	Management / Drugs (Dosing Schedule)	Cycle
Nasal cavity and Ethmoid sinus	T1–T2 N0	Surgery ± adjuvant therapy	Resection followed by post-operative radiotherapy for close/positive margins or perineural invasion (PNI)	As indicated
		Definitive chemoradiotherapy (alternative)	Alternative definitive radiotherapy depending on tumour size, location, and expected cosmetic outcome. Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT
	T3–T4 N0	Surgery + adjuvant therapy	Resectable disease: resection followed by post-operative radiotherapy	As indicated
		Definitive chemoradiotherapy	Unresectable/inoperable disease: definitive radiotherapy (66–70 Gy) OR concurrent chemoradiotherapy	As indicated
	Node-positive (N+)	Surgery + adjuvant therapy	Resection + neck dissection followed by post-operative radiotherapy OR chemoradiotherapy	As indicated
		Definitive chemoradiotherapy (alternative)	Alternative: definitive concurrent chemoradiotherapy Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT
Maxillary sinus	T1–T2 N0	Surgery + adjuvant therapy	Resection followed by post-operative radiotherapy for close margins, PNI, or adenoid cystic histology. For positive margins → re-resection (if feasible) followed by post-operative radiotherapy	As indicated
		Post-operative chemoradiotherapy	Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT
	T3–T4 N0	Surgery + adjuvant therapy	Resectable disease: resection followed by post-operative radiotherapy OR chemoradiotherapy	As indicated
		Definitive chemoradiotherapy	Unresectable/inoperable disease: definitive radiotherapy (66–70 Gy) OR chemoradiotherapy	As indicated
	Node-positive (N+)	Surgery + adjuvant therapy	Resection + neck dissection followed by post-operative radiotherapy OR chemoradiotherapy	As indicated
		Definitive chemoradiotherapy (alternative)	Alternative: definitive concurrent chemoradiotherapy Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT

22.5.6 Oral Cavity Cancer

The oral cavity consists of the upper and lower lips, the gingivobuccal sulcus, the buccal mucosa, the upper and lower gingiva, the retromolar trigone, the hard palate, the floor of the mouth, and the anterior two–thirds of the tongue. 90% of tumors are squamous cell carcinoma. Less common tumors include minor salivary gland cancers (common in the hard palate and include adenoid cystic carcinoma, mucoepidermoid carcinoma, and adenocarcinoma).

Risk factors

Risk factors include tobacco smoking, excessive consumption of alcohol, poor oral hygiene, prolonged focal denture irritation, betel nut chewing, and syphilis.

Clinical Presentation

Non-healing ulcer, speech difficulty, hypersalivation, neck mass, dysphagia, and otalgia

Investigations

- FBC, LFT, RFT and HIV
- CXR
- CT Scan and/or MRI of the Head and Neck
- PET/ CT scan for Stage 3 and 4
- Mirror and fibre-optic endoscopic examination
- Biopsy for histologic confirmation
- Preventive dental care and extractions should occur 10-14 days before RT
- Feeding tube (GFT) when indicated
- Speech, swallow, and audiology evaluations when indicated

Management

Table 22.23: Oral Cavity Cancer Management by disease stage

Stage	Treatment Modality	Management / Drugs (Dosing Schedule)	Cycle
T1–T2 N0	Surgery	Surgical resection of primary tumour with ipsilateral or bilateral selective neck dissection (consider bilateral dissection for midline lesions, oral tongue, or floor of mouth). Neck treatment (dissection or radiotherapy) indicated for lesions >2–3 mm thickness. For positive margins only → re-excision if feasible	As indicated
	Post-operative radiotherapy / chemoradiotherapy	Post-operative radiotherapy (including neck if not dissected) indicated for: • Close margin (<5 mm) • Perineural invasion (PNI) • Lymphovascular space invasion (LVSI) Post-operative chemoradiotherapy indicated for positive margins	As indicated
	Definitive chemoradiotherapy (alternative)	Alternative definitive radiotherapy. Salvage surgery for residual disease. Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT
T3–T4a or N1–N3	Surgery	Surgical resection of primary tumour with ipsilateral or bilateral selective neck dissection (consider bilateral for tumours approaching midline, oral tongue, floor of mouth, or N2c disease). Reconstruction as indicated	As indicated
	Post-operative radiotherapy / chemoradiotherapy	Consider post-operative radiotherapy for all patients. Post-operative chemoradiotherapy indicated for: • Positive margins • Extracapsular extension (ECE)	As indicated
Unresectable disease	Concurrent chemoradiotherapy	Concurrent chemoradiotherapy with cisplatin-based regimen: Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT
	Induction chemotherapy (alternative)	Alternative: induction chemotherapy followed by chemoradiotherapy OR altered fractionation RT if unable to tolerate chemotherapy **S:** cisplatin (IV) 75 mg/m² over 1-hour Day 1 **AND** **S:** docetaxel (IV) 75 mg/m² over 3 hours Day 1 **AND** **S:** 5-Fluorouracil (IV) 1000 mg/m² over 22 hours, repeated every 21 days × 4 cycles	q21 days × 4
	Salvage management	If primary tumour has incomplete response (<CR), salvage surgery remains controversial. If residual neck disease on imaging at 6–12 weeks → consider salvage neck dissection	As indicated

22.5.7 Oropharyngeal Cancer

The oropharynx is located between the soft palate superiorly and the hyoid bone inferiorly. It has four walls: the soft palate, tonsillar region, base of tongue, and pharyngeal wall. Tonsillar and pharyngeal tongue tumors are frequently initially recognized by nodal metastases.

Risk factors: It is associated with tobacco use, alcohol consumption, and HPV.

Clinical Presentation

Sore throat, non-healing oropharyngeal ulcers, dysphagia, referred otalgia, hoarseness (with larynx invasion), odynophagia, hot potato voice, impaired tongue movement, and protrusion.

Investigations:

- FBC, LFT, RFT, and HIV
- CXR
- CT Scan and/or MRI of the Head and Neck
- PET/CT Scan for Stage 3 and 4
- Mirror and fibre-optic endoscopic examination
- Biopsy for histologic confirmation
- Preventive dental care and extractions should occur 10-14 days before RT
- Feeding tube (GFT) when indicated
- Speech, swallow, and audiology evaluations when indicated

Management:
Radiotherapy mainly treats oropharyngeal cancers in combination with chemotherapy. Surgery can be used in selected cases.

Table 22.24: Oropharyngeal Cancer Management by disease stage

Stage	Treatment Modality	Management / Drugs (Dosing Schedule)	Cycle
T1–T2 N0	Definitive chemoradiotherapy	Preferred treatment: definitive radiotherapy with consolidative surgery for incomplete response (< complete response). Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT
	Surgery ± adjuvant therapy (alternative)	Alternative: surgical resection of primary tumour ± ipsilateral or bilateral neck dissection. Post-operative radiotherapy indicated for: • pT3–T4 disease • Close margins • Multiple lymph nodes • Level IV–V lymph nodes • Perineural invasion (PNI) • Lymphovascular space invasion (LVSI) Post-operative chemoradiotherapy indicated for: • Positive margins • Extracapsular extension (ECE)	As indicated
T3–T4 or LN+ disease	Concurrent chemoradiotherapy	Preferred treatment: concurrent chemoradiotherapy with consolidative surgery for incomplete response (< complete response). Radiotherapy: 60–66 Gy (2 Gy/fraction) concurrently with: **S:** cisplatin (IV) 40 mg/m² weekly during radiotherapy	Weekly during RT
	Surgery ± adjuvant therapy (alternative)	Alternative: surgical resection of primary tumour ± ipsilateral or bilateral neck dissection followed by post-operative radiotherapy/chemoradiotherapy based on pathological risk factors	As indicated
	Alternative systemic radiosensitizer	For patients not eligible for cisplatin-based chemoradiotherapy: **S:** cetuximab (IV) 400 mg/m² weekly during radiotherapy	Weekly during RT
	Alternative radiotherapy approach	If unable to tolerate concurrent chemotherapy, use altered fractionation radiotherapy	As indicated

22.5.8 Thyroid Carcinoma

Thyroid cancer is the most common endocrine malignancy in Tanzania. Histological types are medullary, anaplastic, and well-differentiated thyroid cancer. Most of these cases are differentiated thyroid cancer, the commonest being the follicular subtype, followed by the papillary subtype. Rare ones are Hurthle cell, a follicular variant of papillary thyroid carcinoma, tall cell, columnar, solid, and clear cell. Females are mostly affected, the male-to-female ratio being 3:1. Follicular cells take up iodide ions, including radioactive iodine (RAI).

Risk factors

- Radiation exposure, especially if exposed at age <10 years
- Iodine deficiency

Clinical Presentation

- Thyroid mass (Anterior neck mass), Obstructive symptoms (Stridor, hoarseness), laryngeal nerve palsy, dysphagia
- Metastatic symptoms such as weight loss, difficulty in breathing, bone pain/pathological fractures

Investigations

- Thyroid function tests (T3, T4, TSH), FBC, LFTs, Urea & Creatinine, Serum calcitonin, Serum thyroglobulin levels, CEA and Calcium
- Thyroid Scan
- CXR
- Isotope bone scan
- CT-Scan of the neck/ MRI (avoid iodinated contrast with CT, as this may preclude treatment with RAI for up to 6 months)
- Laryngoscopy/ bronchoscopy if airway invasion
- Biopsy or Fine needle aspiration cytology (FNAC) of a thyroid lesion
- Tracheostomy placement when indicated
- PET/CT scan for high-risk medullary and anaplastic thyroid carcinoma

Management

Surgery is the mainstay of treatment; lobectomy, total or near-total thyroidectomy. Radiotherapy is indicated in all cases of anaplastic carcinoma.

Table 22.25: Management of Thyroid Carcinoma by disease stage

Histologic Type	Stage	Management	Drugs / Radiotherapy (Dosing Schedule)	Cycle Follow-up
Differentiated Thyroid Carcinoma	High-risk disease (history of radiation exposure, family history, high-grade histology, tumour >4 cm, multifocal tumour, vascular invasion, extrathyroid extension (ETE), LN+, distant metastasis)	Total thyroidectomy ± central neck dissection (if cN+); consider prophylactic central neck dissection if cN0; lateral neck dissection for FNA-confirmed nodal metastasis	Post-operative radioactive iodine (RAI); levothyroxine to suppress TSH <0.1 mU/L; consider EBRT 66–70 Gy to tumour and 50–54 Gy to nodes for gross ETE, microscopic residual disease, or non-iodine-avid disease	Long-term follow-up
	Low-risk disease	Total thyroidectomy RAI OR lobectomy + isthmusectomy; completion thyroidectomy for positive margins/high-risk pathology	Levothyroxine to maintain TSH 0.1–0.5 mU/L	Long-term surveillance
	Locoregional recurrence/residual disease	Cervical LN recurrence → neck dissection → RAI; superior mediastinal recurrence → dissection → RAI OR RAI alone	If unresectable/no RAI uptake: EBRT 66–70 Gy to tumour and 50–54 Gy to nodes	As indicated
	Metastatic disease	Total thyroidectomy (if not previously done) to facilitate RAI	RAI every 12–24 months until no longer beneficial; continue levothyroxine suppression; palliative RT 30 Gy/10 fractions OR 20 Gy/5 fractions; systemic therapy with TKIs, chemotherapy, bisphosphonates, or denosumab	Individualized
	Visceral metastatic disease	Palliative chemotherapy	**S:** paclitaxel (IV) 175 mg/m²over 3 hours Day 1 **AND** **S:** doxorubicin (IV) 60 mg/m²bolus Day 1 every 21 days for up to 6 cycles	q21 days × 6
Papillary Thyroid Microcarcinoma	PTC ≤1 cm without high-risk features	Lobectomy OR observation (controversial); completion surgery if high-risk features develop	Observation/surveillance	Ongoing
Medullary Thyroid Carcinoma	Locoregional disease	Total thyroidectomy + central neck dissection ± ipsilateral/bilateral neck dissection (levels II–V if cN+)	Consider EBRT 66–70 Gy to tumour and 50–54 Gy to nodes for incomplete resection, LN+, extensive ETE, or persistent calcitonin; levothyroxine only to normalize TSH (no role for RAI)	Long-term follow-up
	Metastatic disease	Surgery/EBRT/ablative therapies for palliation	Palliative RT 30 Gy/10 fractions OR 20 Gy/5 fractions; **S:** cabozantinib; other kinase inhibitors; octreotide for hormonal peptide syndromes	Individualized
	Visceral metastatic disease	Palliative chemotherapy	**S:** paclitaxel (IV) 175 mg/m²over 3 hours Day 1 **AND** **S:** doxorubicin (IV) 60 mg/m²bolus Day 1 every 21 days for up to 6 cycles	q21 days × 6

Histologic Type	Stage	Management	Drugs / Radiotherapy (Dosing Schedule)	Cycle Follow-up
Anaplastic Thyroid Carcinoma	Locoregional disease	Gross total resection if feasible (rare); avoid morbid surgery if unresectable; airway management/tracheostomy if needed	Post-operative chemoradiotherapy: EBRT 66–70 Gy to tumour and 50–54 Gyto nodes; consider accelerated fractionation schedules	As indicated
	Locoregional disease (supportive care)	Early palliative care involvement; consider clinical trials	Levothyroxine only to normalize TSH (no role for RAI)	Ongoing
	Metastatic disease	Local palliation	Surgery, EBRT, ablative therapies	As indicated
	Metastatic disease	Systemic therapy	Palliative RT 30 Gy/10 fractions OR 20 Gy/5 fractions; systemic chemotherapy or targeted therapy	Individualized
	Visceral metastatic disease	Palliative chemotherapy	**S:** paclitaxel (IV) 175 mg/m²over 3 hours Day 1 **AND** **S:** doxorubicin (IV) 60 mg/m²bolus Day 1 every 21 days for up to 6 cycles	q21 days × 6

Note: All patients must be referred to a cancer specialized center for proper management.

Table 22.26 Recommended Radiotherapy and Chemotherapy treatment for Head and Neck tumours

Treatment Category	Management	Drugs / Radiotherapy (Dosing Schedule)	Cycle
Curative Radiotherapy	Definitive radiotherapy	Radiotherapy dose: 66–70 Gy in conventional fractionation of 1.8–2 Gy per fraction	Daily fractions until total dose achieved
Concurrent Chemoradiotherapy	Radiosensitisation during curative RT	**S:** cisplatin (IV) 40 mg/m² over 1 hour weekly during radiotherapy **OR** **S:** cisplatin (IV) 75 mg/m² over 1 hour Day 1, repeated every 21 days during radiotherapy	Weekly or q21 days during RT
Induction Chemotherapy (Advanced disease)	TPF or PF-based induction for advanced head and neck cancer	S (TPF/PF alternative): **S:** carboplatin (IV) AUC 5 over 1 hour Day 1 **AND** **S:** 5-Fluorouracil (IV) 400 mg/m² bolus Day 1 **AND** **S:** paclitaxel (IV) 175 mg/m² over 3 hours Day 1, repeated every 21 days for 3–6 cycles **OR** S (TPF regimen): **S:** cisplatin (IV) 75 mg/m² over 1 hour Day 1 **AND** **S:** docetaxel (IV) 75 mg/m² over 3 hours Day 1 **AND** **S:** 5-Fluorouracil (IV) 1000 mg/m² over 22 hours, repeated every 21 days for 4 cycles	q21 days × 3–6 (PF/TPF)
Adjuvant / Concurrent Chemotherapy (Curative setting)	Post-induction or definitive concurrent therapy	**S:** carboplatin (IV) AUC 5 over 1 hour Day 1 **AND** **S:** 5-Fluorouracil (IV) 400 mg/m² bolus Day 1 **AND** **S:** cetuximab (IV) 400 mg/m² over 2 hours Day 1 (administered 1 hour before chemotherapy), repeated every 21 days for 3–6 cycles	q21 days × 3–6
Recurrent / Metastatic Disease – Combination Therapy	Systemic palliative chemotherapy	Combination regimens include: **S:** cisplatin **OR** **S:** carboplatin + **S:** paclitaxel/Docetaxel **S:** cisplatin + **S:** 5-Fluorouracil **S:** cisplatin + **S:** gemcitabine **S:** gemcitabine + **S:** vinorelbine **S:** carboplatin + **S:** cetuximab (IV)	Palliative cycles (q21 days or weekly schedules)
Recurrent / Metastatic Disease – Single Agent Therapy	Palliative monotherapy	Single agents: **S:** cisplatin, **S:** carboplatin, **S:** paclitaxel, **S:** docetaxel, **S:** 5-Fluorouracil, **S:** methotrexate, **S:** gemcitabine, **S:** capecitabine (IV/PO as applicable)	Continuous until progression or toxicity

22.6 Gastrointestinal Malignancies

22.6.1 Esophageal Cancer

Histologically, there are two types: SCC and adenocarcinoma. Male to female ratio 4:1.

Risk factors

Tobacco and alcohol abuse are major risk factors for SCC, whereas obesity, gastroesophageal reflux disease (GERD), and Barrett's esophagus are the major risk factors for adenocarcinoma.

Clinical Presentation

Difficulty swallowing (dysphagia) is the most common symptom associated with weight loss and poor performance status.

Investigations

- FBC, LFT, Urea, Creatinine
- Barium swallow and meal
- Chest and Abdominal CT scan
- PET/CT scan
- Abdominal USS
- Rigid Oesophagoscopy or Oesophagoduodenoscopy (OGD) and biopsy for histology
- Bronchoscopy
- Nutritional assessment and Gastrostomy tube placementtomy

Staging: TNM Staging system

Management: Surgery and radiotherapy

Surgery is a major component of treatment for resectable disease. Surgery and or radiotherapy may be curative in early diseases. However, most patients present in late stages, hence the goal of treatment is to prolong survival and relieve symptoms. Radiation (alone or in combination with chemotherapy) is given as a definitive, preoperative, postoperative therapy or palliative setting.

Table 22.27: Management of Oesophageal Cancer by disease stage

Stage	Treatment Modality	Management	Drugs / Radiotherapy (Dosing Schedule)	Cycle
Tis – T1a	Endoscopic / Surgical management	Endoscopic therapy preferred for lesions <2 cm, well–moderately differentiated (EMR ± ablation) OR oesophagectomy for extensive disease	As indicated	Single procedure
T1b N0 (Operable)	Surgery / endoscopic therapy	Squamous cell carcinoma: oesophagectomy Adenocarcinoma: endoscopic therapy for superficial T1b <2 cm OR oesophagectomy	As indicated	Single procedure
Post-operative (no prior chemoradiotherapy)	Adjuvant chemoradiotherapy	Squamous carcinoma: R1/R2 resection Adenocarcinoma: node-positive disease, T3–T4, or close/positive margins	Chemoradiotherapy per protocol	As indicated
T1b N1–2, T2–4 N0–2 (resectable, fit patients)	Neoadjuvant chemoradiotherapy → surgery	Pre-operative chemoradiotherapy followed by surgery. Restaging with PET-CT or CT (chest/abdomen) and upper endoscopy to assess response and operability	Radiotherapy: 41.4–50.4 Gy concurrently with: **S:** carboplatin (IV) AUC 5 **AND** **S:** paclitaxel (IV) 175 mg/m² over 3 hours Day 1, repeated every 21 days	Neoadjuvant q21 days
T1b N1–2, T2–4 N0–2 (alternative)	Definitive chemoradiotherapy	Definitive chemoradiotherapy for organ preservation or non-surgical candidates	Radiotherapy: 50.4 Gywith carboplatin/paclitaxel regimen	As indicated
Stage I–III (inoperable)	Definitive chemoradiotherapy	Definitive chemoradiotherapy	Radiotherapy: 50.4–54 Gy with carboplatin/paclitaxel	As indicated
Stage IV (palliative)	Palliative therapy	Radiotherapy or chemoradiotherapy for symptom control (dysphagia, bleeding) ± endoscopic therapy, stenting, systemic therapy	Radiotherapy options: 50.4 Gy/28 fractions OR 35–40 Gy/15–16 fractions OR 30 Gy/10 fractions with carboplatin/paclitaxel	Symptom-directed

Stage	Treatment Modality	Management	Drugs / Radiotherapy (Dosing Schedule)	Cycle
Neoadjuvant chemotherapy (alternative regimen)	Systemic therapy	**S:** paclitaxel (IV) 175 mg/m² over 3 hours Day 1 **AND** **S:** cisplatin (IV) 75 mg/m² Day 1 **OR** **S:** carboplatin (IV) AUC 5 Day 1 every 21 days × 6 cycles **OR** **S:** docetaxel (IV) 75 mg/m² Day 1 **AND** **S:** cisplatin (IV) 75 mg/m² Day 1 every 21 days × 6 cycles	q21 days × 6	
Adjuvant chemotherapy	Post-operative systemic therapy	**S:** 5-Fluorouracil (IV) 1000 mg/m² Day 1–5 **AND** **S:** cisplatin (IV) 75 mg/m² Day 1 every 21 days × 6 cycles	q21 days × 6	
Palliative chemotherapy	Metastatic disease	**S:** capecitabine (PO) 1000 mg/m² twice daily Days 1–14, repeated every 21 days until progression or toxicity	q21 days continuous	

Note: All patients should be referred to cancer specialized centers for proper management Stenting, gastrostomy tube and parenteral nutrition are employed to provide feeding when there is total dysphagia.

22.6.2 Pancreatic cancer

Most common type is of ductal origin. Cystadenocarcinomas, intraductal carcinomas, and solid and cystic papillary neoplasms (also known as Hamoudi tumors) have a more indolent course. Acinar cell cancers and giant cell tumors are aggressive and have poor survival. 5% are tumors of the endocrine pancreas – these tumors are rare, slow-growing, and have a long natural history.

Risk factors

Known risks include tobacco use, alcohol abuse, a diet high in animal fat, ionizing radiation, chemotherapy, and exposure to 2-naphthylamine and benzene. Also, hereditary mutations in BRCA1, BRCA2, Jeghers, and Lynch syndromes.

Clinical Presentation

Most common presenting symptoms: jaundice (common bile duct obstruction), weight loss (malabsorption from exocrine dysfunction), diabetes (related to endocrine dysfunction), gastric outlet obstruction, and abdominal pain.

Investigations

- FBC, LFT, RFT, CA19-9, LDH, CEA, Alkaline phosphatase, amylase, lipase.
- CT Pancreatic protocol (Multiphase, thin slice, no skip)
- Endoscopic US
- Biopsy: ERCP, Laparoscopy, or CT guided
- CXR
- Abdomen and pelvis CT scan
- Laparoscopy
- PET/CT scan if clinically indicated
- Consider endoscopic retrograde cholangiopancreatography (ERCP) With stent placement

Table 22.28: a) Management of Pancreatic cancer by disease stage , Chemotherapy regimen and radiotherapy

Stage	Management	Chemotherapy regimen / Radiotherapy	Cycle
Resectable disease	Surgical management	Pancreaticoduodenectomy (Whipple procedure). Pylorus-preserving pancreaticoduodenectomy may be considered. Distal pancreatectomy for body/tail tumours often with en bloc splenectomy.	Single procedure
	Neoadjuvant therapy (selected high-risk cases)	Consider pre-operative chemotherapy prior to surgery	As per regimen
	Adjuvant chemotherapy	Gemcitabine/capecitabine combination OR gemcitabine alone OR 5-FU–based therapy	q21–28 days cycles
	Adjuvant chemoradiotherapy (R1 or node positive)	Concurrent chemoradiotherapy using 5-FU OR capecitabine OR gemcitabine	Sequential, sandwich, or post-chemotherapy (2–6 cycles chemo)

Stage	Management	Chemotherapy regimen / Radiotherapy	Cycle
Borderline resectable disease	Multimodal neoadjuvant approach	Staging laparoscopy → neoadjuvant chemotherapy → restaging → chemoradiotherapy → surgery if feasible	Multistep pathway
	Neoadjuvant chemotherapy	FOLFIRINOX OR gemcitabine + albumin-bound paclitaxel	q14–28 days
	Neoadjuvant chemoradiotherapy	Gemcitabine ± 5-FU–based concurrent chemoradiotherapy	As indicated
	Post-resection therapy	Additional chemotherapy or chemoradiotherapy (especially R1 or node-positive disease)	Individualized
Unresectable (locally advanced)	Definitive systemic + locoregional therapy	Initial chemotherapy → restaging → definitive chemoradiotherapy	Individualized
	Chemotherapy options	FOLFIRINOX OR gemcitabine-based regimen	q14–28 days
	Chemoradiotherapy	Concurrent chemoradiotherapy using 5-FU OR gemcitabine-based regimens	Curative intent where feasible
	Palliation	Stenting or surgical bypass for obstruction/symptom relief	Symptom-directed
Metastatic disease	Palliative management	Supportive care ± chemotherapy ± radiotherapy ± stenting/bypass	Individualized
	First-line chemotherapy (good PS)	FOLFIRINOX OR gemcitabine + albumin-bound paclitaxel	q14–28 days
	Poor performance status	Gemcitabine monotherapy + best supportive care	As tolerated
	Combined modalities	Chemo + RT or supportive interventions depending on symptoms	Symptom-directed

Table 22.28: b) Pancreatic Cancer – Pharmacological Management

Regimen	Drugs (Dosing Schedule)	Cycle
FOLFIRINOX regimen	**S:** oxaliplatin 85 mg/m² IV **AND** **S:** folinic acid 400 mg/m² IV **AND** **S:** irinotecan 180 mg/m² IV **AND** **S:** 5-Fluorouracil 400 mg/m² IV bolus then 2400 mg/m² continuous IV infusion	q14 days (± chemoradiotherapy)
Modified FOLFIRINOX	**S:** oxaliplatin 85 mg/m² IV **AND** **S:** folinic acid 400 mg/m² IV **AND** **S:** irinotecan 150 mg/m² IV **AND** **S:** 5-Fluorouracil 2.4 g/m² over 46 hours	q14 days (± chemoradiotherapy)
Gemcitabine + Capecitabine	**S:** gemcitabine 1000 mg/m² IV Days 1 & 8 **AND** **S:** capecitabine 1300 mg/m² PO twice daily Days 1–14	q21 days × 6 cycles
Gemcitabine + Nab-paclitaxel	**S:** gemcitabine 1000 mg/m² IV Days 1, 8, 15 **AND** **S:** nab-paclitaxel 125 mg/m² IV Days 1, 8, 15	q28 days × 6 cycles
CapOX regimen	**S:** capecitabine 1000 mg/m² PO twice daily Days 1–14 **AND** **S:** oxaliplatin 130 mg/m² IV Day 1	q21 days × 6 cycles
FOLFOX regimen	**S:** folinic acid 300 mg IV **AND** **S:** oxaliplatin 85 mg/m² IV **AND** **S:** 5-Fluorouracil 400 mg/m² IV bolus then 2000 mg/m² continuous infusion over 46 hours	q21 days × 6 cycles
FOLFIRI regimen	**S:** folinic acid 300 mg IV **AND** **S:** irinotecan 180 mg/m² IV **AND** **S:** 5-Fluorouracil 400 mg/m² IV bolus then 2000 mg/m² continuous infusion over 46 hours	q21 days × 6 cycles
Immunotherapy (MSI-H / dMMR / TMB-H ≥10 mut/Mb)	**S:** pembrolizumab 200 mg IV every 3 weeks OR 400 mg IV every 6 weeks	6–12 months
Immunotherapy (TMB-H ≥10 mut/Mb)	**S:** nivolumab 3 mg/kg IV every 3 weeks	6–12 months

22.6.3 Gastric Cancer

Gastric cancer is often diagnosed at an advanced stage. About 90–95% of the tumors are adenocarcinoma.

Risk factors

Risk factors include age, gender, genetic factors, smoking, salt-preserved food, a diet low in fruits and vegetables, infection with H. Pylori, and Epstein-Barr Virus.

Clinical Presentation

- Epigastric pain worsened by food intake, early satiety
- Distal tumours may present with obstructive symptoms
- Occult of manifest bleeding may be a feature
- Other symptoms include epigastric mass, pallor, weight loss, supraclavicular nodes, hepatomegaly, periumbilical nodes

Investigations

- FBC, LFT, RFT, H. pylori
- Stool for occult blood
- Carcinoembryonic antigen (CEA)
- IHC – Her 2 Status
- CXR
- Barium meal (double contrast)
- Abdomen and pelvis CT scan
- PET/CT scan if clinically indicated
- Endoscopy and biopsy for histology
- HER2-Neu testing if metastatic adenocarcinoma

Staging: TNM staging system

Management

Surgery is the primary treatment for early-stage gastric cancer. Total or partial gastrectomy is performed together with lymph node dissection. Bypass surgery is done to relieve obstructive symptoms. Surgery is usually preceded by Chemotherapy (Perioperative) or adjuvant chemoradiotherapy.

Table 22.29 a): Gastric Cancer Stage-Based Management

Stage	Management	Chemotherapy regimen / Radiotherapy	Cycle
T1N0	Surgery alone (partial or total gastrectomy with at least D1 lymph node dissection)	Selected T1a patients or medically unfit patients may undergo endoscopic mucosal resection (EMR) at experienced centres	Single procedure
T2–4 and/or LN+ (resectable and operable)	Pre-operative chemotherapy → surgery → post-operative chemotherapy in patients with good performance status	Pre-op chemotherapy × 3 cycles(FLOT or MAGIC regimen) → surgery → post-op chemotherapy × 3 cycles (same regimen)	Perioperative
	Surgery first (if no pre-op therapy)	Followed by adjuvant therapy depending on pathological stage	As indicated
	pT2N0 disease	Surveillance for selected patients with R0 resection and no high-risk features (poor differentiation, high grade, LVSI, PNI, age <50 years)	Ongoing surveillance
	pT3–4, pN+, or R1/R2 resection	Post-op chemotherapy → concurrent chemoradiotherapy → additional chemotherapy	5-FU/LV or capecitabine ×1 cycle → RT 45 Gy with concurrent 5-FU/capecitabine → additional 2 cycles
	Alternative option	Pre-operative chemoradiotherapy may be considered	As indicated
T2–4 and/or LN+ (unresectable/inoperable)	Concurrent chemoradiotherapy	5-FU-based OR taxanes-based chemotherapy + RT 45–50.4 Gy	As indicated
	If not RT candidate	Chemotherapy alone (5-FU, cisplatin, oxaliplatin, taxane, or irinotecan-based regimens)	As indicated
	Poor performance status	Best supportive care ± palliative radiotherapy	Symptom-directed

Stage	Management	Chemotherapy regimen / Radiotherapy	Cycle
M1 (Metastatic disease)	Palliative chemotherapy ± radiotherapy	5-FU OR capecitabine-based therapy + RT 45 Gy	Palliative
	Symptom palliation	Relief of gastric outlet obstruction, bleeding, pain, biliary obstruction	Palliation lasts ~4–18 months
	HER2-positive disease	Add trastuzumab to chemotherapy	Until progression/toxicity
	Alternative	Palliative surgery or best supportive care	Individualized

Table 22.29 b): Gastric Cancer Pharmacological Management

Treatment Setting	Regimen	Drugs Dosing Schedule	Cycle
Pre-operative chemotherapy	FLOT regimen	**S:** docetaxel 50 mg/m² IV **AND** **S:** folinic acid 200 mg/m² IV **AND** **S:** oxaliplatin 85 mg/m² IV **AND** **S:** 5-Fluorouracil 2600 mg/m² over 22 hours	q3 weeks × 3 cycles → surgery
Perioperative chemotherapy	MAGIC regimen	**S:** 5-Fluorouracil 500 mg/m² IV bolus Day 1 **AND** **S:** epirubicin 50 mg/m² IV over 30 minutes Day 1 **AND** **S:** cisplatin 60 mg/m² IV over 1 hour Day 1	q21 days × 6 cycles
	Alternative MAGIC regimen	**S:** capecitabine 625 mg/m² PO every 12 hours daily × 21 days **AND** **S:** epirubicin 50 mg/m² IV Day 1 **AND** **S:** cisplatin 60 mg/m² IV Day 1	q21 days × 6 cycles
	Alternative MAGIC regimen	**S:** 5-Fluorouracil 200 mg/m²/day continuous infusion Days 1–4 **AND** **S:** epirubicin 50 mg/m² IV Day 1 **AND** **S:** cisplatin 60 mg/m² IV Day 1	q21 days × 6 cycles
Locally advanced / metastatic gastric adenocarcinoma	Paclitaxel + Carboplatin	**S:** paclitaxel 175 mg/m² IV over 3 hours Day 1 **AND** **S:** carboplatin AUC 5 IV Day 1	q21 days × 6 cycles
	HER2-positive option	**AND/OR** **S:** trastuzumab IV 6 mg/m² loading dose Day 1, then 4 mg/m² every 14 days	For HER2-positive disease
	Docetaxel regimen	**S:** docetaxel 60 mg/m² IV over 2 hours Day 1 **AND** **S:** cisplatin 60 mg/m² IV Day 1 **AND** **S:** 5-Fluorouracil 750 mg/m² continuous infusion Days 1–4	q21 days × 6 cycles
	HER2-positive option	**AND/OR** **S:** trastuzumab IV 6 mg/m² loading dose Day 1, then 4 mg/m² every 14 days	For HER2-positive disease
Palliative setting	Capecitabine monotherapy	**S:** capecitabine 1000 mg/m² PO every 12 hours Days 1–14	q21 days × 6 cycles or until progression/toxicity

Note

- Concurrent Chemo radiotherapy with 3DCRT may be used as adjuvant post-surgery.
- Radiotherapy can also be used in palliative setting to control bleeding and pain.
- Gastric (MALT) lymphoma are associated with Chronic H. pylori inflammation. They are managed by H. pylori eradication and Chemoradiotherapy (see details in Lymphoma section).
- Patients with CD 117 positive gastro intestinal stromal tumor (GIST) respond well to imatinib.

22.6.4 Hepatocellular Carcinoma

Associated with chronic Hepatitis B/C infection.

Prevention

Vaccination for Hepatitis B/C. Cirrhosis, chronic liver disease, hereditary hemochromatosis, and aflatoxin B exposure are also risk factors.

Clinical Presentation

- An arterial bruit and ascites may be present
- Right upper abdominal swelling and pain are often associated with weight loss, fever, and jaundice

Investigations

- FBC, LFT, RFT, Serum alpha-fetoprotein, HBsAg, HB core antibody, partial thromboplastin time (PTT). Bilirubin, albumin, Hepatitis B/C panels.
- CXR/ Chest CT
- Abdomen and Pelvis USS
- 3-Phase Liver Protocol CT/MRI Scan with IV Contrast
- PET/CT
- Biopsy or FNAC of the Liver; not always needed If radiographic characteristics are diagnostic.

Staging: TNM staging system,

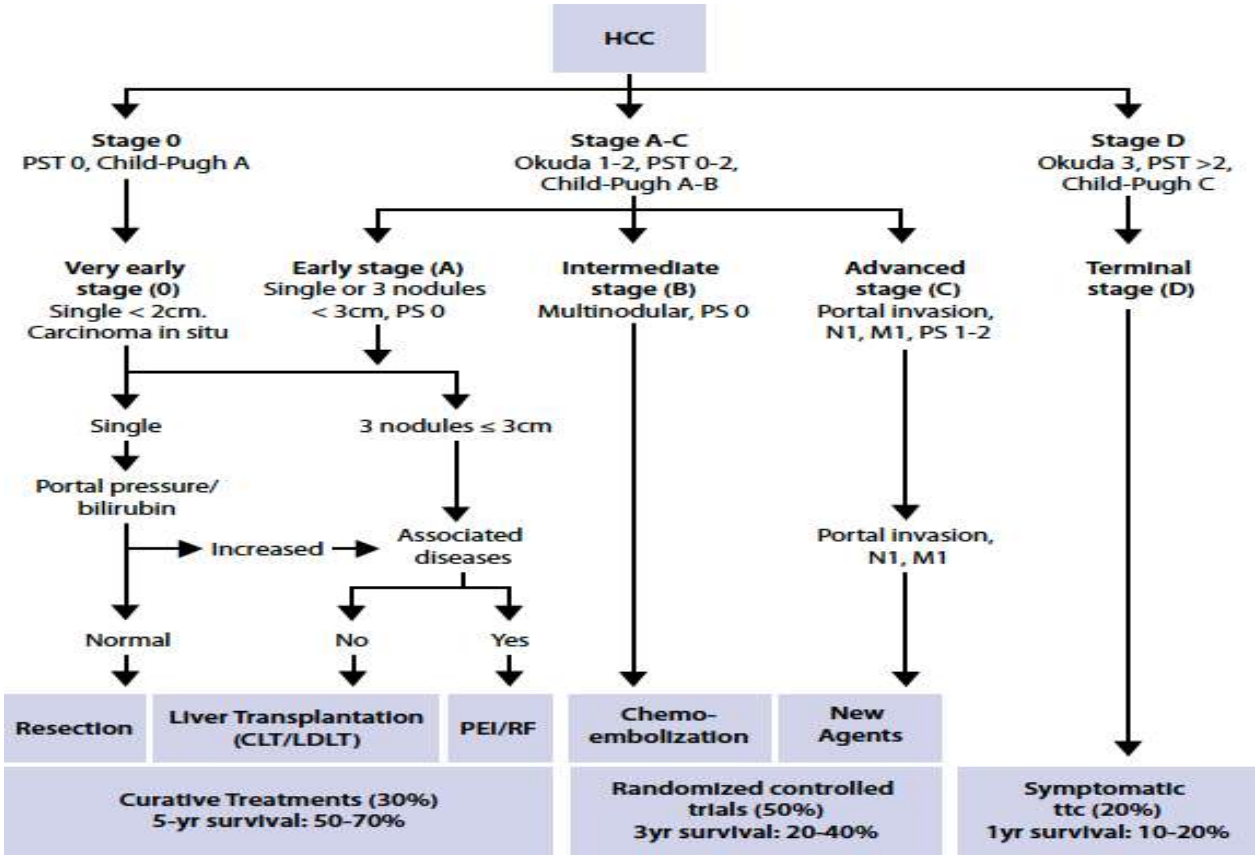
Table 22.14 Child Pugh Score

Parameter	Points for increasing abnormality		
	I	II	III
Encephalopathy (grade)	None	1-2	3-4
Ascites	None	Slight	Moderate
Albumin	>3.5	2.8-3.5	<2.8
Prothrombin time (s)	1-4	4-6	>6
Bilirubin (mg/dl) For primary biliary cirrhosis	1-2 1-4	2-3 4-10	>3 >10

Table 22.15: Management recommendations for Hepatocellular Carcinoma

Disease Presentation / Stage	Recommended Management
Resectable disease	• Partial hepatectomy
Unresectable disease, medically operable	• Liver transplantation
Unresectable disease, medically inoperable	• Ablative therapies: radiofrequency ablation (RFA), cryoablation, percutaneous ethanol injection, percutaneous acetic acid injection, or microwave ablation • Arterially directed therapies: bland embolization, transarterial chemoembolization (TACE), or radioembolization • Conformal radiotherapy ± chemotherapy • Systemic therapy • Best supportive care
Metastatic / Palliative disease	• Palliative radiotherapy for bone metastases • Palliative radiotherapy for brain metastases • Best supportive care

Figure 22.1: Flow chart for the management of Hepatocellular Cancer by Stage and Child Pugh Score



Pharmacological Management
Systemic therapy (advanced/unresectable disease):

S: doxorubicin (IV) 60 mg/m² over 30 minutes on day 1 every 3 weeks for 4–6 cycles
OR
S: sorafenib (PO) 400 mg orally twice daily until disease progression or unacceptable toxicity
OR
S: lenvatinib (PO) 12 mg orally once daily (for patients ≥60 kg) or 8 mg orally once daily (for patients <60 kg) until disease progression or unacceptable toxicity
OR
S: atezolizumab 1200 mg IV every 3 weeks until disease progression or unacceptable toxicity
AND
S: bevacizumab 15 mg/kg IV every 3 weeks until disease progression or unacceptable toxicity

Follow up
MRI or multiphase CT, and labs (LFTs, AFP) every 3–4 months for 2 years, then every 6 months. Chest CT as clinically indicated.

22.6.5 Rectal Cancer

Histology: the commonest is adenocarcinoma 95%.

Risk factors
Risk factors include: inherited genetic syndromes, a diet high in red and processed meat, smoking and alcohol abuse, having inflammatory bowel disease, type 2 diabetes, and obesity.

Screening
- Average risk persons (beginning age 40–75): colonoscopy 10 years.
- Family History (non-FAP/HNPCC): colonoscopy every 1–5 years, initiate at age 40 years or 10 years prior to earliest cancer diagnosis in the family.
- NPCC (lifetime colorectal cancer risk 10–70%, depending on mismatch repair status): colonoscopy every 1–2 years, initiate at age 20–25 or 10 years younger than earliest cancer diagnosis in the family

Clinical Presentation

- Change in bowel habit, e.g., constipation or diarrhea, sense of incomplete bowel emptying.
- Rectal bleeding or blood in stool.
- Abdominal mass with or without obstructive symptoms
- Unexplained weight loss and other symptoms of advanced disease.

Investigations

- FBC, RFT, LFT, CEA
- Stool for occult blood
- CXR/ Chest CT
- Barium enema (double contrast)
- Abdomen and Pelvis USS
- Digital rectal examination
- Sigmoidoscopy or Colonoscopy with Biopsy of the lesion
- Abdomen and Pelvis CT-Scan
- MRI
- PET/CT

Staging: TNM staging system

Management

Surgery is the primary treatment for early disease. Hemicolectomy with lymph node dissection is commonly performed in colon cancer. Give preoperative chemotherapy for locally advanced disease to shrink the tumor. Radiotherapy plays a role in rectal tumors as neo-adjuvant, adjuvant, or palliative.

Table 22.16 a): Rectal Cancer Management by disease stage

Stage	Management	Chemotherapy regimen / Radiotherapy)	Duration / Cycle
Stage I	Favorable T1N0 lesions: Transanal minimally invasive surgery (local excision)	Observation after local excision for favorable T1 lesions	Ongoing surveillance
	High-risk features after local excision (T2 disease, positive margins, Lymphovascular invasion, poorly differentiated histology)	Adjuvant chemoradiotherapy 45–50.4 Gyin 1.8 Gy/fraction	As indicated
	Alternative surgical management	Low lesions → Abdominoperineal resection (APR) Mid/upper lesions → Low anterior resection (LAR) or total mesorectal excision (TME)	Single procedure
	pT1–2N0 after surgery	No adjuvant treatment	Observation
Stage II/III (Pre-operative approach)	Neoadjuvant chemoradiotherapy → surgery → adjuvant chemotherapy	Pre-op chemoradiotherapy → LAR/APR → adjuvant chemotherapy	Multimodal treatment
	Standard long-course chemoradiotherapy	Radiotherapy 50.4 Gy/28 fractions + capecitabine OR infusion 5-FU	Pre-operative
	Alternative short-course radiotherapy	Radiotherapy 25 Gy/5 fractions → surgery	Pre-operative
	Adjuvant chemotherapy	FOLFOX OR CAPEOX preferred	As tolerated
Stage II/III (Post-operative approach)	Adjuvant chemotherapy → chemoradiotherapy → additional chemotherapy	Surgery first followed by combined adjuvant treatment	Multimodal treatment
	Initial adjuvant chemotherapy	FOLFOX OR CAPEOX × 2 cycles	Initial treatment
	Chemoradiotherapy	Radiotherapy 50.4–55.8 Gy + concurrent capecitabine OR infusion 5-FU	During treatment course
	Additional chemotherapy	Additional FOLFOX OR CAPEOX × 2 cycles	Post-chemoradiotherapy
T4 Unresectable disease	Management of obstruction	Consider diverting colostomy if near-total or total obstruction	As indicated
	Induction chemotherapy	FOLFOX	As per protocol
	Definitive chemoradiotherapy	Radiotherapy 55.8–59.4 Gy + concurrent capecitabine OR 5-FU	Pre-resection
	Surgery	Resection if tumour becomes operable	As indicated
	Adjuvant chemotherapy	FOLFOX OR CAPEOX as tolerated	Post-operative
Stage IV (Oligometastatic disease)	Induction chemotherapy → reassessment	CAPEOX OR FOLFOX OR FOLFIRI	As per response
	Metastatic management	Restaging followed by staged or synchronous treatment of liver/lung metastases (resection preferred)	Individualized
	Adjuvant systemic therapy	Systemic chemotherapy after metastasis-directed treatment	As tolerated

Pharmacological Management

Table 22.16 b): Recommended Chemotherapy Regimens for Rectal Cancer

Treatment Setting	Regimen	Chemotherapy / Radiotherapy Dosing Schedule)	Cycle
Neoadjuvant Chemoradiotherapy	Concurrent chemo RT followed by surgery	**S:** 5-Fluorouracil (IV) 350 mg/m² over 30 minutes **AND** **S:** folinic acid (IV) 20 mg/m² over 30 minutes on Days 1–5, administered during Week 1 and Week 5 of radiotherapy	Concurrent with RT
	Radiotherapy	45 Gy in 25 fractions over 5 weeks	5 weeks
	Surgery	Performed 4–10 weeks after completion of chemoradiotherapy	Single procedure
	Post-operative chemotherapy	**S:** 5-Fluorouracil (IV) 500 mg/m² over 30 minutes Days 1–5 **AND** **S:** folinic acid (IV) 20 mg/m² over 30 minutes Days 1–5	Every 21 days × 4 cycles
Adjuvant Chemoradiotherapy	Post-operative concurrent chemo RT	Initiated 3–10 weeks after surgery	Post-operative
	Concurrent chemotherapy	**S:** 5-Fluorouracil (IV) 500 mg/m² over 30 minutes on Days 1–5 and Days 29–33	During RT
	Radiotherapy	45 Gy in 25 fractions over 5 weeks	5 weeks
	Consolidation chemotherapy	Start 4 weeks after completion of chemoradiotherapy: **S:** 5-Fluorouracil (IV) 450 mg/m² bolus Days 1–5	Every 4 weeks × 2 cycles
Alternative Adjuvant Regimen	Oral concurrent chemoradiotherapy	**S:** Capecitabine (PO) 825 mg/m² every 12 hours during radiotherapy	During RT

22.6.6 Colon Cancer

Investigations

- FBC, RFT, LFT, CEA
- Stool for occult blood
- CXR
- Barium enema (double contrast)
- Abdomen and Pelvis USS.
- Digital rectal examination
- Sigmoidoscopy or Colonoscopy with Biopsy of the lesion
- Abdomen and Pelvis CT scan or MRI
- PET/CT

Staging: TNM staging system

Management

- Management of Non - metastatic disease: Surgery then Adjuvant Post Op Chemotherapy.
- Management of Metastatic Disease: Single or Combination Chemotherapy.

Table 22.17a: Colon Cancer management by disease stage

Stage	Management	Chemotherapy / Additional Treatment	Cycle
Stage I	Colectomy with lymph node dissection (LND)	No adjuvant chemotherapy required	Surgical management only
Stage II	Colectomy with lymph node dissection (LND)	Observation after surgery for low-risk disease	Ongoing surveillance
	High-risk pathological features (<12 lymph nodes analyzed, Lymphovascular invasion [LVI], perineural invasion [PNI], close/positive margins)	Consider adjuvant chemotherapy (FOLFOX OR CAPEOX)	As tolerated
Stage III	Colectomy with lymph node dissection (LND)	Adjuvant chemotherapy preferred: FOLFOX OR CAPEOX	Standard adjuvant course
Stage IV	Individualized multidisciplinary treatment	Consider resection of primary tumour and/or metastatic lesions where feasible	As indicated
	Systemic treatment	Neoadjuvant chemotherapy and/or adjuvant chemotherapy based on disease burden and resectability	Individualized

Pharmacological Management

Table 22.17b: Colon Cancer Management and Chemotherapy Regimens

Stage	Management	Drugs (Dosing Schedule)	Cycle
Stage I	Colectomy + lymph node dissection (LND)	No adjuvant chemotherapy required	Surgical management only
Stage II (Low-risk)	Colectomy + LND	Observation after surgery	Ongoing surveillance
Stage II (High-risk features) (<12 lymph nodes analyzed, LVI, PNI, close/positive margins)	Colectomy + LND followed by consideration of adjuvant chemotherapy	S: FOLFOX → **S:** oxaliplatin (IV) 85 mg/m² over 2 hours Day 1 **AND** **S:** folinic acid (IV) 400 mg/m² over 20 minutes Day 1 **AND** **S:** 5-Fluorouracil (IV) 400 mg/m² bolus Day 1, then 1200 mg/m²/day continuous infusion for 2 days (use infusion pump)	Every 14 days × 6–12 cycles
	Alternative adjuvant regimen	S: CAPEOX → **S:** oxaliplatin (IV) 130 mg/m² over 2 hours Day 1 **AND** **S:** capecitabine (PO) 1000 mg/m² every 12 hours for Days 1–14	Every 21 days × 4–8 cycles
	Alternative monotherapy	**S:** capecitabine (PO) 1000 mg/m² every 12 hours for Days 1–14	Every 21 days × 6 cycles
Stage III	Colectomy + LND followed by adjuvant chemotherapy (preferred: FOLFOX or CAPEOX)	Same regimens as above	As indicated
Stage IV (Metastatic disease)	Individualized treatment; consider resection of primary and/or metastatic disease where feasible	S: FOLFOX → **S:** oxaliplatin (IV) 85 mg/m² Day 1 **AND** **S:** folinic acid (IV) 400 mg/m² Day 1 **AND** **S:** 5-Fluorouracil (IV) 400 mg/m² bolus Day 1 then 1200 mg/m²/day continuous infusion for 2 days **WITH/WITHOUT** **S:** bevacizumab (IV) 5 mg/kg Day 1 **OR** **S:** cetuximab (IV) 500 mg/m² over 2 hours Day 1	Every 14 days × 6–12 cycles
	Alternative metastatic regimen	S: CAPEOX → Oxaliplatin (IV) 130 mg/m² Day 1 **AND** **S:** capecitabine (PO) 1000 mg/m² every 12 hours for Days 1–14 **WITH/WITHOUT** **S:** bevacizumab (IV) 5 mg/kg Day 1	Every 21 days × 4–8 cycles
	Alternative monotherapy	**S:** capecitabine (PO) 1000 mg/m² every 12 hours for Days 1–14	Every 21 days × 6 cycles
	Neoadjuvant/Adjuvant chemotherapy	Based on resectability and multidisciplinary review	Individualized

Follow up

- CEA every 3 months' x 2 years, then every 6 months x5 years.
- CT scan if high risk of recurrence approximately every 4–6 months. Recurrence commonly occurs within
- 2 years after initial therapy.
- Colonoscopy in 1 year, then every 2–3 years if negative.

Note

- Colorectal cancers are usually asymptomatic until advanced stage hence regular
- Screening with annual digital rectal examination, stool for occult blood + colonoscopy and is recommended starting at 40

22.6.7 Anal Cancer

75–80% are squamous cell carcinoma (SCC); others are adenocarcinoma or melanoma.

Risk factors

HPV found in 95% of Anal cancers with Squamous cell carcinoma histology. Additional risk factors: >10 sexual partners, history of genital warts, receptive anal intercourse, chronic immunosuppression, and cigarette smoking.

Investigations

- FBC, RFT, LFT, HIV/CD4
- CXR
- Abdomen and Pelvis USS.
- Digital rectal examination
- Sigmoidoscopy or Colonoscopy with Biopsy of the lesion
- Abdomen and Pelvis CT scan or MRI
- PET/CT

Staging: TNM Staging system

Management

- For resectable Good Performance status: Surgery (APR) then Adjuvant Chemoradiotherapy (45Gy-50Gy)
- For Unresectable Good Performance status: Neoadjuvant Chemoradiotherapy (45Gy- 50Gy) then Surgery (APR)
- For Inoperable and Poor Performance status: Palliative Radiotherapy

Table 22.18: Anal cancer management by disease stage

Stage / Condition	Management	Chemotherapy/ Radiotherapy Dosing Schedule	Cycle
Stage I–III (Anal canal, intact sphincter)	Definitive concurrent chemoradiotherapy	**S:** 5-Fluorouracil (5-FU) + **S:** Mitomycin C concurrent with radiotherapy	As per protocol
	Radiotherapy	Pelvic and inguinal radiotherapy (definitive treatment)	Standard course
Local recurrence	Salvage surgery	Abdominoperineal resection (APR) after prior chemoradiotherapy	Single procedure
	Inguinal node recurrence	Groin dissection	As indicated
Distant metastasis	Systemic chemotherapy ± palliative radiotherapy	**S:** 5-Fluorouracil (5-FU) + **S:** Cisplatin chemotherapy	As tolerated
	Palliative radiotherapy	For symptom control (pain, bleeding, local control), especially in good performance status and limited metastatic disease	Symptom-directed
Anal margin tumours (T1N0 well-differentiated)	Local excision	Wide local excision with ≥1 cm margin	Single procedure
	Surveillance	Observation if low-risk T1N0, well-differentiated tumour	Follow-up
Anal margin tumours (T2–T4 or poorly differentiated or node positive)	Definitive chemoradiotherapy	Concurrent chemo RT with **S:** 5-FU + S: Mitomycin C	Standard course
	Radiotherapy fields	Include pelvic lymph nodes ± inguinal lymph nodes depending on involvement (above dentate line or node-positive disease)	5–6 weeks
	Radiation dose	45 Gy elective nodal irradiation + 60 Gy to gross disease	As per protocol
	Alternative approach	Post-operative RT or chemoradiotherapy with inguinal node management	Individualized

Pharmacological Management

Concurrent Chemoradiotherapy:

S: mitomycin C (IV) 10mg/m2 bolus day 1 and 29

AND

S: 5-fluorouracil (IV) 1000mg/m2 Continuous infusion day 1-4 and 29-32.

OR

S: capecitabine (PO) 825mg/m2 12 hourly a day during radiotherapy (5 days a week)

AND

S:5 5-fluorouracil (IV) 1000mg/m2 Continuous infusion day 1-4 and 29-32.

Metastatic disease
As Rectum

Follow up

- Anal & inguinal LN exam every 8–12 weeks until Complete Remission, then every 3–6 mos × 5 yrs. Examine more frequently if persistent disease (e.g., monthly).
- Anoscopy q6–12 mos × 3 yrs.
- For T3–T4 or inguinal LN+: annual CT chest/abdomen/ pelvis for 3 yrs. Most recurrences occur within 2 yrs.

22.7 Lung Cancer

Worldwide, lung cancer is the leading cause of cancer-related death. Approximately 85 %–90% of lung cancer cases are caused by smoking. There are two main types of lung cancer: Non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC). These two types have different prognosis and management approach.

22.7.1 Non-small cell lung Cancer

Accounts for approximately 85% of all lung cancer cases

Clinical Presentation

- Chronic chest symptoms in a smoker
- Haemoptysis
- May present with superior vena cava obstruction (SVCO) syndrome
- Cough in a patient exposed to asbestos
- Findings of chest symptoms, weight loss, poor Karnofsky performance scale (KPS

Investigations

- FBC, LFT, Urea, Creatinine
- CXR PA & lateral views
- CT Scan of Thorax and Abdomen
- Abdominal USS
- Bronchoscopy and Biopsy for histopathology
- Cytology of sputum or bronchial aspirate examination
- PET/CT scan
- Molecular testing for EGFR, ALK, and PD-L1 Testing

Table 22.19 Non–Small Cell Lung Cancer (NSCLC) Management by disease stage

Stage	Treatment Recommendations	Chemotherapy / Radiotherapy (Dosing Schedule)	Duration / Cycle
Stage I–II (Operable)	Lobectomy preferred over pneumonectomy if anatomically feasible	Wedge resection only if physiologically compromised + lymph node sampling/dissection	Surgical
	Adjuvant chemotherapy (risk-based)	T1–2N1 (resected): Adjuvant chemotherapy T2N0 (>4 cm):Consider adjuvant chemotherapy T3N0: Adjuvant chemotherapy	Standard adjuvant course
	Positive or close margins	Re-resection OR post-operative radiotherapy	As indicated
Stage I–II (Inoperable)	Early-stage local disease	T1–2N0: Definitive SBRT (not conventional 3D RT) T3N0:Definitive MRI chemoradiotherapy OR hypofractionated RT OR SBRT T1–2N1: Definitive chemoradiotherapy (60–66 Gy)	Curative intent
	Adjuvant consideration	T2N0 (>4 cm): consider adjuvant chemotherapy	As indicated
Stage IIIA (Operable / Marginally operable)	Multimodality treatment	Option 1: Concurrent chemoradiotherapy (45 Gy) → restage → surgery → chemotherapy Option 2: Chemotherapy alone → restage → surgery → chemotherapy ± post-op RT (for +margin or N2 disease)	Sequential
	Definitive non-surgical option	Concurrent chemoradiotherapy	60–66 Gy
Stage IIIA (Inoperable)	Definitive therapy	Concurrent chemoradiotherapy (60–66 Gy)	Curative intent
	Alternative strategy	Induction chemotherapy → reassessment → concurrent chemoradiotherapy (to post-chemo volume if no progression)	Sequential
Stage IIIB	Standard definitive therapy	Concurrent chemoradiotherapy (60–66 Gy)	Curative intent
	Alternative approach	Induction chemotherapy → concurrent chemoradiotherapy (to post-chemo volume if no progression)	Sequential
	Selected T4N0–1 disease	Surgery ± chemotherapy ± radiotherapy OR chemoradiotherapy → surgery → chemotherapy	Individualized
Stage IV (Metastatic disease)	Molecularly targeted therapy	EGFR mutation: Erlotinib OR Gefitinib ± Bevacizumab ALK/ROS1 translocation: Crizotinib	Until progression
	Immunotherapy (PD-L1 ≥50%)	Pembrolizumab OR Nivolumab	As per response
	Systemic chemotherapy (ECOG 0–2)	Platinum-based doublet chemotherapy ± palliative radiotherapy	Standard cycles
	Poor performance status (ECOG 3–4)	Best supportive care	Palliative
	Post-platinum progression	Immune checkpoint inhibitors (anti–PD-1 / anti–PD-L1)	As indicated

Non Pharmacological Management
Smoking cessation advice and counselling

Pharmacological Management:
Recommended Chemotherapy regimens for adjuvant, unresectable, or recurrent and metastatic disease are;

Treatment Setting	Recommended Regimen	Dosing Schedule
Adjuvant therapy / Post-surgery	Cisplatin AND Etoposide	**S:** cisplatin 75 mg/m² IV day 1 **AND** **S:** etoposide 100 mg/m² IV days 1–3, every 4 weeks for 4 cycles
	Cisplatin AND Pemetrexed (non-squamous histology)	**S:** cisplatin 75 mg/m² IV day 1 **AND** **S:** pemetrexed 500 mg/m² IV day 1, every 3 weeks for 4 cycles
	Carboplatin AND Paclitaxel (any histology)	**S:** carboplatin AUC 6 IV day 1 **AND** **S:** paclitaxel 175 mg/m² IV day 1, every 3 weeks for 4 cycles
	Cisplatin AND Gemcitabine (squamous histology)	**S:** cisplatin 75 mg/m² IV day 1 **AND** **S:** gemcitabine 1250 mg/m² IV days 1 and 8, every 21 days for 4 cycles
Concurrent chemoradiotherapy	Cisplatin AND Etoposide	**S:** cisplatin 50 mg/m² IV days 1, 8, 29, and 36 **AND** **S:** etoposide 50 mg/m² IV days 1–5 and 29–33
	Carboplatin AND Paclitaxel	**S:** carboplatin AUC 2 IV **AND** **S:** paclitaxel 45 mg/m² IV weekly during radiotherapy, followed by carboplatin AUC 6 IV **AND** **S:** paclitaxel 200 mg/m² IV every 3 weeks for 2 cycles after radiotherapy
Consolidation chemotherapy after chemoradiotherapy	Carboplatin AND Paclitaxel	**S:** carboplatin AUC 6 IV **AND** **S:** paclitaxel 200 mg/m² IV every 3 weeks for 2 cycles
	Cisplatin AND Pemetrexed (non-squamous histology)	**S:** cisplatin 75 mg/m² IV day 1 **AND** **S:** pemetrexed 500 mg/m² IV day 1, every 21 days for 4 cycles
Recurrent / Metastatic disease	Carboplatin AND Paclitaxel	**S:** carboplatin AUC 6 IV day 1 **AND** **S:** paclitaxel 175 mg/m² IV day 1, every 21 days for 6 cycles
PD-L1 expression (selected patients)	Pembrolizumab	**S:** pembrolizumab 200 mg IV every 3 weeks OR 400 mg IV every 6 weeks for 6–12 months (only for MSI-H, dMMR, or TMB-H ≥10 mutations/Mb)
	Nivolumab	**S:** nivolumab 3 mg/kg IV every 2 weeks for 6–12 months (only for TMB-H ≥10 mutations/Mb)
EGFR mutation-positive disease	Erlotinib	**S:** erlotinib 150 mg PO once daily for 6–12 months
	Gefitinib	**S:** gefitinib 250 mg PO once daily for 6–12 months
ALK rearrangement-positive disease	Crizotinib	**S:** crizotinib 250 mg PO twice daily for 6–12 months

Radiotherapy
With advanced radiotherapy machines and treatment techniques, RT may be given for neo–adjuvant or adjuvant to surgery. Palliative Radiotherapy is frequently used in metastatic disease to bone, spinal cord compression, brain, liver, and in case of superior vena cava obstruction (SVCO), atelectasis, obstructive pneumonitis, and fungating masses. A dose of 30GY/10 Fractions/2weeks gives good symptom relief.

22.7.2 Small cell lung cancer

SCLC is characterized by early development of widespread metastases. It is highly sensitive to initial chemotherapy and radiotherapy; however, most patients eventually die of recurrent disease.
Diagnostic criteria and investigations: As in non–small cell lung cancer (NSCLC), however, brain scan and bone marrow aspirate are necessary

Staging: Limited disease versus extensive disease

Table 22.20: Small Cell Lung Cancer Management by disease stage

Stage	Management	Drugs / Radiotherapy Dosing Schedule)	cycle
Limited Stage Disease	Concurrent chemoradiotherapy (preferred)	**S:** cisplatin (IV) 75 mg/m² Day 1 **AND** **S:** etoposide (IV) 100 mg/m² Days 1–3, repeated every 21 days for 4 cycles **AND** early thoracic radiotherapy 60–70 Gy during cycle 1 or 2	Chemotherapy: q21 days × 4 cycles
Limited Stage Disease with Complete Response (CR) or Near-CR	Prophylactic cranial irradiation (PCI)	PCI: 25 Gy in 10 fractions	After completion of chemo-radiotherapy
Limited Stage Disease (cT1–2 N0, negative mediastinal staging)	Surgical management for selected patients (<5%)	Lobectomy AND mediastinal lymph node dissection/sampling	Selected surgical candidates
Post-operative pN0 disease	Adjuvant chemotherapy	**S:** cisplatin (IV) 75 mg/m² Day 1 **AND** **S:** etoposide (IV) 100 mg/m² Days 1–3, repeated every 21 days	q21 days × 4 cycles
Post-operative pN+ disease	Concurrent chemoradiotherapy	**S:** cisplatin (IV) 75 mg/m² Day 1 **AND** **S:** etoposide (IV) 100 mg/m² Days 1–3 every 21 days **AND** thoracic radiotherapy 60–70 Gy	q21 days × 4 cycles
Post-operative responders	Prophylactic cranial irradiation (PCI)	PCI: 25 Gy in 10 fractions	After chemotherapy/chemoradiotherapy
Extensive Stage Disease	Combination platinum-based chemotherapy ± palliative radiotherapy to symptomatic sites	**S:** cisplatin (IV) 75 mg/m² Day 1 **OR** **S:** carboplatin (IV) AUC 5–6 Day 1 **AND** **S:** etoposide (IV) 100 mg/m² Days 1–3, repeated every 21 days	q21 days for 4–6 cycles
Extensive Stage Disease with Partial Response (PR) or Complete Response (CR)	Prophylactic cranial irradiation (PCI)	PCI: 25 Gy in 10 fractions	After chemotherapy response
Extensive Stage Disease with residual thoracic disease	Consolidative thoracic radiotherapy	Thoracic RT: 30 Gy in 10 fractions	After chemotherapy response
Brain Metastases	Whole brain radiotherapy (WBRT)	WBRT: 30–37.5 Gy in 10–15 fractions	As indicated
Symptomatic metastatic disease	Palliative radiotherapy	RT to symptomatic metastatic sites (e.g., bone pain, bleeding, brain metastases)	As clinically indicated

Pharmacological Management

Aim is for local control and palliation. Cure rate is low

Platinum + Etoposide are the major drugs for which the tumor is sensitive.

S: cisplatin (IV) 60 mg/m2 1-hour infusion Day 1

AND

S: etoposide (IV) 100 mg/m2 over 30 minutes Day 1–3, Every 21 days for 4 –6 cycles

OR

S: carboplatin (IV) AUC 5 1-hour infusion Day 1

AND

S: etoposide 100 mg/m2 30 minutes (IV) infusion Day 1–3, every 21 days for 4–6 cycles

Other recommended chemotherapeutic drugs are irinotecan and gemcitabine

Radiotherapy:
Consolidation to primary site and mediastinum: 50Gy/25Fractions/5weeeks

- Prophylactic brain irradiation in complete responders
- Palliative treatment for symptom relief in respiratory, bone or CNS symptoms: 30Gy/10Fractions/2 weeks

22.8 Genitourinary Malignancies

22.8.1 Carcinoma of the Prostate

The most common type of prostate cancer is adenocarcinoma (95 %). Tumours are stratified by T stage, Gleason score (GS), and PSA into three prognostic groups of low, intermediate and high risk.

- Low risk: T1–T2a and PSA < 10 ng/ml and GS ≤ 6
- Intermediate risk: T2b or PSA 10 – 20 ng/ml or GS 7
- High risk: T2c–T4 or PSA > 20ng/ml or GS 8–10

Patient can be offered appropriate treatment options according to stage of disease, prognostic risk group and estimated survival taking into account performance status and comorbidity.

Clinical Presentation

- May be asymptomatic in the early stages of the disease
- May present incidentally following examination for benign prostatic hypertrophy or elevated serum prostatic specific antigen (PSA)
- Prostatic symptoms are associated with advanced stages of the disease, which include: reduced potency, urinary frequency and nocturnal, poor stream, hesitancy and terminal dribbling
- Very often patients may present with bone pain including backache or pathological fracture
- Digital Rectal Examination (DRE) typically reveals a hard, irregular prostate. TURP is carried out to both confirm the diagnosis and also as part of the treatment (to relieve obstruction).

Screening for prostate cancer
Routine screening not recommended, but when done should begin with PSA and digital rectal examination at age 50 if life expectancy is >10 years. It is recommended that screening of high-risk group should take place starting at age 45.

Investigations

- FBC, LFT, Urea, Creatinine, Serum PSA, ALP, Testosterone
- X-rays of the painful bone or spine
- CXR
- Abdomen and Pelvis USS and or CT scan
- Pelvic MRI in early-stage disease
- PET/CT
- Bone scan
- Biopsy for histopathology

Staging: TNM staging system

Management
Treatment depends on disease profile (Risk stratification) and patient factors as noted above. Options include:

- Watchful waiting
- Active surveillance
- Surgery (curative or palliative)
- Radiotherapy (curative or palliative)
- Hormonal therapy (chemical vs surgical castration)
- Chemotherapy

Surgery
Early stages (Low and Intermediate risk groups) can be treated with either radical prostatectomy or radical Radiotherapy with cure intent. However, surgery may cause postoperative impotence and impaired urinary control. TURP is carried out to both confirm the diagnosis and also as part of relieving obstruction.

Radiotherapy
Radical Radiotherapy for Adjuvant and definitive, EBRT up to 74 Gy/37 Fractions can be given using 3DCRT or IMRT Techniques. Palliative radiotherapy is valuable to bone metastases, massive hematuria, spinal cord compression and brain metastases

Hormonal Therapy
Hormonal manipulation is by surgical or medical castration. It is carried out in patients with locally advanced or metastatic disease. Bilateral orchidectomy is a surgical hormonal manipulation and should not be regarded curative surgery.

Pharmacological Management
S: goserelin (SC) 3.6 mg every 4 weeks or 10.8mg every 12 weeks with/ without oral bicalutamide (PO) 50mg once daily

Note

- Goserelin is not required after orchidectomy but patient may receive Bicalutamide.
- Treatment with goserelin and bicalutamide may be given up to 2 years depending on patient condition and Prostate Specific Antigen (PSA) levels

Chemotherapy
Recommended chemotherapy regimens for hormonal refractory prostate cancer are:
S: docetaxel (IV) 75mg/m2 2 hours' infusion day 1 given every 21 days for 6 cycles. It is mainly reserved in hormonal refractory prostate cancer.

For Bone metastases/osteolytic/tumour induced hypercalcemia are:
S: zolendronic acid (IV) 4mg over 15min given 4 Weekly

Metastatic disease
Lifelong ADT ± palliative RT ± bisphosphonates for hormone refractory disease. docetaxel and prednisone for androgen independent disease can add Carboplatin if docetaxel not working to Castrate resistant prostate cancer patients.

Evaluation every 3 months (Check PSA level) Castrate resistant patients with rising PSA zoledronic acid should be given monthly. These are given together with Ca2+ and Vitamin D supplements.

In Castrate resistant patients which did not respond to Docetaxel plus carboplatin and prednisolone, patients Abiraterone acetate with prednisolone is an option (500mg OD taken with food is highly recommended)

S: abiraterone acetate (PO) 500mg one a day (Taken with food)
OR
S: enzalutamide (PO) 160mg daily

22.8.2 Urinary Bladder Cancer

Urinary bladder cancers are malignant tumors that commonly arise from the inner lining of the bladder or its connective tissue. Common pathologies include transition cell carcinoma, squamous cell carcinoma, adenocarcinoma, sarcomas and secondary deposits.

Risk factors for bladder cancer include chronic irritation (schistosomiasis, irradiation, and catheterization), chemicals (aromatic amines, aniline dyes, tobacco, analgesics) and genetic predisposition. Symptoms include blood in the urine, dysuria, Lower urinary tract symptoms (LUTS), and low back pain.

Clinical Presentation
Symptoms include blood in the urine, pain with urination, and low back pain.

Investigations
- FBC, RFT, LFT, Alkaline phosphatase
- Urinalysis, Urine culture and sensitivity, Urine for cytology
- CXR and /or CT chest
- Bone scan
- Abdomen and Pelvis USS or CT scan
- PET/CT
- Cystoscopy with bladder mapping & Biopsy
- EUA
- Bimanual examination
- TURBT with random biopsies of normal appearing mucosa to exclude CIS. (If trigone involved, biopsy prostatic urethra)

Staging: TNM staging system

Management
Treatment of Urinary bladder cancer depends on how deeply the tumor invades into the bladder wall.
Surgery: Several modalities that may extend from bladder preserving surgery–TURB; to radical cystectomy with urine diversion depending bladder muscle invasion. Post operation patient may receive adjuvant chemo and/or radiotherapy

Chemotherapy
Chemotherapy in bladder cancer may be offered before surgery or after surgery. It may also be given concurrent with radiotherapy or as palliative in inoperative tumor.

Recommended chemotherapy regimens for locally advanced and metastatic disease are;
S: gemcitabine (IV) 1000mg/m2 infusion over 30minutes day 1, 8 & 15
AND
S: cisplatin (IV) 70mg/m2 infusion over 30mins day 2 given every 28 days for 6 cycles
OR
MVAC regimen
S: methotrexate (IV) 30mg/m2 over 5 minutes day1, 15 & 22
AND
S: vinblastine (IV) 3mg/m2 over 10 minutes day2, 15 & 22
AND
S: doxorubicin (IV) 30mg/m2 over 15 minutes day2
AND
S: cisplatin (IV) 70mg/m2 over 30mins day2

Radiotherapy
Radiotherapy may be given after bladder-preserving surgery or alone in small lesions with a dose up to 66Gy/33Fractions concurrent with cisplatin. It is also commonly used as palliative therapy to control bleeding and or pain locally advanced and metastatic disease. Palliative dose 30Gy/10Fractions or 20Gy/5Fractions

22.8.4 Testicular Cancer

Testicular cancer types:

- Germ cell tumor (GCT, which accounts for >95% of testicular cancers) and pure seminoma (60% of GCT).
- Non-seminomatous germ cell tumors (NSGCT, 40% of GCT).
- Embryonal, yolk sac tumor, choriocarcinoma, teratoma, and mixed.
- Sex cord-stromal tumors.
- Sertoli cell, Leydig cell, granulosa cell, and mixed types.
- Others include lymphoma and embryonal rhabdomyosarcoma.

Investigations

- Bilateral testicular ultrasound, β-hCG, AFP, LDH, RFT, and LFT.
- CXR.
- CT Chest, abdomen, and pelvis.
- PET CT scan
- MRI
- Bone scan

Table 22.21: Testicular Cancer Management by disease stage

Stage	Treatment Recommendation	Drugs / Radiotherapy Dosing Schedule)	Cycle
All patients	Primary surgical management	Radical inguinal orchiectomy with high ligation of spermatic cord	Surgical
Stage I Seminoma	Post-orchiectomy surveillance preferred for compliant patients (pT1–T3)	Surveillance	Ongoing follow-up
	Alternative adjuvant therapy	Radiotherapy: 20 Gy to para-aortic ± pelvic lymph nodes	As prescribed
	Alternative adjuvant chemotherapy	**S:** carboplatin AUC 7 IV day 1	1–2 cycles
Stage IIA Seminoma	Definitive RT or chemotherapy	Radiotherapy: 20 Gy to pelvic and para-aortic lymph nodes PLUS boost to gross disease to total 30 Gy	As prescribed
	Alternative chemotherapy	**S:** etoposide 100 mg/m² IV days 1–5 **AND** **S:** cisplatin 20 mg/m² IV days 1–5 every 3 weeks (EP) **OR** **S:** bleomycin 30 units IV days 1, 8, 15 **AND** **S:** etoposide 100 mg/m² IV days 1–5 **AND** **S:** cisplatin 20 mg/m² IV days 1–5 every 3 weeks (BEP)	EP × 4 cycles OR BEP × 3 cycles
Stage IIB Seminoma	Definitive RT or chemotherapy	Radiotherapy: 20 Gy to pelvic and para-aortic lymph nodes PLUS boost to gross disease to total 36 Gy	As prescribed
	Alternative chemotherapy	**S:** EP OR BEP regimen as above	EP × 4 cycles OR BEP × 3 cycles
Stage IIC / Stage III Seminoma	Systemic chemotherapy	**S:** EP regimen OR BEP regimen	EP × 4 cycles OR BEP × 3 cycles
NSGCT (Non-Seminomatous Germ Cell Tumors)			
Stage IA	Primary management	Open nerve-sparing retroperitoneal lymph node dissection (nsRPLND)	Surgical
Stage IB	nsRPLND	Surgery	Surgical
	Alternative chemotherapy	**S:** bleomycin 30 units IV days 1, 8, 15 **AND** **S:** etoposide 100 mg/m² IV days 1–5 **AND** **S:** cisplatin 20 mg/m² IV days 1–5 every 3 weeks (BEP)	1–2 cycles
	Alternative option	Surveillance (if T2 and compliant patient)	Ongoing follow-up

Stage	Treatment Recommendation	Drugs / Radiotherapy Dosing Schedule)	Cycle
Stage IIA	Marker-negative disease	nsRPLND	Surgical
	Alternative chemotherapy	**S:** EP regimen OR BEP regimen	EP × 4 cycles OR BEP × 3 cycles
	Persistent tumour marker elevation	**S:** EP regimen OR BEP regimen	EP × 4 cycles OR BEP × 3 cycles
Stage IIB	Marker-negative LN metastases within drainage sites	nsRPLND	Surgical
	Alternative chemotherapy	**S:** EP regimen OR BEP regimen	EP × 4 cycles OR BEP × 3 cycles
	Persistent marker elevation/multifocal LN metastases	**S:** EP regimen OR BEP regimen	EP × 4 cycles OR BEP × 3 cycles
Stage IIC / IIIA	Systemic chemotherapy	**S:** EP regimen OR BEP regimen	EP × 4 cycles OR BEP × 3 cycles
Stage IIIB	Systemic chemotherapy	**S:** bleomycin 30 units IV days 1, 8, 15 **AND** **S:** etoposide 100 mg/m² IV days 1–5 **AND** **S:** cisplatin 20 mg/m² IV days 1–5 every 3 weeks (BEP)	4 cycles
Stage IIIC	Preferred systemic chemotherapy	**S:** BEP regimen	4 cycles
	Alternative regimen	**S:** etoposide 75 mg/m² IV days 1–5 **AND** **S:** ifosfamide 1,200 mg/m² IV days 1–5 **AND** **S:** cisplatin 20 mg/m² IV days 1–5 every 3 weeks (VIP)	4 cycles

Pharmacological Management

S: bleomycin 30,000 IU days 1,8,15 IV

AND

S: cisplatin 50mg/m2 days 1,2

AND

S: etoposide 150mg/m2 days 1,2,3. Repeat every 3 weeks for 3-4 cycles

Alternatively

S: etoposide 75mg/m2 days 1,2,3,4,5

AND

S: cisplatin 20mg/m2 days 1,2,3,4,5

AND

S: mesna 120mg/m2 days 1,2,3,4,5

AND

S: ifosfamide 1200mg/m2 + mesna 600mg/m2 days 1,2,3,4,5. Repeat every 3 weeks for 4 cycles.

22.8.5 Renal Cell Carcinoma

Renal cell carcinoma (RCC) constitutes 80–95% of primary renal neoplasms. There are four subtypes of RCC: clear cell (75–85%), chromophilic/papillary (10–15%), chromophobic (5–10%), oncocytic (3–5%), and collecting duct (very rare). RCC is a radioresistant tumor and has low response rates to cytotoxic chemotherapies, though targeted molecular agents and stereotactic ablative radiotherapy are redefining the management of the disease.

Risk factors
Risk factors: tobacco, occupational exposure to cadmium/asbestos/petrols, obesity, acquired cystic disease of the kidney, and phenacetin-containing analgesics exposure.

Table 22.22: Renal Cell Carcinoma Management by disease stage

Stage	Treatment Recommendation	Drugs / Radiotherapy Dosing Schedule	Cycle
Stage I–III	Primary surgical management	Partial nephrectomy if feasible	Surgical
		Radical nephrectomy if partial nephrectomy is not feasible or tumor is centrally located	Surgical
	Regional nodal disease	Regional lymph node dissection for radiographic or palpable adenopathy	Surgical
	Adjuvant systemic therapy	No established role	Not applicable
	Neoadjuvant/adjuvant radiotherapy	No established role	Not applicable
	Inoperable disease	Cryosurgery OR radiofrequency ablation	As indicated
	Alternative for inoperable patients	Radiotherapy 45–50 Gy in fractions	As prescribed
Stage IV (Metastatic disease)	Cytoreductive surgery	Cytoreductive nephrectomy for potentially resectable primary tumor in patients with solitary metastasis, good performance status, and/or limited metastatic burden	Surgical
	First-line molecular targeted therapy	**S:** bevacizumab 10 mg/kg IV every 2 weeks **OR** **S:** axitinib 5 mg orally twice daily **OR** **S:** sunitinib 50 mg orally once daily (4 weeks on/2 weeks off) **OR** **S:** pazopanib 800 mg orally once daily **OR** **S:** sorafenib 400 mg orally twice daily	Until progression/unacceptable toxicity
	Immunotherapy	**S:** interleukin-2 (IL-2) 600,000 IU/kg IV every 8 hours (selected patients) **OR** **S:** interferon alfa 5–10 million units SC three times weekly	As tolerated / until progression
	Treatment of metastases	Metastasectomy for resectable metastatic lesions	As indicated
	Palliative treatment	External beam radiotherapy (EBRT) for symptomatic metastases	As prescribed
	Focal palliation	Supportive care for pain, bleeding, spinal cord compression, or brain metastases	As indicated

Pharmacological Management
S: bevacizumab 4.5mg/kg loading dose then 3mg/kg every 3 weeks for 12 cycles.
OR
S: sunitinib 50mg PO daily for 4 weeks then rest 2 weeks. Repeat for 8 -12 cycles.
OR
S: sorafenib 400mg PO 12hourly for 4 weeks. Repeat for 8-12 cycles.

22.9 Haematological Malignancies

22.9.1 Lymphomas

The World Health Organization broadly classifies lymphomas into Hodgkin lymphoma (HL) and non-Hodgkin lymphoma (NHL).

22.9.1.1 Non-Hodgkin's lymphoma

NHLs are a heterogeneous group of diseases which are mainly linked by their origin within the lymphoid system and its different cellular components. They are -sub-classified based on the stage of maturation (immature vs. mature) and cell of origin [B cell, T cell, or natural killer cell (NK) cell].

Clinical Presentation
- Peripheral Lymph node enlargement (commonest site-neck)
- Hepatomegaly and/or splenomegaly in advanced stages
- B-symptoms: Unexplained weight loss, fever, drenching night sweats
- Coughing, trouble breathing, or chest pain in case of Superior vena cava obstruction (SVCO)

Investigations

- CXR
- Chest and Abdominopelvic CT scan
- PET/CT
- FBC, differential, and film
- Bone marrow aspirate and trephine
- Immunohistochemistry (IHC)
- LDH, Urea, Electrolyte, Creatinine, Albumin, Aspartate transaminase (AST), Bilirubin, Alkaline phosphatase, Serum calcium, Uric acid, HIV
- Pregnancy test in females of hild–bearing age
- Hepatitis B and C
- HIV status
- Tissue Biopsy for histopathology
- MUGA scan/ ECHO

Note: Lumbar puncture and CSF cytology if there is CNS involvement in NHL associated with a high risk of CNS relapse, e.g., Testicular, paranasal sinuses, extradural/paraspinal mass.

Staging: Ann Arbor classification.

Management:

NHL diseases are sensitive to both chemotherapy and radiotherapy

Table 22.23: Non-Hodgkin Lymphoma (B-Cell) Management by grade and disease stage

Grade	Stage	Treatment Recommendations	Drugs / Radiotherapy (Dosing Schedule)	Cycle
Low Grade B-cell NHL	I–II	Localized disease	Involved-site radiotherapy (ISRT)	24–30 Gy in 1.5–2 Gy fractions
	III–IV (asymptomatic)	Observation	Watchful waiting	Until progression
	III–IV (symptomatic)	Systemic therapy ± local control	**S:** rituximab 375 mg/m² IV day 1 **AND/OR** **CHOP** **S:** cyclophosphamide 750 mg/m² IV day 1 **AND** **S:** doxorubicin 50 mg/m² IV day 1 **AND** **S:** vincristine 1.4 mg/m² IV day 1 **AND** **A:** prednisolone 100 mg PO days 1–5) **OR** **CVP** **S:** cyclophosphamide + **S:** vincristine + **A:** prednisolone)	6–8 cycles
	Any stage (relapse)	Salvage therapy	Rituximab ± chemotherapy OR radioimmunotherapy OR high-dose chemotherapy + stem cell transplant	Individualized
Intermediate Grade B-cell NHL	I–II (favorable)	Aggressive lymphoma with CD 20 positive These include B-cell lymphoma (DLBCL), primary CNS lymphoma, adult Burkitt lymphoma, mantle cell lymphoma, and aggressive T-cell lymphomas. Combined modality	**R-CHOP** **S:** rituximab 375 mg/m² IV day 1 **AND** **S:** cyclophosphamide 750 mg/m² IV day 1 **AND** **S:** doxorubicin 50 mg/m² IV day 1 **AND** **S:** vincristine 1.4 mg/m² IV day 1 **AND**	3 cycles
			A: prednisolone 100 mg PO days 1–5) every 21 days	6–8 cycles.
			ISRT	30–36 Gy
	I–II (alternative)	Systemic therapy alone	R-CHOP regimen	6 cycles
	I–II (unfavorable)	Combined modality	R-CHOP ± ISRT	6 cycles ± RT
		Alternative	R-CHOP + ISRT	3 cycles + 30–36 Gy
	III–IV	Advanced disease	R-CHOP regimen	6–8 cycles
		Bulky disease	R-CHOP + ISRT to bulky sites	As indicated
	Relapsed/Refractory	Salvage therapy	DHAP (Dexamethasone + High-dose Cytarabine + Cisplatin) OR ICE (Ifosfamide + Carboplatin + Etoposide) OR MINE-ESHAP OR Lenalidomide-based regimens	Individualized
High Grade B-cell NHL	All stages	Primary treatment	S: R-CHOP regimen (as above)	6–8 cycles
	Symptomatic disease	Palliative therapy	Palliative radiotherapy	As indicated

Radiotherapy

- Radiotherapy is directed to stage IA and IIA Disease.
- Mantle or inverted Y: 40Gy/20 Fractions/4weeks with shielding of the critical organs.
- Involved field RT (IFRT): 46Gy/23 Fractions/4.5weeks

22.9.1.2 Primary CNS Lymphoma

Standard chemotherapy regimens like CHOP are not effective, possibly due to poor penetration of the blood-brain-barrier (BBB).

Pharmacological Management

S: methotrexate (IV) 8mg/m2/day twice a week until remission is achieved

22.9.1.3 Burkitt Lymphoma (BL)

Recommended chemotherapy regimens are:

S: CODOX-M AND IVAC (Magrath regimen- cyclophosphamide, vincristine, doxorubicin, methotrexate/ifosfamide, etoposide, cytarabine) (IV)

OR

S: CALGB 9251 (cyclophosphamide, prednisolone, ifosfamide, mesna, methotrexate, folinic acid, vincristine, cytarabine, etoposide, dexamethasone and doxorubicin) (IV)

OR

S: Hyper CVAD (cyclophosphamide, vincristine, doxorubicin and dexamethasone, methotrexate, cytarabine, folinic acid, methylprednisolone and 6-mercaptopurine) (IV)

OR

S: Dose-adjusted CHOP+ Etoposide (IV)

Aggressive T-cell lymphomas

Rare and more aggressive than DLBCL. First-line therapy is usually

S: CHOP with Etoposide (CHEOP) (IV)

OR

S: cyclophosphamide (IV) day1 750 mg/m2 1-hour infusion AND doxorubicin (IV) 50 mg/m2 15 minutes' infusion day 1 AND vincristine (IV) 1.4 mg/m2 over 10 minutes (maximum 2mg) day1 AND prednisolone (PO) 100mg once a day, day 1–5 AND etoposide 100mg/m2 (IV) day 1-day 3; repeat every 21 days for 6–8 cycles.

Note

- For MALT lymphoma, eradication of Helicobacter pylori is essential. Splenectomy is recommended in splenic marginal zone lymphoma.
- Topical corticosteroids are indicated for localized or generalized skin involvement in mycosis fungoides. Systemic therapy is indicated for non-responders and Sezary syndrome.

These include S: retinoids, interferons and low dose methotrexate.

S: fludarabine AND Cyclophosphamide (FC) regimen is used as a second-line therapy for indolent B-cell lymphoma.

22.9.1.4 Hodgkin's disease (HD)

Hodgkin Lymphoma comprises about 30% of all lymphomas. The disease is characterized by scattered large multinucleated Reed-Sternberg or mononuclear Hodgkin's cells in an inflammatory background of a lymph node biopsy section.

Classified into two main types:

- Nodular lymphocyte predominant Hodgkin lymphoma–NLPHL
- Classical Hodgkin lymphoma–CHL, which is subdivided into:
    - Nodular sclerosis classical Hodgkin lymphoma–NSHL
    - Mixed cellularity classical Hodgkin lymphoma–MCHL
    - Lymphocyte–rich classical Hodgkin lymphoma–LRCHL
    - Lymphocyte–depleted classical Hodgkin lymphoma–LDHL

Clinical Presentation

- Enlarged painless lymph nodes in the neck or elsewhere
- B symptoms (weight loss, night sweats, and fever), pruritus, alcohol induced pain, general condition, throat, lymph nodes (site, number, size, consistency, mobility, matting), respiratory system, abdomen (liver, spleen, other masses), bone tenderness

Investigations

- CXR
- CT-Scan of neck, chest, abdomen, and pelvis
- PET/CT
- FBC, LFT, RFT, ESR, LDH, HIV Test
- Bone marrow aspirate and biopsy (Not required in Stage I or II A)
- Biopsy for histological diagnosis
- MUGA scan / ECHO

Management

As it is for NHL, HL diseases are sensitive to both chemotherapy and radiotherapy.

Table: 22.24a: Management of Hodgkin's disease by disease stage

Stage	Treatment Recommendations	Drugs / Radiotherapy Dosing Schedule	Cycle
Stage IA / IIA (Favorable)(no bulky mediastinum, <10 cm nodes, ≤3 sites, ESR <50, no B symptoms)	Standard combined-modality or PET-adapted therapy	**S:** ABVD **S:** doxorubicin 25 mg/m² IV days 1 & 15 **AND** **S:** bleomycin 10 units/m² IV days 1 & 15 **AND** **S:** vinblastine 6 mg/m² IV days 1 & 15 **AND** **S:** dacarbazine 375 mg/m² IV days 1 & 15) every 28 days **AND/OR** **S:** ISRT	ABVD × 2–4 cycles + RT
	PET-adapted option	ABVD × 2 cycles → PET/CT → continue ABVD or stop based on response (Deauville score)	Total 2–6 cycles
	Radiotherapy	Involved-site radiotherapy (ISRT): 20 Gy (complete response) or 30 Gy (partial response)	As indicated
	Alternative regimen	Stanford V regimen (chemotherapy combination protocol)	8 weeks + ISRT 30 Gy
Stage I–II (Unfavorable bulky) (>10 cm or mediastinal bulky disease)	Combined chemotherapy + PET-adapted RT	ABVD × 4 cycles → PET/CT → continue ABVD or escalate depending on Deauville score	4–6 cycles
	Alternative PET-adapted strategy	ABVD × 4–6 cycles based on response	As per response
	Alternative regimen	Stanford V × 12 weeks → PET/CT → ISRT	30–36 Gy to bulky sites
	Intensified option	Escalated BEACOPP × 2 cycles + ABVD × 2 cycles → PET/CT → ISRT	As per response
Stage I–II (Unfavorable non-bulky)	Standard chemotherapy with PET adaptation	ABVD × 4 cycles → PET/CT → continue ABVD if responsive	Total 6 cycles
	Alternative regimen	Stanford V × 12 weeks → PET/CT → ISRT	30–36 Gy to initial bulky sites (>5 cm if present)
	Intensified regimen	Escalated BEACOPP × 2 + ABVD × 2 → PET/CT → ISRT	As indicated
Stage III–IV (Advanced disease)	Standard chemotherapy with PET-guided approach	ABVD × 2 cycles → PET/CT → continue ABVD if Deauville 1–3 OR escalate therapy if poor response	Total 6 cycles
	Poor PET response (Deauville 4–5)	Escalated BEACOPP × 4–6 cycles OR continue ABVD (selected cases) → PET/CT	As per response
	Alternative regimen	Stanford V × 12 weeks → PET/CT → ISRT to residual bulky sites (>5 cm) or spleen involvement	30–36 Gy
	PET-adapted escalation	Escalated BEACOPP × 6 cycles → PET/CT	6 cycles
	Response-based radiotherapy	Deauville 1–2: observe OR Deauville 2–3: ISRT for PET-positive residual (>2.5 cm) OR Deauville 5 (biopsy negative): observe or ISRT	As indicated
Relapsed / Refractory Hodgkin Lymphoma	Salvage chemotherapy ± immunotherapy	DHAP (Dexamethasone + High-dose Cytarabine + Cisplatin) OR ICE (Ifosfamide + Carboplatin + Etoposide) OR MINE- ESHAP OR MOPP OR ESHAP OR DHAC OR IGE C AND/OR checkpoint inhibitors	Individualized cycles
	Immunotherapy options	**S:** nivolumab OR **S:** pembrolizumab	Until progression / response

Table: 22.24b Pharmacological Management

Treatment Category	Treatment Recommendations	Drugs / Radiotherapy Dosing Schedule	Cycle
First-line chemotherapy (ABVD)	Standard curative regimen for Stage II–IV disease	**S:** doxorubicin 25 mg/m² IV over 30 min day 1 & 15 **AND** **S:** bleomycin 10 IU/m² IV over 10 min day 1 & 15 **AND** **S:** vinblastine 6 mg/m² IV over 10 min day 1 & 15 **AND** **S:** dacarbazine 375 mg/m² IV infusion over 30 min day 1 & 15	Every 28 days for 4–8 cycles
First-line chemotherapy (Stanford V)	Alternative regimen for advanced disease	**S:** doxorubicin 25 mg/m² IV **AND** **S:** vinblastine 6 mg/m² IV days 1 & 15 **AND** **S:** bleomycin 5 units/m² IV **AND** **S:** vincristine 1.4 mg/m² IV (max 2 mg) days 8 & 22 **AND** **S:** etoposide 60 mg/m² IV days 15 & 16 **AND** **A:** prednisone 40 mg/m² PO every other day (weeks 1–10, taper weeks 11–12)	12 weeks
Escalated BEACOPP	High-risk or poor prognosis disease	**S:** cyclophosphamide 1200 mg/m² IV day 1 **AND** **S:** doxorubicin 35 mg/m² IV day 1 **AND** **S:** etoposide 200 mg/m² IV days 1–3 **AND** **S:** procarbazine 100 mg/m² PO days 1–7 **AND** **A:** prednisone 40 mg PO days 1–14 **AND** **S:** vincristine 1.4 mg/m² IV day 8 (max 2 mg) **AND** **S:** bleomycin 10 mg/m² IV day 8	Cycles every 21 days
ICE regimen (salvage)	Relapsed/refractory disease	**S:** ifosfamide 5 g/m² IV day 2 **AND** **S:** carboplatin AUC 5 IV day 1 **AND** **S:** etoposide 100 mg/m² IV days 1–3	Every 14 days for 2 cycles
DHAP regimen (salvage)	Relapsed/refractory disease	**D:** dexamethasone 40 mg PO days 1–4 **AND** **S:** cytarabine 2 g/m² IV every 12 hours × 2 doses day 2 **AND** **S:** cisplatin 100 mg/m² IV day 1	Every 21 days for 2 cycles
ESHAP regimen (salvage)	Relapsed/refractory disease	**S:** etoposide 40 mg/m²/day IV **AND** **D:** methylprednisolone 500 mg/day IV **AND** **S:** cisplatin 25 mg/m²/day continuous IV days 1–4 **AND** **S:** cytarabine 2 g/m² IV day 5	Every 21–28 days up to 6 cycles
GCD regimen (salvage)	Relapsed disease	**S:** gemcitabine 1000 mg/m² IV days 1 & 8 **AND** **S:** carboplatin AUC 5 IV day 1 **AND** **D:** dexamethasone 40 mg PO days 1–4	Repeated cycles
GVD regimen (salvage)	Relapsed disease	**S:** vinorelbine 20 mg/m² IV **AND** **S:** gemcitabine 1000 mg/m² IV **AND** **S:** liposomal doxorubicin 15 mg/m² IV days 1 & 8	Every 21 days for 2–6 cycles

Treatment Category	Treatment Recommendations	Drugs / Radiotherapy Dosing Schedule	Cycle
IGEV regimen (salvage)	Relapsed/refractory disease	**S:** ifosfamide 2000 mg/m² IV **AND** **S:** mesna 2600 mg/m² IV **AND** **S:** gemcitabine 800 mg/m² IV days 1–4 **AND** **S:** vinorelbine 20 mg/m² IV day 1	Cycles per protocol
Immunotherapy (relapsed/refractory)	Checkpoint inhibitor therapy	**S:** nivolumab 240 mg IV every 2 weeks OR 480 mg IV every 4 weeks (over 30 min) **OR** **S:** pembrolizumab 200 mg IV every 3 weeks OR 400 mg IV every 6 weeks	Up to 12 months or until progression/toxicity
Radiotherapy (all stages as indicated)	Local disease control or consolidation	Involved-field RT / Mantle field / Inverted Y field: 1.8–2 Gy per fraction to total dose 30–40 Gy	As per protocol

22.9.2 Leukemia

The symptoms and signs are caused by: (i) bone marrow failure (e.g., anaemia, neutropenia, thrombocytopenia); and (ii) infiltration of organs (e.g. liver, spleen, lymph nodes, meninges, brain, skin or testes).

Investigations

- FBC, LFT, RFT, Coagulation indices
- Peripheral blood film
- Bone marrow aspiration and trephine biopsy
- Flow cytometry analysis, immunophenotyping, cytogenetic and molecular evaluation.
- ECHO/ECG for Cardiac function evaluation.

22.9.2.1 Acute Myeloid Leukemia (AML)

Classification: According to WHO

Table 22.25; Pharmacological Management

Treatment Phase	Treatment Recommendation	Drugs / Regimen Dosing Schedule	Cycle
Induction phase	Standard remission-induction therapy	**S:** 7+3 regimen **S:** cytarabine 100 mg/m² IV continuous infusion every 24 hours for 7 days **AND** **S:** daunorubicin 60 mg/m² IV every 24 hours for 3 days	Single induction cycle (repeat if needed based on marrow response)
Consolidation phase (in remission)	Post-remission therapy (blast cells <2%)	**S:** cytarabine (HiDAC) high-dose IV (dose per protocol)	Multiple cycles (commonly 3–4 cycles)
Transplant (high-risk disease)	Curative-intent therapy in eligible patients	**S:** allogeneic hematopoietic stem cell transplant (allo-HSCT)	Single definitive procedure after remission
Relapsed AML	Salvage chemotherapy	**S:** FLAG-IDA regimen **S:** fludarabine 30 mg/m² IV daily for 4 days **AND** **S:** cytarabine 2 g/m² IV daily for 4 days **AND** **S:** filgrastim 300 mcg/m² SC for 5 days **AND** **S:** idarubicin 10 mg/m² IV daily for 3 days	1 cycle; proceed to transplant if remission achieved
Palliative therapy (unfit patients) single-dose regimen for newly diagnosed adults who are age 75 years or older, or with comorbidities	Low-intensity disease control	**S:** cytarabine 20 mg SC every 12 hours for 10 days (Low-dose) **OR** **S:** venetoclax (PO) 100mg 24 Hourly on Days 1-14 **AND** **S:** azacitidine 75 mg/m² SC daily for 5 days, rest for 2 days, then continue until on 8th and 9th day. After 2 cycles, do BMA to assess response	Repeat every 4–6 weeks

Management of acute promyelocytic leukemia (APL)
It is a medical emergency. Treatment should be initiated as soon as diagnosis is suspected based on cytologic criteria, before definitive genetic, cytogenetic, or immunostaining confirmation is made.
All -trans - retinoic acid (ATRA) is added in all three phases of APL treatment. There is a high risk of developing DIC and differentiation syndrome. Differentiation syndrome is treated with;

B: dexamethasone (IV) 10mg twice a day for 3 days or until symptoms resolve. Consider cessation of ATRA if symptoms are severe

Pharmacological Management

Treatment Phase	Treatment Recommendation	Drugs / Regimen Dosing Schedule	Cycle
Induction phase	Standard remission induction therapy	**S:** ATRA + Arsenic trioxide (ATO) **S:** ATRA 45 mg/m²/day IV **AND** **S:** arsenic trioxide 0.15 mg/kg/day IV daily until bone marrow remission	Until hematologic remission
	Alternative induction regimen	**S:** ATRA + Anthracycline-based regimen **S:** ATRA 45 mg/m²/day IV **AND** **S:** daunorubicin 50 mg/m² IV daily for 4 days PLUS/MINUS **S:** cytarabine 200 mg/m² IV daily for 7 days	Induction cycle
	High-risk relapse prevention modification	cytarabine added in high-risk relapse patients	As per protocol
Consolidation phase	Post-remission therapy	**S:** ATRA + ATO OR S: ATRA + daunorubicin OR S: ATO + daunorubicin OR S: daunorubicin + cytarabine	Multiple consolidation cycles
Maintenance phase	Long-term remission maintenance therapy	**S:** ATRA alone OR S: **S:** ATRA 45 mg/m²/day orally for 15 days every 3 months **AND** **S:** 6-Mercaptopurine 60 mg/m² orally once daily **AND** **S:** Methotrexate 20 mg/m² orally once weekly	2 years

22.9.2.2 Acute Lymphoblastic Leukemia (ALL)

Pharmacological Management
The treatment of ALL is complex. The recommended regimens are, HYPER-CVAD/MTX-ARA-C Regimen which consists of (cyclophosphamide/mesna/vincristine/ doxorubicin/dexamethasone/methotrexate/cytarabine/folinic acid) (IV)

22.9.2.3 Chronic Myeloid Leukemia (CML)

Investigations:
Similar to other leukemia, plus BCR-ABL1 analysis by PCR or FISH for Ph chromosome analysis

Pharmacological Management
For BCR-ABL1 positive, first line treatment is Tyrosine kinase inhibitors (TKI)
Chronic phase: Characterized by blast cells < 10%.

S: imatinib (PO) 400mg once a day every day.

Accelerated phase: blasts 10 – 19%.
S: imatinib (PO) 600-800mg/day in 2 divided doses until the chronic phase is reached. Thereafter, continue with 400mg once daily.

Blast crisis: Blast cells > 20%. If the patient was not on TKIs, treat as in accelerated phase. If patient was on TKIs, treat as acute leukemia.

S: Second line TKIs include nilotinib, dasatinib, bosutinib and ponatinib (PO)
If BCR-ABL1 negative

D: hydroxyurea (PO) 40mg/kg daily. The dose ranges between 1mg and 3mg based on the WBC count.

Note: Adequate hydration should be maintained. Blood transfusion is indicated based on the degree of anaemia

B: allopurinol (PO) 300mg 24hourly daily to prevent hyperuricemia.

22.9.2.4 Chronic Lymphoid Leukemia (CLL)

Staging: RAI and Binet staging systems.

Pharmacological Management
S: chlorambucil (PO) 0.1mg/kg 24hourly for 2weeks, then rest for 2 weeks, repeat until remission is achieved.
OR
S: fludarabine + cyclophosphamide + rituximab (FCR) regimen (IV)

If autoimmune haemolytic anaemia or autoimmune thrombocytopenia is present add
B: prednisolone (PO) 1mg/kg 24 once a day for 2 weeks

22.9.3 Multiple myeloma and Plasmacytoma
Clinical features – CRAB: Features of hypercalcemia, renal impairment, features of anaemia, bone pain, recurrent infections due to impaired antibody production, and bleeding tendencies and hyper viscosity syndrome in rare cases.

Investigations
- FBC plus diferRFT, LFT, Serum electrolytes, LDH
- Peripheral blood smear
- Serum BUN, Calcium, uric acid
- Bone marrow aspiration and trephine biopsy including IHC and flow cytometry
- FISH panel on bone marrow
- 24 urine for total protein Bence Jones protein
- Serum quantitative immunoglobulins, serum protein electrophoresis and serum immunofixation electrophoresis
- Skeletal survey by X-ray, CT scan or MRI
- ECHO
- Serum Beta2 microglobulin
- PET/CT scan

Staging: Revised International Staging System (RISS) Adopted by the International Myeloma Working Group

Stage	Treatment recommendations
I or systemic smouldering	Observe or treat with systemic therapy
SP – osseous	Involved field RT (≥30 Gy). Whole body MRI to look for additional sites of disease
SP – extraosseous	Involved field RT (≥45 Gy) alone, surgery alone, or surgery + RT.
II or III	Chemo consists of a two- or three-agent combination of either alkylators, proteasome inhibitors, immunomodulatory agents (lenalidomide/pomalidomide + prednisone/ dexamethasone + bortezomib/carfilzomib), histone deacetylase inhibitors, or newer monoclonal antibodies + bisphosphonate for bone disease Consider high-dose therapy followed by autologous stem-cell transplant. Consider RT for palliation of local bone pain, prevention of pathologic fractures, or relief of spinal cord compression New MM with cord compression and significant end organ damage – start steroids and bortezomib with RT to spine (hold lenalidomide until after RT) Consider surgical consultation for impending fracture or spinal cord involvement

Management
Radiotherapy is used for pain control of lytic lesions that are refractory to systemic therapy, treatment of spinal cord compression from plasmacytoma and primary treatment of solitary plasmacytoma. Supportive treatment with blood transfusion, antibiotic, hydration and analgesia when indicated.

Bisphosphonate therapy
S: zoledronic acid (IV) 4mg once monthly for 2 years

Recommended chemotherapy regimens include the following drugs in various combinations: Melphalan, Thalidomide, Lenalidomide, Bortezomib, Cyclophosphamide, Prednisolone and Dexamethasone.
S: thalidomide (PO) 200mg 24hourly for 28days
OR
S: lenalidomide (PO) 25mg 24hourly for 21days,
AND
D: dexamethasone (PO) 40mg 24hourly on day 1, 8, 15, 22, repeats after every 4 weeks.
OR
S: bortezomib (IV) 1.3mg/m2 24hourly AND dexamethasone (PO) 40mg 24 hourly **WITH/WITHOUT** cyclophosphamide (PO) 300mg/m2 all on day 1,8,15,22. Repeat every 4 weeks

22.10 Central Nervous System Malignancies

22.10.1 Meningiomas

Meningiomas are the second most common primary tumors of the meninges of the brain and constitute 30% of all intracranial tumors. Commonest sites are cerebral convexity, parasagittal, and sphenoid ridge.

Clinical Presentation

- Chronic headache
- Adult-onset seizures
- Inability to speak
- Loss of vision
- Focal neurological deficits

Investigations

- FBP
- Serum electrolytes
- CT Brain
- MRI Brain
- CT/MR angiography
- Histopathology studies
- Digital substraction angiography (DSA) (4 Vessels Angiography) pri

Pharmacological Management

- Seizures: Give anticonvulsants.
- Brain edema: Give Dexamethasone

Non-Pharmacological Management

- Intracranial meningiomas are best managed with total excision following the principle of maximum safe excision (Refer to Simpson grading for intracranial meningiomas)
- Subtotal resection is associated with inferior outcome and higher recurrence rates.
- Preoperative embolization by DSA as initial treatment to embolize feeding vessels and decreasing intraoperative blood loss

Radiotherapy

- Radiotherapy is indicated in unresectable tumors, postoperative incomplete resection for WHO grade 1, and all grade 2/3 tumors.
- Meticulous attention to operative notes is required, as well as to postoperative CT/MRI.

Stage	Management
Benign-appearing, completely resectable	Surgery (± preop angiography, embolization) Definitive RT may achieve symptom relief and durable control for patients Observation can be considered for small, asymptomatic tumors
Post op	WHO grade I GTR/STR: Observation? Consider RT if significant residual or symptomatic. WHO grade II GTR: Radiation? Grade II STR: 54–60 Gy/30 Fractions WHO grade III 60 Gy/30 Fractions?
Inoperable	RT Alone 60Gy/30 Fractions
Recurrent, not previously radiated	Surgery Adjuvant RT 60Gy/30 Fractions

Follow up

- Follow up MRI is preferable than CT scan
- Follow up MR is a preferable test than CT scan WHO I
    - i. Complete Resected-Annually for 5 years and then every 2years for 5 years
    - ii. incomplete Resected-Annually indefinitely
- Small asymptomatic – 2years and 5years then discharge.
- WHO grade II
    - i. Complete resected- Annually indefinitely
    - ii. Incomplete resected Annually indefinitely
- WHO grade III (Malignant)
    - i. Complete resected -3month to 6month for 2years then 6month indefinitely
    - ii. Incomplete resected -3month

22.10.2 Pituitary Tumors

Pituitary tumors constitute 10% of intracranial tumors. Morbidity is often due to mass effect and endocrine consequences, including hyper -or hyposecretion of pituitary hormones.

Clinical Presentation

- Chronic headache
- Loss of vision
- Focal neurological deficits
- Hormonal imbalances
- Prolactinomas
  >Female -Mensural irregularity, galactorrhea, primary infertility, decrease libido
  >Male- erectile dysfunction, primary infertility, decreased libido
- Growth hormone excess (GH)
  > Adult- Acromegalic features (Hands, feet, face), high blood sugar, hypertension
  > Children- gigantism
- ACTH excess- Obesity, Skin changes, muscles weakness
- TSH excess- Anxiety, weight loss, tachycardia

Investigations

- FBP, RFT, LFT
- Prolactin
- T3, T4, TSH
- LH, FSH, Testosterone
- FBS/glycosylated haemoglobin
- Echo and ECG
- Anterior pituitary hormones
- CT / MRI Brain thin with contrast
- CT/MR angiography
- Visual field assessment
- Histopathology studies

Stage	Management
Nonfunctioning pituitary tumours	Surgery → (observation or RT) OR definitive RT alone
GH-secreting	Surgery → observation → RT 45–50 Gy for recurrent GH elevation. Or, RT alone 45–50 Gy for inoperable patients.
Prolactin-secreting	Observation OR medical management OR surgery vs. RT, individualize treatment based on symptoms, side effect profile, and patient preferences.
ACTH-secreting	Surgery → observation → RT 45–50 Gy for recurrent ACTH elevation. RT alone 45–50 Gy for inoperable patients.
TSH-secreting	Aggressive, always treat with postop RT 45-50Gy

Pharmacological Management

These should be treated initially with dopamine receptor agonist: Give:

C: bromocriptine (PO) 2.5mg 8 hourly

OR

S: cabergoline (PO) 0.25mg once/twice a week (Titrate with prolactin levels checked 2 weekly, aim isto maintain PRL < 30ng/ml)

Cushing's disease

Surgical management is recommended. Consider medicines that inhibit adrenocortical function only when surgery is not possible:

S: metyrapone 250mg once a day (can be escalated based on response)

Acromegaly

Somatostatin analogues may be used to treat acromegaly.

S: octreotide (SC) 50–100 micrograms every 8 hours, titrated according to GH and IGF-1 response

OR

S: octreotide LAR/SR 20 mg IM every 4 weeks (may be adjusted to 10–30 mg every 4 weeks based on response)

Efficacy is measured using clinical response defined as basal GH levels < 2.5 ng/ml, glucose- suppressed levels <1.5 ng/ml and normalization of serum IGF-1 levels.

Surgical management of pituitary tumors

- This is the primary treatment for most symptomatic pituitary tumors, except for prolactinomas which may be managed medically if there is no urgent deterioration of vision.
- Trans-sphenoidal approach (endoscopic or microsurgical) is preferred as it is safer and better tolerated.
- Frequently subtotal especially in large tumors or tumors invading into cavernous sinuses. Hypopituitarism occurs post-operative in about 12% of patients.

Radiotherapy
Indicated post subtotal tumor resection, recurrent tumors, persistently elevated circulating hormone levels, and inoperable patients.
Follow up MRI 3 months after surgery to assess residual tumor.

Radiotherapy is very effective for control of growth of pituitary tumors (>95%), but less effective for decreasing circulating hormone levels in functional tumors.

Common complications
Diabetes Insipidus: is characterized by excessive urine output due to lack of ADH, usually immediate post-operative but may be delayed. Patient will present with Polyuria, Polydipsia and some of them Polyphagia. In immediate post-operative period you may consider fluid replacement (monitoring in input, output and serum electrolyte). Consider medical treatment if not resolving

S: desmopressin (PO) 0.05mg 12 hourly daily (titrate based on response.
OR
S: tolvaptan 7.5mg (PO) maximum dose 30mg in 24hr.

Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH) is characterized by decreased urine output and hyponatremia due to excessive ADH secretion, may occur early (first week) or late (2nd week) post operative. It's important to note that SIADH may occur in TBI, Brain tumors, CNS infections and some medications, treat the cause and manage hyponatremia according the guideline on electrolyte imbalance section.

A: furosemide (PO/IV) 40mg Once or twice a day
AND/OR
S: tolvaptan 7.5mg (PO) maximum dose 30mg in 24hr

Cerebral Salt Wasting(CSW): characterized by excessive urine sodium secretion and hyponatremia, usually immediate post-operative. Manage hyponatremia with
C: sodium chloride 3% (hypertonic saline) (IV) 100–150 mL bolus (or as per severity), Repeat as needed until Na^+ improves
AND
D: fludrocortisone (PO) 0.05-0.1mg 12hourly daily.

Follow up
- There is significant risk of pituitary hypofunction after surgery or irradiation and this risk may occur up to 15 years later – the patients should be warned of the symptoms and be tested regularly.
- Patients treated with standard radiotherapy are unlikely to show an early response and would therefore be assessed at 12 monthly intervals in terms of hormone levels and pituitary function.

22.10.3 Gliomas

Gliomas constitute the most common tumors of the brain affecting all age groups, with predilection to the adult population.

22.10.3.1 Low-grade Gliomas (LGGs) Clinical Presentation

- Seizures are common
- progressive neurologic symptoms depending on site of tumor

Investigations
- CT or MRI should be done in diagnosis of Gliomas.
- MR spectroscopy
- Diffusion tensor tractography (DTI)

Non- Pharmacological Management
Surgical management
Long term survival approaches 100% with complete removal. After partial resection, survival rates range from 80-90% at 5 years to 70-80% at 10 years and 50-60 % at 20 years.
Repeat the MRI scans at 3, 6, 12, 24 months to check for growth. If this is surgically resectable then repeat surgery should be attempted

Radiotherapy
Dose for low grade gliomas: 1.8 Gy X 28 Fractions = 50.4 Gy (5 times per week). Concurrent and adjuvant use of Temozolomide is indicated if available,

Pharmacological Management
S: temozolomide (PO) 75mg/m2 daily during RT and 150-200mg/m2 day 1-5 Monthly for 6 months.
If the hypothalamus /pituitary are in the RT field, then endocrine function should also be evaluated annually by T4 & TSH, testosterone or FSH/LH.

Follow up
- CT scan immediate postoperative to assess resection.
- MRI recommended at 3months and then annually unless other clinical indications emergency.

22.10.3.2 High Grade Gliomas (HGGs)

Anaplastic Astrocytoma (AA) and Glioblastoma Multiforme (GBM)

Clinical Presentation
Headache, Seizures are common, progressive neurologic symptoms depending on site and size of tumor.

Investigations
- FBP, Serum electrolytes,
- Histopathology studies
- Immunohistochemistry studies: IDH,1 and IDH2, 1p/19q codeletion, ATRX gene loss, MGMT.
- Ki-67, p53.
- CT brain scan
- MRI preferred investigation
- MR spectroscopy
- CT/MR angiography
- Functional MRI (fMRI)
- PET/CT scan
- Intraoperative USS

Non-Pharmacological Management
Surgical management
- Complete excision of the tumor is essential for improved survival. Preoperative and intraoperative techniques to improve extent of resection in a safe manner (maximum safe resection) including brain mapping, use of intraoperative fluorescein guidance to expand resection margins and neuromonitoring techniques are advocated.
- Extent of resection is best assessed on post-op CT/MRI scans.
- Frozen section useful for a rapid and real-time histology diagnosis during the operation and this allow surgeons to make informed decision on extent of tumor removal, assess the margin, assess the margin and extent of tumor resection of which these have impact on surgical out come and overall mortality.
- Stereotactic brain biopsy/Neuronavigational using Brain lab indications:
  > CT/MRI- suggestive of high-grade glioma but Abscess, Metastasis and demyelinating disease
  > Tissue necessary for tumor grading of glioma
  > For Molecular testing for genetic mutations e.g. IDH, ATRX, EGFR) or epigenetic changes(methylation) which can influence treatment strategies
  > Suspicious PCNSL to differentiate it from glioma
  > Inoperable or eloquent area
  > Multifocal or diffuse infiltrative tumor

Radiotherapy
- Patients should be CT-planned, with contrast administration. 3mm to 5mm slices cuts from Vertex to Base of skull. Large volume PTV = should completely encompass enhancing lesion seen on pre-op T2/FLAIR scan, plus small (2cm) margin.
- Dose to LARGE VOLUME = 2.00 Gy X 23 Fractions = 46.00 Gy (5 times per week).
- Small volume PTV (PTV2) is based on Gd-enhanced T1 weighted image= enhancing lesion on pre-op scans +1- 2 cm margin.
- Dose to SMALL VOLUME = 2.00 Gy X 7 Fractions = 14.00 Gy
- Total dose 60Gy in 30 fractions.
- Other alternative radiotherapy fractionations can be used in elderly, more than 65 years of age are Hypo fractionation; 40Gy/ 15 Fractions and 5Gy X 5 Fractions

Pharmacological Management
Seizures: Treat as per these **guidelines Chapter 8 Nervous system disease conditions**

Note: Imaging techniques such as MR Spectroscopy may be indicated during follow up to distinguish tumor recurrence from post RT changes.

Chemotherapy
Concurrent chemotherapy + RT:
S: temozolomide (PO) 75 mg/m2 daily during RT, then 150-200mg/m2 give. n D1-D5 of a 28day cycle for 6 cycles after RT
Oral steroid/ Ondansetron should be taken half an hour prior to chemotherapy tablet on each day. Tablets must be taken 1st thing in the morning on an empty stomach.

Prophylaxis for PCP pneumonia with
A: sulfamethoxazole + trimethoprim 480mg 12 hourly should be given during daily temozolomide treatment.

Recurrent disease

- Surgery plays an important role in selected patients- relieves symptoms, improves PS and QOL and reduces steroid requirement.
- Repeat radiotherapy can be considered, depending on size of lesion and previous dose.
- Palliation Chemotherapy may be the only modality available. Active regimens include BCNU, PCV, Temozolomide, and, more recently, Irinotecan and Bevacizumab.

Follow up

- A baseline scan should be done at 4 months' post RT as a reference.
- Thereafter, scans are usually done at 6 months and annually, or if clinically indicated.
- High index of suspicion and testing if indicated for pituitary function for post RT hypopituitarism.

22.11 Musculoskeletal tumors

22.11.1 Bone tumors

Primary bone tumors account for <0.2% of all cancers. 60% of the cases occur between 10 and 20 years of age (most active age of skeletal growth). 80% of the cases in long bones until epiphyseal closure (then occur with the appendicular skeleton). Lung metastases common in osteosarcoma, chondrosar- coma, malignant fibrous histiocytoma.

Investigations

- FBC, RFT, LFT, LDH urinalysis, ESR, alkaline phosphatase,
- Plain films (primary region)
- CXR
- CT and MRI (primary area and chest)
- Bone scan to evaluate for intramedullary skip metastases
- PET/CT scan
- Incisional or percutaneous core biopsy treatment recommendations
- In general, limb-sparing strategies are preferred, which may involve a combination of neoadjuvant chemo, RT, and surgery.
- Input of an orthopedic surgeon is essential in determining whether limb sparing is possible. Final limb function may
- sometimes be better with a prosthesis than with a partially resected and/or irradiated limb. In children, RT has added implications on limb growth and future function.

Management

Pathology	Treatment recommendations	Dose	Follow up
Osteosarcoma	•WLE, amputation vs. limb sparing surgery. •Mastectomy for pulmonary, visceral metastases improves survival. •Neoadjuvant chemotherapy for high-grade, localized disease or metastatic disease •Consider RT for positive margin, subtotal resection, or unresectable	Post-op: R0 55–60 Gy R1 64–66 Gy R2 68–70 Gy Unresectable: 60–70 Gy	Exam and imaging every 3–6 Months (including chest imaging) for 5 years, annually to 10 years
Chondrosarcoma	•WLE is the primary treatment •RT for inadequate margins, unfavourable location, palliation	Post-op: 60–70 Gy Unresectable: >70 Gy	
Chondroma	•WLE or en bloc resection is the primary treatment, followed by RT •RT alone for unresectable disease •EGFR inhibitors can be added to surgery/RT for recurrent disease	66–70 Gy standard fractionation	

Pharmacological Management

Osteosarcoma

First line

Regimen 1

S: doxorubicin 25 mg/m²/day IV over 2 hours on Days 1–3

AND

S: cisplatin 75 mg/m² IV over 3 hours on Day 1

Repeat every 3 weeks for 6 cycles

OR

Regimen 2

S: ifosfamide 1.3 g/m² IV on Days 1–3

AND

S: doxorubicin (Adriamycin) 50 mg/m² IV on Day 1

AND

S: cisplatin 100 mg/m² IV divided over Days 1–3

Repeat every 3 weeks for 6 cycles

2nd line

Regimen 1

S: gemcitabine 675 mg/m² IV on Days 1 and 8

AND

S: docetaxel 75–100 mg/m² IV on Day 8

Repeat every 3 weeks for 4–6 cycles

OR

Regimen 2

S: carboplatin 400 mg/m²/day IV on Days 1–2

AND

S: ifosfamide 1,800 mg/m²/day IV on Days 1–3

AND

S: mesna (uroprotection)

AND

S: etoposide 100 mg/m²/day IV on Days 1–3

Repeat every 3 weeks for up to 6 cycles

22.11.2 Soft tissue sarcoma

Frequency: MFH (20–30%), liposarcoma (10–20%), leiomyosarcoma (10–15%), fibrosarcoma (5–10%), synovial cell sarcoma (5–10%), rhabdomyosarcoma (5–10%), malignant peripheral nerve sheath tumor/malignant schwannoma (5%). Rhabdomyosarcoma most common sarcoma in children. Approximately 10% have metastases at diagnosis. Extremity mainly lung and retroperitoneal mainly liver.

Many sarcoma types harbor characteristic genetic aberrations, including single base pair substitutions, deletions and amplifications, and translocations. For example, cKIT or PDGFRA activating mutation in GIST.

Risk factors

Genetics: NF-1, retinoblastoma, Gardner's syndrome, Li-Fraumeni syndrome, and Carney Stratakis syndrome. Environmental risk factors: ionizing radiation, herbicides, thorotrast, chlorophenols, vinyl chloride, and arsenic.

Investigations

- FBC, BUN/Cr, ESR, LDH
- CT/MRI of primary, CT chest. If myxoid liposarcoma, include CT abdomen because it frequently metastasizes to the retroperitoneum.
- MRI brain for alveolar type.
- PET CT scan
- Incisional biopsy or core needle biopsy.
- Cytogenetic analysis of tissue to look for characteristic chromosomal translocations.

Management

Stage	Treatment recommendations
I Extremity	Surgery alone, unless close (<1 cm) or +margin, re-resect or post-op RT (60-66Gy).
II-III Extremity	Pre-op RT (60-66Gy) then surgery or surgery then post-op RT. Consider neoadjuvant/adjuvant chemo for large deep high-grade tumors. For LR, amputation can salvage ~75%
IV	For controlled primary, with ≤4 lung lesions and/or extended disease-free interval, consider surgical resection and metastatectomy. OR, best supportive care, chemo, and/or palliative surgery or RT.
Unresectable	Definitive RT (70-80Gy), chemo (Doxorubicin + ifosfamide), or chemoRT. Surgery if becomes resectable.
Retroperineal	Surgery then post-op EBRT 45–50 Gy. Alternatively, pre-op RT +/– chemo then resection.
GIST	If resectable, surgery then imatinib. If marginally or unresectable, imatinib then consider surgery then imatinib.

Pharmacological Management

AIM Regimen

S: doxorubicin 20-25 mg/m2 IV push on days 1-3

AND

S: ifosfamide 2000-3000 mg/m2 IV push bolus 3 h on days 1-3

AND

S: mesna 225 mg/m2 IV over 1 hour before ifosfamide and at 4 and 8 hour after ifosfamide. Repeat every 21-28 days for 6 cycles.

MAID Regimen

S: mesna 2.5 g/m2/day IV continuous infusion on days 1-4

AND

S: doxorubicin 20 mg/m2/day IV continuous infusion on days 1-3

AND

S: ifosfamide 2.5 g/m2/day IV continuous infusion on days 1-3

AND

S: dacarbazine 300 mg/m2/day IV continuous infusion on days 1-3. Repeat every 21 days for 6 cycles.

AD Regimen

S: doxorubicin 15 mg/m2/day IV continuous infusion on days 1-4

AND

S: dacarbazine 250 mg/m2/day IV continuous infusion on days 1-4. Repeat every 21 days for 6 cycles.

GD Regimen

S: gemcitabine 900 mg/m2 IV over 30-90 min on days 1 and 8

AND

S: docetaxel 75-100 mg/m2 IV over 60 min on day 8; repeat every 21 days for 6 cycles.

22.12 Oncological Emergencies

Important oncological emergencies include Hypercalcemia, Superior venous cava obstruction, Spinal cord compression, and Neutropenic sepsis.

22.12.1 Superior Vena Cava Syndrome (SVCS)

Superior vena cava syndrome (SVCS) is the clinical expression for obstruction of blood flow through the SVC. Malignancy (90%) is the most frequent cause of SVC obstruction. SVC obstruction is a strong predictor of poor prognosis in patients with non–small cell lung cancer. SVC obstruction in cancer patients can result from

- Extrinsic compression of the SVC
  - >Lung Cancer (65%)
  - >Lymphomas (15%)
  - >Other cancers (10%)
- Intrinsic compression

Clinical Presentation

- Dyspnea
- Headache
- Oedema and change in colour in the areas drained by SVC (examples–face and upper limb)
- Venous distension of the neck, upper chest, and arms
- Cough
- Pemberton's sign (development of facial flushing, distended neck and head superficial veins, inspiratory stridor, and elevation of the jugular venous pressure (JVP) upon raising both of the patient's arms above his/her head simultaneously, as high as possible (Pemberton's maneuver)

Investigations

- CXR
- CT scan Chest, Abdomen, and Pelvis
- PET/CT
- Tissue diagnosis for the appropriate treatment modality
- Bronchoscopy
- Needle aspiration of a peripheral lymph node, or mediastinoscopy
- Sputum cytology
- Thoracentesis.

Non-Pharmacological Management

Treatment of SVC syndrome is divided into supportive and definitive therapy

Supportive measures

- Head elevation–To decrease the hydrostatic pressure and thereby the edema. No data are documenting the effectiveness of this maneuver, but it is simple and without risk.
- Glucocorticoid therapy (dexamethasone, 4 mg every 6 hours) to relieve inflammation and oedema (to be avoided before biopsy if lymphoma is suspected as steroid induced tissue necrosis might obscure the diagnosis)
- Loop diuretics (furosemide) are also commonly used, but it is unclear whether venous pressure distal to the obstruction is affected by small changes in right atrial pressure.

Definitive Therapy

- Radiation treatment to the malignant mass.
- Chemotherapy–in chemo sensitive cancers like lymphoma, germ cell tumours or small cell lung cancer
- SVC Stent–can be useful in cases of thrombosis and for patients not responding to cancer treatment
- Removal of central venous device.

Note: It is advisable to avoid placement of intravenous lines in the arms so that fluid is not injected into the already compressed SVC.

22.12.2 Hypercalcaemia

Hypercalcaemia refers to elevated calcium level in blood (normal range 2.2–2.6 mmol/L) that occurs in 10–20% patients with advanced cancers (most commonly in cancer of the breast, kidney, lung, prostate, head and neck, and multiple myeloma)

Clinical Presentation

- Symptoms of hypercalcaemia include nausea, vomiting, constipation, polyuria and disorientation
- Psychiatric overtones (depression 30–40%, anxiety, cognitive dysfunction, insomnia, coma)
- Clinical evidence of volume contraction secondary to progressive dehydration may be apparent. Severe hypercalcaemia (above 3.75–4.0 mmol/L) is a medical emergency and a poor prognostic sign

Investigations

- Specific biochemistry like PTH,
- ECG to detect arrhythmias and
- Imaging with Bone Scan or PET–CT scan to identify metastatic bone disease.

Pharmacological Management
Treat the hypercalcaemia first and the cause later:
Hydration & dieresis:
A: sodium chloride (Normal saline) 1–2 litres over 2 hours with 30–40 mg of furosemide expands intravascular volume and enhances calcium excretion.

In elderly and cardiac patients, the rate of hydration needs to be slower.

Bisphosphonates–via a complex mechanism inhibit osteoclasts and, in turn, both normal and pathological bone resorption. Commonly used bisphosphonates are:

S: zolendronic acid (IV) infused as 4mg (IV) in 100 mL of Normal saline over 15 mins. Normalization of serum calcium occurs in 4–10 days and lasts 4–6 weeks. Therefore, if re–treatment is required, dose is repeated after 7 days
OR
S: ibandronate (IV) 6 mg over 2 hours' infusion

Note
- Bisphosphonates and denosumab cause increasing risk of osteonecrosis of jaw following extraction of teeth or oral surgical procedures. Therefore, a dental review may be necessary to make sure the necessary dental procedures are completed prior to commencing therapy
- Calcitonin – a thyroid hormone given 4–8 IU/kg IM or SC every 6–8 hours can bring about a rapid decline in calcium levels, however tachyphylaxis limits its utility.

22.12.3 Spinal–cord Compression

Spinal cord compression can result from a myriad of both atraumatic and traumatic causes. The spinal column is vulnerable to various compressive phenomena, such as the expansion of blood products, neoplastic disease, infectious collections, or protrusion of bone or intervertebral disc within the limited area of the fat-filled spinal epidural space and meninges.

This topic focuses on atraumatic causes of spinal cord compression, including degenerative spondylosis with myelopathy, metastatic disease of the spine, primary spinal cord malignancy, spinal epidural abscess, and spontaneous or iatrogenic spinal epidural hematoma. (Traumatic spinal cord compression in chapter 18)

Clinical Presentation
- Myelopathy,
- Neurologic deficit(s)
- Back pain
- Spastic urinary and rectal sphincter dysfunction
- Upper Motor Neurons findings
- Lower Motor Neurons Findings
- Gait disturbance

Investigations
- X-rays
- CT scan
- MRI neuroaxis
- Bone scan
- FBP
- NCV
- EMG
- Bone Marrow Aspiration Biopsy
- CT /ultrasound-guided biopsy

Non-Pharmacological Management
- Immobilizing the patient and obtaining urgent investigations
- Bladder catheterization as appropriate.
- Physiotherapy
- Radiotherapy: for patients who are not candidates for upfront surgery.
- Palliative dose: 8Gy Single fraction or 20Gy/5Fractions or 30Gy/10 Fractions

Surgical Treatment
Spinal Cord Decompression and Spine stabilization

Pharmacological Management

Indication	Medicine and Dose
Reduce spinal cord edema	**B:** dexamethasone 16 mg IV immediately, followed by 4 mg IV/PO every 6 hours (total 16 mg/day), then taper according to clinical response
Pain management (mild–moderate pain)	**A:** ibuprofen 400 mg PO every 8 hours after meals **OR** **C:** diclofenac 50 mg PO every 8–12 hours after meals
Gastric protection	**A:** omeprazole 20–40 mg PO/IV once daily **OR** **C:** pantoprazole 40 mg PO/IV once daily
Neuropathic support	**C:** vit B1, B6, B12 and Folic acid (FDC) once daily
Severe pain	Epidural spinal analgesia as per anaesthesia/pain specialist protocol

Note: All patients suspicious for spinal cord compression should be referred to a Neurosurgeon and radiation oncologist as soon as possible.

22.12.4 Tumor Lysis Syndrome

The syndrome is mostly observed in cancers with a rapid proliferation index such as Burkitt's lymphoma, acute lymphocytic leukemia, acute non-lymphocytic leukemia, and less frequently, solid tumors of small-cell type, breast cancer, and medulloblastoma.

Clinical Presentation

Clinically, the syndrome is characterized metabolically by the presence of hyperuricemia, hyperkalemia, hyperphosphatemia, hypocalcemia, and acute renal failure.

- Work Up
- FBP, RFT, LFT, LDH
- Serum electrolytes phosphates and calcium
- Urine pH and output
- ECG.
- CXR
- CT-Scan.
- Abdomen and Pelvis USS

Pharmacological Management

Indication	Medicine and Dose
Prevention/treatment of hyperuricemia	**B**: allopurinol 300 mg PO/IV once daily
Urine alkalinization (if indicated)	**D:** sodium bicarbonate 100 mEq added to IV fluids over 24 hours for 48–72 hours
Hyperkalemia with ECG changes	**A:** calcium gluconate 10% 10–30 mL IV over 5–10 minutes
Hyperphosphatemia	**B:** calcium carbonate 500–1500 mg PO every 8 hours with meals
Symptomatic hypocalcemia	**A:** calcium gluconate 10% 10–20 mL IV slow infusion
Suspected febrile neutropenia/opportunistic infection	**B:** ceftriaxone 2 g IV once daily **OR** **S:** piperacillin + tazobactam 4.5 g IV every 6–8 hours
Suspected resistant gram-positive infection/MRSA	**S:** vancomycin 15–20 mg/kg IV every 8–12 hours
Suspected fungal infection (persistent neutropenic fever/high-risk patients)	**C:** fluconazole 400 mg IV/PO once daily **OR** **S:** amphotericin B deoxycholate 0.7–1 mg/kg/day IV
Neutropenia	**S:** filgrastim (G-CSF/Neupogen) 5 mcg/kg/day SC once daily until neutrophil recovery
Nutritional support	Total parenteral nutrition (TPN) if indicated

22.12.5 Febrile Neutropenia

Applied only to the management of patients with:

- Fever and neutropenia as a result of a known or suspected malignancy or the use of chemotherapy
- Fever and neutropenia as a result of a bone marrow failure syndrome.
- Fever (or evidence of infection), who chemotherapy or have completed cancer therapy within 6 months, even though they are not neutropenic.

Investigations

FBP, LFT, RFT, Malaria screen, Urine analysis, Urine/blood/stool culture Serum Electrolytes, Throat Swab

Pharmacological Management

Antibiotic administration and Antipyretics and analgesics

Initial (first-line) and subsequent (second-line – deteriorating patients) empiric antibiotic selection.
Patients with no significant beta-lactam reactions:

S: piperacillin +tazobactam (FDC) (IV) 4 g piperacillin / 0.5 g tazobactam given every IV 6 hourly
AND
C: Gentamicin 3-6mg/kg once daily. Deteriorating patients on first-line treatment with no history of anaphylaxis to Beta Lactams (i.e. if history of rash only, can still use meropenem
OR
S: meropenem (IV) 500mg 8 hourly
AND
S: amikacin (IV) 15mg/kg/dose in 2-3 divided doses (or ciprofloxacin 200– 400 mg IV 12 hourly)
AND
S: vancomycin 15 - 20mg/kg/dose 8 - 12 hourly

Patients with history of definite anaphylaxis to Beta Lactams
C: ciprofloxacin (IV) as above
AND
D: metronidazole (IV) 500mg – 750mg dose 8 hourly
AND
S: amikacin dose as above
AND
S: vancomycin dose as above

Culture Negative Patients

First 48 hours

- If the patient had a single spike of fever (i.e., the patient's temperature returns to normal within 4 hours of the initial fever), antibiotics may be discontinued.
- If the patient had more than a single spike of fever, antibiotics must be continued for at least 7 afebrile days. Also, consider the following.
- If the patient develops oral herpes or severe mucositis, commence IV Acyclovir.
- Obvious fungal infection – suspect candida – add fluconazole IV; suspect other fungal infection – add Amphotericin B IV.
- Diarrhoea and vomiting – culture stool and commence ciprofloxacin and metronidazole
- Signs of skin infection – add vancomycin
- No clinical focus but deteriorating rapidly or extremely unwell – consider adding vancomycin

Note: If by day 5-7, the patient remains febrile, neutropenic, consider performing a fungal work-up, prior to commencing empiric appropriate antifungal treatment.

CHAPTER TWENTY-THREE
MENTAL HEALTH CONDITIONS

23.1 Aggressive Disruptive Behaviors in Adults

Agitation may escalate to overt aggression and often manifests with restlessness, pacing, and loud or demanding speech. Aggressive behavior includes verbally abusive language, specific verbal threats, intimidating physical behavior, and/or actual physical violence to self, others or property. All agitation and aggression must be considered an emergency and violence prevented wherever possible.

Causes:

- Physical: acute medical illness, delirium and its causes, epilepsy, intracerebral lesions, traumatic brain injury.
- Psychiatric: psychosis, mania, agitated depression, neurocognitive disorders, developmental disorders, severe anxiety.
- Substance misuse: alcohol, cannabis, methaqualone (mandrax) intoxication or withdrawal; stimulant (e.g. cocaine) intoxication; benzodiazepine withdrawal.
- Psychological factors: high levels of impulsivity and antagonism, hypersensitivity to rejection or insult, poor frustration tolerance and maladaptive coping skills all contribute to aggression and rage

In pregnant women: labour, obstetric complications, sepsis, organ failure as well as substances and mental disorders

Non-Pharmacological Management

Before starting pharmacological treatment, conduct a structured assessment:

- Explore possible reasons for their distress
- Check for and address clinical or environmental causes (e.g., pain, delirium, or inappropriate care).
- Ensure the safety of the patient and those caring for them.
- Caution is needed with elderly and frail patients as they are vulnerable to falls and further injury if sedated.
- The use of physical restraint should only be employed when there is a need to protect the patient and surrounding people in an acute setting and it should be for as short time as possible with a constant monitoring of patients' safety. Manual restraint may be necessary to administer medication.
  > Mechanical restraint: Only if absolutely necessary to protect the patient and others for as short a time as possible.
  > Document the type, sites and duration of any restraints used.
  > 15-minute monitoring: vital signs, the mental state, restraint sites, and reasons for use.
- As initial and ongoing management, offer psychosocial and environmental interventions to reduce aggressive and disruptive behavior.

De-escalation Techniques should be attempted first:

- Be calm, confident, kind, and reassuring.
- Maintain a submissive posture with open hands.
- Do not turn your back on the patient; avoid direct eye contact.
- Do not attempt to reason with the patient.
- Do not argue, confront delusions, or touch the patient.
- Set clear limits regarding behavior.
- Take patient to quiet, calm area – do not leave unobserved

Note: In Pregnant women:

- Never leave unattended.
- Use restraint sparingly, with care, if possible, with mother in a supported semi-seated position (not supine or prone).

Pharmacological Management

For cooperative patients

A: promethazine (PO) 25-50mg stat
OR
C: diazepam (PO)10 mg stat
OR
C: lorazepam (PO)4 mg stat

Uncooperative and severely agitated patients, if oral treatment fails after 30–60 minutes, OR If there is significant risk to the patient and others, give

Parenteral treatment as follows:
B: haloperidol (IM) 2.5-5mg stat, repeat in 30-60minutes, if required. (Maximum dose: 20mg, within 24hours)
AND
A: diazepam (IV/IM) 10mg stat. Repeat after 30–60minutes if needed. (maximum dose: 60mg per 24hours)
OR
A: promethazine (deep IM) 25–50mg Repeat after 30–60minutes if needed. (Maximum dose: 100mg per 24hours.
OR
C: lorazepam (IM) 1-4mg stat. Repeat after 30–60minutes if needed to a maximum dose of 12mg in 24hours
OR
D: midazolam (IV/IM) 2-10mg stat

If haloperidol is unavailable,
A: chlorpromazine (deep IM) 25–50mg may be repeated as necessary 4 times in 24hours (Maximum dose: 2000mg per 24hours).

If patient is known to suffer from schizophrenia and is not neuroleptic naïve give:
S: zuclopenthixol acetate IM) 50–150 mg (Repeat after 2–3 days, if necessary.
Give a maximum of 3 repeat injections and should not be used for longer than 2 weeks. The maximum administered dose should not exceed 400mg.

If patient develops acute dystonia give:
A: promethazine (deep IM) 25–50 mg 24hourly. In the elderly 25 mg (Maximum dose: 100mg per 24hours.
OR
S: clonazepam (IM) 0.5 -4mg 24hourly
OR
A: atropine (IM) 0.5 -2 mg when required

Note
- Repeated doses of high potency antipsychotics may lead to the development of the life- threatening neuroleptic malignant syndrome. If suspected, stop antipsychotic, and institute supportive care.
- Elderly patients are at increased risk of respiratory depression and delirium from benzodiazepines, so they should be avoided as far as possible.
- Always monitor vital signs of sedated patients
- In giving Injection (IM) of Chlorpromazine, caution has to be taken and monitor BP every half an hour within administration period and every 4 hours for the next 24 hours, 6 hourly for the next days

23.2 Delirium
Delirium or acute confusion state is a condition characterized by disturbance in attention accompanied with reduced awareness of the environment; develops over a short period of time and fluctuates in severity.

Causes:
Think Delirium
- **D** rugs / Dehydration
- **E** electrolytes
- **L** evel of pain
- **I** nfection / Inflammation (post-surgery)
- **R** espiratory function (Hypoxia/Hypercapnia)
- **I** mpaction – constipation
- **U** rine retention (avoid catheters where possible)
- **M** etabolic disorder

Clinical Presentation
- Reduced awareness of the environment
  > Inability to stay focused on a topic or to switch topics
  > Getting stuck on an idea rather than responding to questions or conversation
  > Being easily distracted by unimportant things
  > Being withdrawn, with little or no activity or little response to the environment
- Disturbance in cognition
  > Poor memory, particularly of recent events
  > Disorientation — for example, not knowing where you are or who you are
  > Difficulty speaking or recalling words
  > Rambling or nonsense speech
  > Trouble understanding speech
  > Difficulty reading or writing
  > Perceptual disturbance -Seeing things that don't exist (hallucinations)
- Behavioral changes
  > Restlessness, agitation or combative behavior
  > Calling out, moaning or making other sounds
  > Being quiet and withdrawn — especially in older adults
  > Slowed movement or lethargy
  > Disturbed sleep habits
  > Reversal of night-day sleep-wake cycle
- Emotional disturbances
  > Anxiety, fear or paranoia
  > Depression
  > Irritability or anger
  > A sense of feeling elated (euphoria)
  > Apathy
  > Rapid and unpredictable mood shifts
  > Personality changes

Non-Pharmacological Management

- Control the acute disturbance.
- Patients who actively walk with symptoms of agitation or restlessness require close observation within a safe and reasonably closed environment.
- The least restrictive option should always be used when acting in the best interests of the patient to keep them safe from assessed risk.
- Firstly, attempts should be made to identify and remedy possible causes of agitation, e.g. pain, thirst, or a need for the toilet.
- Allowing the patient to walk will help promote and maintain functional ability and reduce the risk of pressure damage occurring.
- The use of restraint or Pharmacological Management should only be considered necessary in cases where the symptoms are considered to be threatening to the patient's safety and that of others, or would result in the interruption of essential care, and should only be used as a final option
- Depending on the layout and nature of the ward, the medical and nursing team may need to consider what is in the best interest of the patient, using patient-centered therapy to frequently perform mental status examination
- Perform proper physical assessment as well as investigations in order to rule out or ascertain the underlying medical condition and treat accordingly

Pharmacological Management

Treat the underlying medical condition, if present. And any other presentations, symptomatically
Acute Management

B: haloperidol (IM) 5mg stat repeated in 30-60 minutes when required (Maximum dose: 20mg within 24 hours)

- Monitor vital signs and beware of acute dystonia and neuroleptic malignant syndrome
- Dosing may vary according to clinical circumstances

AND

A: diazepam (IV) 10mg.

OR

C: lorazepam (IM) 1-4mg.

Switch to oral route once containment is achieved.

Note

- Benzodiazepines, especially diazepam IV, can cause respiratory depression. Monitor patients closely
- In the frail and elderly patient or where respiratory depression is a concern, reduce the dose by half
- The safest route of administration is oral followed by IM with the IV route having the highest risk of respiratory depression and arrest. Use the safest route wherever possible.
- Monitor vital signs closely during and after administration
- Use haloperidol instead of benzodiazepines in patients with respiratory insufficiency
- To avoid benzodiazepines toxicity, allow at least 15-30 minutes before repeating the IM dose

23.3 Schizophrenia

It is a chronic mental disorder, characterized by disturbances in thought, emotions, drive, behavior and withdrawal from reality.

Clinical Presentation

Symptoms vary from patient to patient and from time to time. To diagnose Schizophrenia, the following criteria need to be met;

- Presence of 2 or more of the following symptoms over a 1-month period:
  a) Delusions
  b) Hallucinations
  c) Disorganized speech
  d) Disorganized behavior
  e) Negative symptoms
  (at least 1 of which must be a, b or c)
- Individual's premorbid level of functioning is affected in several major domains of life.
- There must be continuous impairment over a period of at least 6 months, during which the individual might experience either active or residual symptoms.
- These symptoms must not be due to the effects of substance usage or an underlying medical condition

Assessment

Assessment includes thorough history taking, physical examination, mental state examination and investigations

Non-Pharmacological Management

- People with a first episode of psychosis are offered psychological interventions (family intervention and individual CBT) in conjunction with oral antipsychotics. CBT should be delivered on a one-to-one basis over at least 16 planned sessions
  > The re-evaluation of people's perceptions, beliefs or reasoning relates to the target symptoms
- Also include at least one of the following components:
  > People monitoring their thoughts, feelings or behaviors with respect to their symptoms or recurrence of symptoms
  > Promoting alternative ways of coping with the target symptom

> Reducing distress
> Improving functioning.

- Family intervention should:
  > Include the person with psychosis or schizophrenia if practical
  > be carried out for between 3 months and 1 year
  > Include at least 10 planned sessions
  > Take into account the whole family's preference for either single-family intervention or multi-family group intervention
  > Take into account the relationship between the main carer and the person with psychosis or schizophrenia
  > Have a specific supportive, educational or treatment function and include negotiated problem solving or crisis management work

Pharmacological Management
In acute attacks:
Treat like under section: Aggressive and Disruptive Behaviors in Adults.

For maintenance:
B: haloperidol (PO) 1.5-4.5mg 12hourly, increase by 1.5mg, every two weeks. Maximum dose 20 mg Daily
OR
A: chlorpromazine (PO) 100–400mg 24hourly in divided doses
OR
S: olanzapine (PO) 5–10mg titrate to maximum dose 20mg/24hours, given at night
OR
S: aripiprazole (PO) Start 10 -15mg OD, Maximum dose 30mg OD
OR
S: risperidone (PO) 1mg 12hourly then increase by 1mg every 2–3 days to 2–3mg 12 hourly. Maximum dose 6mg/day
OR
S: quetiapine (PO) Start 25mg, then increase by 25mg over one week to a Maximum dose of 300mg-400mg in divided doses a day

Note:
- Titrate to maximum dose while monitoring dose-response to target symptoms against adverse effect
- The above medicines should not be given in combination
- The atypical antipsychotics have been shown to be comparatively more effective in treatment of negative symptoms
- High risk of tardive dyskinesia (age >50 years, female sex, prominent mood symptoms, cognitive or neurological disturbance e.g. intellectual disability, autistic spectrum, HIV-positive): avoid haloperidol and antiparkinsonian medicines; use chlorpromazine, risperidone or olanzapine at lowest doses possible

For patients who have poor compliance to oral medications and patient preference, give depot antipsychotics

C: fluphenazine decanoate (IM) 12.5 -50mg 2-4weekly, and monitor dose-response to target symptoms against adverse effect, if necessary, dose may be tapered
OR
S: zuclopenthixol decanoate (IM) 100-600mg 2-4weekly, and monitor dose-response to target symptoms against adverse effect, if necessary, dose may be tapered
OR
S: flupenthixol decanoate (IM) 20–40 mg every 4weeks, and monitor dose-response to target symptoms against adverse effect, if necessary, dose may be tapered

Note
- Give a test dose first. This is in view of the fact that depots are known to be long acting
- Giving a test dose helps to determine whether the patient is sensitive to the medication (either via development of EPSE or any adverse reactions to the oil base)
- Commence treatment with the lowest therapeutic dose
- Administer the depot at the longest possible duration
- Adjustment of dosages should be conducted after an adequate period of assessment

For treatment of resistant Schizophrenia, and recurrent suicidal behaviors in schizophrenic/schizoaffective patients;

S: clozapine (PO): Initial dose: 12.5–25 mg at night. Usual dose: 200–450 mg per day in divided doses. Maximum dose: 900 mg/day in divided doses

Caution:
Clozapine may cause:

- Neutropenia (3% of cases) and agranulocytosis (0.8% of cases):
  > Pre-treatment: Baseline normal white cell counts and absolute neutrophil count.
  > Monitor absolute neutrophil count regularly.
  > Withdraw clozapine and review medication if neutrophils <1.0 x109/L (general population).
- Myocarditis: highest risk in first two months of treatment. Monitor pulse, blood pressure, temperature; advise patient to report any palpitations, shortness of breath, chest pain, fever immediately.
- Seizures: risk increased at doses >450 mg/day. Manage as for epilepsy. Lamotrigine preferable as it is weight neutral and does not interfere with clozapine metabolism. Avoid carbamazepine because of possible myelosuppression and enzyme induction.
- Constipation: avoid anticholinergics; may require laxatives; prolonged discomfort may indicate intestinal obstruction.
- Weight gain, diabetes, dyslipidemia: Manage as per this STG:

Electroconvulsive Therapy (ECT)
ECT is an effective treatment for some types of severe mental illness. ECT uses an electric current to cause a seizure in the brain and is one of the fastest ways to treat severe symptoms of mental illness. ECT is done with the informed consent of the patient or following the patient's advance directives.
The procedure is done under anesthesia by a team of specialists with a prior comprehensive evaluation of patients for any medical contraindication to ECT.

ECT is a safe and effective treatment with indications of its use in patients with schizophrenia including:

- Treatment-resistant schizophrenia
- To augment pharmacotherapy
- Management of catatonia
- Presence of Suicidal behavior
- Severe agitation
- Clozapine-resistant schizophrenia

ECT should be administered 2 to 3 times a week for a total of 6-12 sessions.

Extrapyramidal side effects

Acute dystonia
A: promethazine (PO) 25-50mg 24hourly, until symptoms/signs subside
OR
B: benzhexol (PO) 5mg 24hourly to12hourly, last dose before 1400 hours to avoid insomnia

Parkinsonism:
A: promethazine (PO) 25-50mg 24hourly, until symptoms/signs subside
OR
B: benzhexol (PO) 5mg stat

Akathisia:
A: Propranolol (PO), 20-80mg 8 hourly. Monitor pulse and blood pressure
Neuroleptic Malignant Syndrome (NMS)
It is a syndrome caused by the use of high dose of antipsychotics; potent antipsychotics (e.g. haloperidol) and antipsychotics that are given via the intravenous or intramuscular routes.

23.4 Neuroleptic Malignant Syndrome (NMS)

It is a syndrome caused by the use of high dose of antipsychotics; potent antipsychotics (e.g. haloperidol) and antipsychotics that are given via the intravenous or intramuscular routes.

Clinical Presentation

- Muscle rigidity,
- Fever,
- Altered consciousness,
- Mutism,
- Dysphagia,
- Diaphoresis,
- Tachycardia,
- Labile blood pressure,
- Tremor,
- Incontinence,
- Leukocytosis,
- Laboratory evidence of muscle injury:
- Increase in creatinine kinase levels.

Pharmacological Management
A: diazepam10 mg (IV) start.
OR
C: lorazepam (IM/IV) 2 mg for immediate sedative or hypnotic action. If no response gives a second dose
OR
C: bromocriptine (PO) 2.5 mg 8hourly

Note

- NMS is a clinical emergency, it needs ICU care
- It is important to stop the antipsychotics immediately
- Supportive measures such as bed rest and controlling the hyperthermia by rapid cooling with the help of tepid water spray and via direct fluid replacement should be started immediately
- Consideration of ventilator support or intubation would be necessary if the patient has severe breathing difficulties

Referral: Refer to the next level in the following situations:

- First psychotic episode
- High suicidal risk or risk of harm to others
- Children and adolescents
- Elders
- Pregnant and lactating women
- No response to treatment
- Intolerance to medications
- Concurrent medical conditions or other

23.5 Catatonia

Catatonia is a complex neuropsychiatric syndrome characterized by abnormalities in movement, behavior, and mental state.

Causes

- Schizophrenia
- Severe depressive disorder,
- Bipolar disorder,
- Organic disorders e.g. CNS infections, CNS tumor, cerebrovascular accident, severe intoxication of recreational drugs and lethal catatonia.

Clinical Presentation

- Ambitendency,
- Automatic obedience,
- Waxy flexibility / catalepsy,
- Negativism,
- Stereotypy,
- Mannerism,
- Echolalia
- Echopraxia.

Investigations

- FBP,
- RFT,
- LFT,
- TFT,
- Blood glucose,
- CK,
- Urine drug screen,
- ECG,
- CT,
- MRI,
- EEG,
- Urine and blood culture,
- Syphilis screen,
- HIV,
- Heavy metal screen,
- Auto-antibody screen and lumbar puncture.

Non-Pharmacological Management

Hydration, early mobilization, close monitoring, transferal to ICU if patient deteriorates.

Pharmacological Management

A: diazepam (IV/IM) 10-20mg 24hourly

OR

C: lorazepam (IM) 2mg initially, then 2mg after 3hrs if no effect, maximum 24 mg/day

Note: If benzodiazepine does not work after 1-2 days and symptoms are severe, ECT is an option

23.6 Schizoaffective Disorder

DSM-5 Diagnostic criteria

For an individual to fulfill the diagnostic criteria, there must be the presence of solely hallucinations or delusions for at least 2 weeks in the absence of an affective episode, throughout the whole duration of the psychiatric illness. There must also have an uninterrupted period where there are prominent affective symptoms concurrent with symptoms of schizophrenia. Individuals should have symptoms fulfilling the diagnosis of an affective disorder for most of the duration of the illness.

DSM-5 has specified 2 subtypes of schizoaffective disorder, which are:

- Bipolar type - Whereby a manic episode is part of the entire course of the illness
- Depressive type - Whereby a major depressive episode is part of the entire course of the illness

Non-Pharmacological Management

- Family counselling and psycho-education
- Cognitive Behavioural Therapy (CBT) for stabilized patients
- Supportive group therapy for patients
- Rehabilitation may be enhanced by assertive community programs, work assessment, occupational therapy and bridging programmes prior return to the community

Pharmacological Management

For Psychotic symptoms:

A: chlorpromazine (PO) 100-1000mg in divided doses 24hourly (max. dose 1000mg, per 24hours)

OR

B: haloperidol, (PO) 1.5-6mg in divided doses 24hourly. (max. dose 20mg)

OR

S: aripiprazole (PO), 10-15 mg 24hourly; Maximum dose 30mg per day

OR

S: olanzapine (PO) 5–10mg titrate to maximum dose 20mg/24hours, given at night

OR

S: risperidone (PO) 1mg 12hourly then increase by 1mg every 2–3 days to 2–3mg 12 hourly. Maximum dose 16mg/day

OR

S: quetiapine (PO) Start 25mg, then increase by 25mg over one week to a Maximum dose of 300mg-400mg in divided doses a day for Manic subtype:

OR

A: carbamazepine (PO) 200-1000mg 24hourly, in divided dose* (titrating depending to individual response)

OR

C: sodium Valproate (PO) 500-1000mg 24hourly, in divided dose* (titrating depending to individual response)

For Depressive subtype:

A: amitriptyline (PO) 12.5-75 mg 24 hourly (titrating depending to individual response)

OR

S: fluoxetine (PO) 10-20 mg 24 hourly (titrating depending to individual response)

OR

S: escitalopram (PO) 10-20 mg 24 hourly (titrating depending to individual response)

OR

S: aripiprazole (PO) 10-15 mg 24 hourly (titrating depending to individual response)

Note: Symptoms should be monitored and medication can be tapered* divided doses: in acute phase 8hourly or 12hourly while in maintenance phase titrate to 12hourly or preferably 24hourly

23.7 Brief or Acute/Transient Psychotic Disorder

Clinical Presentation

DSM-5 Diagnostic criteria: For an individual to fulfill this diagnosis;

- He/she must have, for a duration of between 1 day to 1 month the following symptoms:
  > Delusions
  > Hallucinations
  > Disorganized speech
  > Grossly disorganized or catatonic behavior
- Exclude differentials like major depression or bipolar depression with psychotic features, schizophrenia and exclude the possibility of the symptoms being due to underlying substance use or medical conditions.

Non-Pharmacological Management

Manage as in Schizophrenia

Pharmacological Management

Manage as in Schizophrenia

23.8 Bipolar Mood Disorders

These are lifelong mental disorders, which may have an episodic, variable courses. The presenting episodes may be manic, hypo manic, depressive or mixed. By definition, a diagnosis of bipolar disorders requires either a current or previous episode of mania or hypomania.

Bipolar I Disorder Diagnostic Criteria

DSM-5 specified that an individual need to have at least 1 manic episode in order to fulfill the diagnostic criteria of Bipolar I disorder.

Manic Episode

A manic episode is characterized by a period of time, of at least 1 week, during which the individual has persistent elevated (extreme happiness) or irritable mood and present for most of the days.

In addition, the individual needs to have at least 3 (4 if mood is only irritable) of the following symptoms:

- Increased self-confidence (Grandiose and/or religious delusions)
- Reduction in the need for sleep
- Chattier than usual, with increased pressure to talk
- Racing thoughts
- Easily distractible
- Increase in number of activities engaged
- Involvement in activities that might have a potential for serious consequences

There must be marked impairments in terms of functioning with the onset of the above symptomatology.

Non-Pharmacological Management

- Hospitalization may be required during acute mania.
- Investigate for causative medical conditions, medications, substances.
- Optimize management of comorbid medical illness and substance use.
- Psychotherapy, usually after the manic episode has been controlled with medication
- Family therapy and psycho-education of patient and family to increase compliance and knowledge of the condition
- In severe cases, electroconvulsive therapy may be required.

Pharmacological Management

For Manic or Mixed Episodes

For agitated and acutely disturbed patient: See section on patients with aggressive and disruptive behaviours.

Maintenance therapy

A: carbamazepine (PO) 600mg 24hourly in 2-3 divided doses, increase by 200mg at three- day interval up to a maximum of 2000mg

OR

C: sodium valproate (PO) 20 mg/kg/day in 2–3 divided doses (maximum of 2000 mg, per day)

OR

S: lamotrigine (PO) 600mg once a day, increase by 200mg at three-day interval up to a maximum of 2000mg

OR

S: aripiprazole (PO) 10-15 mg 24 hourly (titrating depending to individual response)

Note: The option of combining two mood stabilizers at S: level should be allowed i.e. sodium valproate and Lithium carbonate

Treatment for Severe Depressive Episodes in Bipolar Patients, Give antidepressant in combination with mood stabilizer and antipsychotic if there is psychosis

A: amitriptyline (PO) 12.5 to 50mg nocte (titrating according to individual response)

OR

S: fluoxetine (PO) 10-20mg nocte, (titrating according to individual response)

OR

S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)

OR

S: sertraline 25mg -100mg 24hourly (titrating according to individual response)

OR

S: venlafaxine (PO) -Initial dose: 37.5 mg 12hourly. OR 25 mg 8hourly -Maintenance dose: 75-150 mg per day, given in divided doses

Maximum dose:

- Moderately depressed outpatients: 225 mg/day
- Severely depressed inpatients: 375 mg/day

OR

- Initial dose: 15 mg once a day at bedtime
- Maintenance dose: 15-45 mg 24hourly
- Maximum dose: 45 mg/day

AND

A: carbamazepine (PO) 200-400mg 12hourly, maximum 2000mg per day

OR

C: sodium valproate (PO) 500-2000mg 24 hourly

AND

A: chlorpromazine (PO) 100-1000mg 24hourly in divided doses, (max. dose 1000mg, per day

OR

B: haloperidol (PO) 1.5mg –10mg 12hourly (if there is psychosis) and symptoms should be monitored, and medication to be tapered

Note: Do not use monotherapy antidepressants in bipolar patients.

Referral: Refer to the next level in the following situations:

- Mixed or rapid cycling bipolar disorder
- Depressive episodes in bipolar patients not responding to treatment
- Manic episodes not responding to treatment

23.9 Major Depressive Disorder

It is a mood disorder characterized by at least 2 weeks of depressed mood and/or diminished interest and pleasure in activities. It is associated with impairment in level of functioning in different areas including social and occupational.

Clinical Presentation

Psychological symptoms

- Depressed mood
- Feeling of worthlessness
- Guilt
- Diminished concentration
- Thoughts of death and suicide

Somatic symptoms

- Change in appetite
- Sleep disturbances
- Agitation
- Retardation
- Loss of energy
- Marital and family issues
- Sleep hygiene advice

Non-Pharmacological Management

Effective psychotherapies include:

- Cognitive Behavioural Therapy
- Interpersonal psychotherapy
- Stress management / coping skills

Pharmacological Management

A: amitriptyline (PO) 12.5–75mg 24hourly at night, increase gradually to a maximum of 150mg per 24hour. {Elderly: Initially 12.5–50 mg. Max. 75mg)

OR

D: citalopram (PO) 10-60mg 24hourly

OR

S: fluoxetine (PO) 20-60mg 24hourly (morning)

OR

S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)

Note

- Efficacy of the treatment is gauged by amelioration of symptoms and the dose should be titrated according to clinical response.
- Monitor all patients recently started on antidepressants closely for increased agitation and suicidal behaviour, especially young patients (younger than 25 years).
- Some symptoms, such as sleep and appetite, may improve more quickly.
- If partial response or non-response, increase the dose or switch to another antidepressant. The first line is an alternative SSRI. The second line is an antidepressant from a different class.

Referral: Refer to the next level in the following situations:

- Suicidal ideation
- Major depression with psychotic features
- Failure to respond to available antidepressants
- Patients with concomitant medical illness, e.g. heart disease, epilepsy
- Poor social support systems
- Pregnancy and lactation

23.10 Suicide

Suicide is the act of deliberately killing oneself and is a serious public health problem affecting families, communities and entire countries. Suicides are preventable with timely, evidence-based and often low-cost intervention.

Suicidal behaviour

Suicidal behaviour refers to any thoughts, actions or behaviour that indicates an individual's intent or desire to end their own life. It encompasses a spectrum of behaviour from suicidal ideation to suicide attempts and death. It includes: Suicidal ideation, Suicide plan, Suicide attempt and Completed suicide

Warning signs to look out for

- Feeling like a burden
- Being isolated
- Increased anxiety
- Talking about feeling trapped or in unbearable pain
- Increased substance use
- Looking for a way to access lethal means
- Increased anger or rage
- Extreme mood swings
- Expressing hopelessness and having no reason to live
- Sleeping too little or too much
- Talking or posting about wanting to die or to kill self
- Making plans for suicide
- Giving away prized possessions
- Showing rage or talking about seeking revenge
- Suddenly, coming out from being hopeless
- Not wanting to complete projects, one has started

Assessments of Patients with suicidal behavior

- Previous suicidal attempts.
- Look out for signs of poisoning or intoxication, loss of consciousness, bleeding from self-inflicted wounds or extreme lethargy.
- Previous history of self-harm/suicidal thoughts or plans in the past two weeks –one year. For a person who is extremely agitated, violent, distressed or lacks communication, inquire if, in the past two weeks to one month, they have had thoughts or plans to self-harm/suicidal ideations, or if in the past year, they have self-harmed.
- Presence of mental, neurological & substance abuse (MNS) conditions, e.g., depression, child & adolescent mental and behavioral disorders, psychoses, disorders due to substance use, epilepsy, and chronic pain.
- Severity of emotional symptoms:
    > Is the person having difficulty carrying out usual work, school, domestic or social activities?
    > Is the person on repeated self-medication for emotional distress or unexplained physical symptoms?
    > Is the person experiencing marked distress or repeated help-seeking behaviour?

Management of Suicide

- Assess the physical condition of the patient to ensure that the patient is medically stable by stabilizing the vital signs and appropriately managing any emergencies.
- When medically stable, calm the patient to do a risk assessment.
- Evaluate for underlying psychiatric illness by taking history and mental status examinations.
- A multidisciplinary approach including the role of physicians in medical management of injuries
- It is best to admit the patient for at least 24 hours with strict vigilance to prevent another suicidal attempt or completion.
- Remove all potentially harmful objects or means near the patient.
- All medication given should be supervised.

Non-Pharmacological Management

This approach can be dual-focused, addressing both the individual and the available caregivers. Ensure the person is placed within a secure and nurturing environment at a healthcare facility (avoid leaving them unattended). Additionally, take measures to eliminate access to potential means of self-harm. If the person must wait for treatment, offer an environment that minimizes distress; if possible, in a separate, quiet room with constant supervision and contact with a designated staff or family member to always ensure safety. Consult a mental health specialist, if available. Offer psychoeducation.

Some key messages to the person and the caregivers can include:

- If one has thoughts of suicide, seek help immediately from a trusted family member, friend or health care provider.
- It is okay to talk about suicide. Talking about suicide does not provoke the act of suicide.
- Suicides are preventable.
- Having a suicidal episode is an indicator of severe emotional distress. The person does not see an alternative or a solution. Therefore, getting the person immediate support for emotional problems and stressors is essential.
- Suicidal means (e.g., pesticides, firearms, medications) should be removed from the home.
- Social networks, including the family and significant others, are important for providing social support.
- Mobilize active engagement of family, friends, and other concerned individuals, along with available community resources, to oversee and provide support to the individual throughout imminent risk.

Follow the guidelines outlined below:

- Offer Support to the Person
- Explore reasons and ways to stay alive.
- Focus on the person's strengths by encouraging them to discuss how earlier problems have been resolved.
- Consider problem-solving therapy to help people with suicidal behavior within the last year.

Activate Psychosocial Support

- Mobilize family, friends, concerned individuals and other available resources to ensure close monitoring of the person if the risk of suicide persists.
- Advise the person and care givers to restrict access to means of suicide (e.g. Pesticides/toxic substances, prescription medications, firearms, etc.) when the person has thoughts or plans of suicide.
- Optimize social support from available community resources. These include informal resources, such as relatives, friends, acquaintances, colleagues and religious leaders or formal community resources, such as crisis centers and local mental health centers.
- Provide emotional support to caregivers and family members if they need it.
- Ensure continuity of care.

Referral, Linkages and follow-ups

- It is important to follow up on the patient.
- The healthcare worker should maintain regular contact (via telephone and home visits). This will initially be frequent (e.g., daily, weekly) for the first two months. This should continue for as long as the risk of suicide persists and decreases as the person improves.
- If the person does not show signs of improvement, they should be referred to a specialist for further management as required.
- At each point of contact during follow-up, the healthcare worker should regularly assess for thoughts and plans for self-harm/suicide.

Pharmacological Management

The choice of medication administered depends on the specific circumstances and the psychiatric diagnosis determined during the assessment of suicidal behavior.

23.11 Generalized Anxiety Disorder

Generalized anxiety disorder is characterized by excessive, exaggerated anxiety and worry about everyday life events with no obvious reasons for worry.

Clinical Presentation

- Persistent worry
- Disturbances in sleep
- Poor concentration
- Mood disturbances
- Muscle tension
- Tremors

Non-Pharmacological Management

Psychotherapy, most patients can be treated as outpatients

Pharmacological Management

Indicated where symptoms are interfering with normal functions of daily living. Where there is concomitant drug/alcohol dependence or co-morbid major depressive episode, an antidepressant may be more appropriate.

Acute management
For an acute episode or intense prolonged anxiety:
C: diazepam (PO) 2–5 mg stat repeat 12hourly when required

Duration of therapy: up to 2weeks, taper off to zero within 6weeks
Maintenance Therapy
A: fluoxetine (PO) 20–40mg 24hourly (Medication should be titrated according to symptoms resolution)
OR
S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)
OR
D: citalopram (PO) 10–40mg 24hourly (Medication should be titrated according to symptoms resolution)
OR
D: clonazepam (PO) 0.5 – 4 mg 24hourly (Medication should be titrated according to symptoms resolution)
OR
S: venlafaxine (PO) 37.5–2025mg 24hourly (Medication should be titrated according to symptoms resolution)

Note:

- Prolonged treatment with benzodiazepines often leads to tolerance and withdrawal symptoms if the medicine is discontinued abruptly
- Avoid combining more than one benzodiazepine.

Referral: Refer to the next level if there is lack of improvement with treatment.

3.12 Panic Disorder

Panic disorder is an anxiety disorder characterized by recurrent unexpected panic attacks. A panic attack is characterized by an acute onset of intense anxiety accompanied by a sense of dread/impending threat, usually for no apparent reason.

Clinical Presentation

The patient will experience significant fear and emotional discomfort, typically peaking within 10 minutes and resolving within 30 minutes. There will usually be accompanying physical symptoms including:

- Rapid pulse/palpitations
- Shortness of breath
- Dizziness
- Sweating

Non-Pharmacological Management

- Psycho-education and reassurance
- Psychotherapy, e.g. cognitive-behaviour therapy
- Exclude an underlying medical condition, e.g. thyrotoxicosis

Pharmacological Management

Panic attack: Acute management
The initial aim is to control the panic symptoms and exclude an underlying medical cause.

C: diazepam (PO) 5-10mg 12hourly (Medication should be titrated according to symptoms resolution)
OR
C: lorazepam (PO) 2-4mg 12hourly (Medication should be titrated according to symptoms resolution)
OR
D: clonazepam (PO) 0.5-3mg 12hourly (Medication should be titrated according to symptoms resolution)

Panic disorder
S: fluoxetine (PO) 20–40mg 24hourly (Medication should be titrated according to symptoms resolution)
OR
S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)
OR
D: citalopram (PO) 10–40mg 24hourly (Medication should be titrated according to symptoms resolution)
OR
S: sertraline (PO) 20–40mg 24hourly (Medication should be titrated according to symptoms resolution)
AND/OR

For physical symptoms, Use
A: propranolol (PO) 40mg 24hourly

Note
- Initiate at low dose and gradually titrate to therapeutic dosages according to tolerability.
- Duration of therapy: variable, initially 6 months–1 year.
- Long term medicine treatment may be necessary.
- Relapses may occur when treatment is discontinued.
- Consider short term co-administration of a benzodiazepine, due to the slow onset of action and the potential for increased anxiety during the initial phase of treatment with antidepressants.

Referral: Refer to the next level in the following situations; Treatment resistance or need for benzodiazepine treatment beyond 6 weeks

23.13 Obsessive-Compulsive Disorder

This condition is characterized by the presence of persistent intrusive thoughts or concerns, and is usually associated with compulsions, which are mental acts or behaviours which an individual engages in to attempt to get rid of the obsessions and/or decrease his or her distress i.e. excessive hand washing. Obsessive thoughts and compulsions may interfere with daily functioning. The features are usually distressing to the patient.

Clinical Presentation
- A pattern of repetitive behaviours
- Anxiety symptoms

Non-Pharmacological Management
- Psycho-education
- Psychotherapy
- Behaviour therapy

Pharmacological Management
D: citalopram, Initial dose: (PO) 20mg. If there is no or partial response after 4-8weeks, increase to 40mg, if well tolerated.
OR
S: fluoxetine, Initial dose: (PO) 20mg. If there is no or partial response after 4-8weeks, increase to 40mg then 60mg, if well tolerated.
OR
S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)

Referral: Refer to the next level in the following situations: Inadequate response to treatment

23.14 Acute Stress Disorder and Post-Traumatic Stress Disorder

Acute stress and post-traumatic stress disorder arise in response to stressful events. The patient should have experienced the event as life threatening or as a physical threat to themselves or others, at which time they felt fear and helplessness.

Clinical Presentation
- Re-experiencing of the event, e.g. flashbacks, dreams
- Avoidance of situations associated with the event
- Features of anxiety or increased arousal, e.g. hyper vigilance, heightened startle response and insomnia

The conditions are symptomatically similar but differ with regard to the duration and time of onset of symptoms. The symptoms of acute stress disorder arise within 4 weeks of the event and last up to 4 weeks, whereas the symptoms post-traumatic stress disorder last longer than 4 weeks, and may arise more than 4 weeks after the traumatic incident.

Non-Pharmacological Management
- Reassurance and support of patient and family
- Psychotherapy, supportive/cognitive-behavioral therapy

Pharmacological Management
Acute stress disorder:
For acute anxiety or agitation give:

D: clonazepam (PO) 0.5–2 mg 24hourly to 12hourly for 2weeks
Not for longer than 2 weeks and taper to a stop in the course of 26 weeks. The maintenance treatment needs antidepressants

Note: Prolonged use of benzodiazepines > 1 week may be detrimental to adaptation, leading to higher rates of post-traumatic stress disorder

Post-traumatic stress-disorder:
A: amitriptyline (PO) 50–150mg nocte Elderly: 25- 75mg. (PO) for 4-8weeks
OR
D: citalopram 20-40mg (PO) 24hourly for 4–8weeks
OR
S: fluoxetine (PO) 20-40 mg 24hourly morning for 4–8weeks
OR
S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)

Note: An adequate antidepressant trial of treatment is 8–12 weeks, before an alternative treatment should be considered.

Referral: Refer to the next level in the following situations:
- Inadequate response to treatment
- Co-morbid conditions

Discontinuation symptoms of serotonin reuptake inhibitors
Discontinuation symptoms are experienced due to receptor adaptation or receptor rebound after stopping of antidepressants. It can be avoided or reduced by slowly tapering the drug over at least 4 weeks. Symptoms include flu-like symptoms, 'shock-like" sensations, dizziness exacerbated by movement, insomnia, vivid dreaming and irritability, problems with concentration, and memory or movement disorders.
It is managed by reintroduction of the SSRI and slower tapering of the dose.

Note: Fluoxetine seldom causes discontinuation symptoms because of its long half-life.

23.15 Substance Related Disorder

23.15.1. Substance Use Disorder

23.15.1.1 Alcohol Use Disorder Description

DSM-5 diagnostic criteria
There must be a problematic usage of alcohol that has led to significant impairments
occurring over a total of 12 months' duration. The problematic usage of alcohol is manifested by at least 2 of the following:

- Increasing usage of alcohol, or over a longer period than originally intended
- Repeated unsuccessful efforts to cut down or control usage, despite the desire to do so.
- Large amount of time is spent on activities to obtain alcohol, use alcohol, or recover from the effects of alcohol.
- Presence of a strong desire or urge to use alcohol
- Repeated alcohol usage resulting in a significant failure to fulfill major roles
- Persistent usage of alcohol despite having recurrent social or interpersonal problems due to the usage of alcohol.
- Important activities are given up due to the usage of alcohol
- Repeated usage despite significant impairments in physical health
- Continued use despite knowing that there have been physical or psychological problems arising from the usage of alcohol
- Tolerance as defined by either (1) Need for increasing amounts of alcohol to achieve the same or desired effects or (2)
- Reduced effects with continued use of the same amount of alcohol
- Withdrawal as defined by either (1) Characteristic withdrawal symptoms or (2) Alcohol is being used to prevent or avoid withdrawal symptoms

The following patients should be admitted for detoxification:
- Past history of convulsions
- Past history of psychosis
- Suicidal ideation
- Significant medical comorbidity such as heart failure and liver disease
- Inadequate support at home
- History of withdrawal delirium
- >60 years of age
- Pregnancy
- Cognitive impairment
- Previous failed community detoxification attempts

Non-Pharmacological Management

- Cognitive Psychotherapy – Involves assessment of the patient's readiness for behavioral change using the stage of change model and also make use of motivation interviewing to enable patients to be empowered to change
- Alcoholic Anonymous groups
- A self-help group, with the sole purpose of enabling patients to quit their drinking habits. Their program is based on 12 core principles.

Pharmacological Management
Alcohol detoxification may be managed on an outpatient basis in most patients.

B: thiamine (PO), 100-300 mg daily for 14 days
AND
C: diazepam (PO) 10 mg immediately, Then 5 mg 6 hourly for 3 days. Then 5 mg 12 hourly for 2 days. Then 5 mg daily for 2 days. Then stop.
Higher doses may be needed in individual patients.

23.15.1.2 Opioid Use Disorder

DSM-5 - Diagnostic criteria
It states that there must be problematic usage of opioid that has led to significant impairments in terms of functioning over a 12-month period. The rest of the criteria are similar to that of alcohol use disorder

Non-Pharmacological Management

- Motivational interviewing
- Therapeutic group therapy in a structured environment is helpful for helping individuals with their addiction.
- Psycho-education with regards to their possibility of HIV transmission when using shared needles would be helpful

Pharmacological Management
Opioid substitutes

C: methadone (PO) 10-30mg stat based on clinical assessment and UDS test then increase by 5-10mg every 3-5days to achieve optimal dose when opioid withdrawal features are well controlled.

Once stability is reached, the client should be planned to remain on treatment for a minimum of two years. For more detail refer to national guidelines for comprehensive management of opioid use disorder
OR
S: buprenorphine 8-32mg (PO) 8hourly (Medication should be titrated according to symptoms resolution)

Note: For severe patients, Rehabilitation should be considered

23.15.1.3 Nicotine Use Disorder (Nicotine dependence)

Nicotine dependence is a chronic, relapsing disorder characterized by compulsive nicotine use, impaired control over tobacco consumption, development of tolerance, and withdrawal symptoms upon cessation. It can result from the use of any nicotine-containing product, including cigarettes, smokeless tobacco, and electronic cigarettes. Nicotine dependence is a major public health problem because it sustains tobacco use and increases the risk of preventable morbidity and premature mortality**.**

Clinical Presentation
Withdrawal symptoms include:

- Restlessness
- Tremors
- Difficult in getting/maintaining sleep
- Anxiety
- Loss of appetite

Non-Pharmacological Management

- Support group that encourages abstinence
- Inpatient rehabilitation program where necessary

Pharmacological Management
S: bupropion (PO), Initial dose: 150 mg orally once a day for 3 days, increased to 150 mg orally twice a day.

Maintenance dose: 150 mg orally twice a day. Maximum dose: 300 mg/day; maximum single dose should not exceed 150 mg.
Duration of therapy: 7 to 12 weeks

If you take bupropion to help you stop smoking, you may continue to smoke for about 1 week after you start the medicine. Set a date to quit smoking during the second week of treatment.

Note:
Nicotine replacement therapy (NRT) may be provided as a transdermal patch, gum, lozenge/mini-lozenge, inhaler, or nasal spray. The choice of formulation and dosage should be individualized according to the patient's level of nicotine dependence, treatment preference, and clinical response.

23.15.2. Substance Induced Disorder

23.15.2.1. Alcohol Intoxication

Clinical Presentation

DSM-5

It specifies that there must be recent usage of alcohol and that clinically significant behavioral or psychological changes have arisen during or shortly after the usage.

- Slurred speech
- Incoordination
- Unsteady gait
- Nystagmus
- Impairments in attention or memory
- Stupor or coma

Non-Pharmacological Management

- Support group that encourages abstinence
- Inpatient rehabilitation Programme where necessary

Pharmacological Management

Symptomatically, depending on how patient presents. For further treatment, refer on **Chapter twenty-five (Poisoning).**

23.15.2.2 Opioid Intoxication

Clinical Presentation

DSM-5

It states that there must be recent usage of opioid, with the presence of pupillary constriction (or pupillary dilation due to anoxia from severe overdose) and at least 1 of the following signs and symptoms:

- Feeling drowsy or losing consciousness
- Slurring of speech
- Impairments in attention or memory
- There must also be significant problematic behavioral or psychological changes that have arisen during or shortly after the usage.

Non-Pharmacological Management

- Support group that encourages abstinence
- Inpatient rehabilitation Programme where necessary

To ascertain opioid overdose, perform a quick assessment as follows:

- Is the person breathing? Is the respiratory rate below 10 breaths per minute and oxygen saturation below 92%?
- Is the person responsive (do they answer when you shake them and call their name)?
- Does he/she respond to stimulation (such as sternum rub)?
- Can the person speak? Is the speech slurred?
- Is the color of his/her skin pale?

The following steps (best remembered by the acronym "SCARE ME") are used in the management of opioid overdose.

S – Stimulation (wakening): Try to wake the person by shouting their name, shaking their body or pressing the breastbone with your knuckles.
C – Call for additional medical help: If the client doesn't respond to noise, movement or pain, immediately call for help, and put the person in a recovery position to prevent choking in case of vomiting.
A – Airway: Make sure the airway is clear of blockage.
R – Rescue Breathing: Assess for breathing and connect oxygen support
E – Evaluate: check whether the client has improved and is breathing properly.
M-Muscular Injection of Naloxone (IM)
E – Evaluate and Support: The effect of Naloxone should be evident within 1-5minutes and may last for 60-90 minutes.

Pharmacological Management

B: naloxone (IM/IV/Sub cutaneous 0.4-10mg dose of Naloxone on the upper arm or thigh.;

if there is no response, the dose should be increased every 2 minutes. Repeat Naloxone administration (maximum daily dose of 10mg) if the patient is not awake or able to take a deep breath after 5 minutes.

23.15.2.3 Stimulant Intoxication
DSM-5 specifies that there must be recent usage of amphetamine-type substance, cocaine or other stimulant that has led to significant impairments in functioning, shortly after usage. This is manifested by at least 2 of the following signs and symptoms:

Clinical Presentation
- Increase or decrease in heart rate
- Pupillary dilation
- Elevated or lowered blood pressure
- Perspiration or chills
- Nausea or vomiting
- Evidence of weight lost
- Psychomotor agitation or retardation
- Muscular weakness, respiratory depression, chest pain or cardiac arrhythmias
- Confusion, seizures and coma

Non-Pharmacological Management
- Support group that encourages abstinence
- Inpatient rehabilitation Programme where necessary

Pharmacological Management
Cocaine intoxication: If patient presents with agitation, refer to treatment of patient with aggressive and disruptive behaviors
If patient presents with psychosis, give
A: chlorpromazine (PO) 100-1000mg in divided doses, per day (max. dose 1000mg, per day)
OR
B: haloperidol (PO) 1.5-6mg in divided doses, per day (max. dose 20mg)
OR
S: aripiprazole (PO) 10-15 mg 24 hourly (titrating depending to individual response)

Note: Treatment rendered largely targets the symptoms that individuals are experiencing

Pharmacological Management
a) Amphetamines intoxication:

If patient presents with agitation, refer to treatment of patient with aggressive and disruptive behaviors
If patient presents with depressive symptoms after detoxication, refer to Pharmacological management with depressive symptoms

b) Cannabis intoxication:
A: chlorpromazine (PO) 100-1000mg in divided doses, per day (max. dose 1000mg, per day)
OR
B: haloperidol (PO) 1.5-6mg in divided doses, per day (max. dose 20mg)

23.15.3 Substance Withdrawal

23.15.3.1 Alcohol Withdrawal Delirium (Delirium Tremens)
Delirium typically occurs 2–3 days following cessation of prolonged alcohol intake, reaching a peak at around 5 days. However, some withdrawal symptoms, such as tremor, may start within 12 hours.

Clinical presentation
- Visual hallucinations
- Delusions
- Disorientation, fluctuating level of consciousness
- Agitation
- Tonic-clonic seizures
- Tachycardia, and Hypertension.

It is important to consider alternative diagnoses, especially true in cases with an atypical presentation.
Similar symptoms may occur following withdrawal from other sedative hypnotic agents. Mortality varies from 1–5%.

General Measures
- See section 23.2: Delirium with perceptual disturbances.
- Cardiac monitoring and oximetry should be used when administering large doses of benzodiazepines.
- Assess for infections and other comorbid conditions.
- Ensure adequate hydration. Overhydration is a common error made in this setting.
- Correct abnormalities of electrolytes.
- Nutritional support.
- Consider referring appropriate patients to a rehabilitation Programme after recovery from delirium tremens.

Pharmacological Management
Administer medicine doses according to severity of symptoms. These patients may require high doses of benzodiazepines because of hepatic enzyme induction.

A: diazepam, slow IV, 10 mg (Not IM). Repeat dose after 5–10 minutes if required. If this dose is not sufficient, use 10 mg every 5–10 minutes for another 1–2 doses.

If patient is not yet sedated, continue with doses of 20 mg until this occurs. Usual initial dose is 10–20 mg, but up to 60 mg is occasionally required.

OR

Where intravenous access is not possible:
S: clonazepam (IM), 2 mg as a single dose. If no response, repeat dose after 60 minutes until patient is sedated. Repeat dose regularly to maintain mild sedation.

OR

C: lorazepam (IM), 1–4 mg every 30–60 minutes until patient is sedated. Repeat dose regularly to maintain mild sedation

Once patient is sedated, i.e. light somnolence, maintain mild sedation with:
C: diazepam (PO), 5–20 mg. Repeat dose regularly to maintain mild sedation.

Caution
Benzodiazepines, especially diazepam IV, can cause respiratory depression. Monitor patients closely as benzodiazepines can exacerbate an abnormal mental state or mask important neurological signs of deterioration.

Neuroleptic medicines, e.g. haloperidol, are associated with a reduced seizure threshold. Consider only for severe agitation and restlessness persisting after adequate doses of benzodiazepines.

B: haloperidol (IV/IM), 0.5–5 mg. Repeat after 4–8 hours as required to a maximum of 20 mg/day.

Once patient has responded and is able to take oral medication:
B: haloperidol (PO), 0.75–5 mg 4–8 hourly.

OR

S: aripiprazole (PO) 10-15 mg 24 hourly (titrating depending to individual response)

OR

S: olanzapine (PO) 5-10mg 24 hourly (maximum dose 20mg/day)

OR

S: risperidone (PO) 1mg 12 hourly (maximum 6mg/day)

When administering glucose-containing fluids:
C: thiamine, (PO/IM) 300 mg daily.

OR

A: vitamin B Complex (IV) 1ampoule in 500ml 5% Dextrose

Relapse prevention following detoxification
S: naltrexone (PO) 50mg 24hourly, and should be titrated, according to response

23.15.3.2 OPIOID (e.g. Heroin) Withdrawal
Heroin addiction, is a chronic, relapsing brain disease that is characterized by compulsive substance seeking and use, despite harmful consequences. When your body has become dependent on heroin, a number of unpleasant withdrawal symptoms will arise when the drug hasn't been used for a certain amount of time. Opioid withdrawal is generally poorly tolerated, but not dangerous, except in very frail debilitated patients or during pregnancy, with an increased risk of miscarriage in the first trimester and of preterm delivery in the third trimester.

Clinical Presentation
Myalgia, gooseflesh, diarrhea, rhinorrhea, lacrimation, agitation, anxiety, Insomnia, sweating, yawning, abdominal cramping, dilated pupils, nausea and vomiting

Non-Pharmacological Management
The identification and evidence-based management of opioid dependence among patients who are admitted to hospital will increase their likelihood of completing their primary admission-related treatment. Sub-optimal management of opioid withdrawal will increase the likelihood of absconding from hospital. It is extremely important to counsel patients managed for opioid withdrawal upon discharge.

Patients' opioid tolerance will be reduced after the down tapering of methadone (or similar medication) during hospital stay. Upon discharge, patients should be advised to use opioids with caution due to their increased risk of accidental overdose. Opioid related overdose deaths must be prevented. Special considerations apply during pregnancy, consult an expert.
Concomitant withdrawal from opioids and other "downer" drugs, like benzodiazepines or alcohol may complicate withdrawal, consult an expert.

Pharmacological Management
To prevent repeating using of the heroin, give;

S: methadone (PO) 30-120mg 24hourly for a minimum of 1 year
OR
S: buprenorphine (PO) 2-8mg 24hourly for a minimum of 1 year
OR
S: naltrexone (PO) 25-50mg 24hourly for 6 months.

Symptomatic Treatment

For difficult to get sleep, give:
C: diazepam (PO) 5–20 mg 24hourly to a minimum of 7days, in divided doses. Then taper off after 5-7 days
OR
A: promethazine (PO) 50mg 24hourly at bed time (medication should be titrated according resolution)
OR
A: chlorpromazine (PO) 50–100mg 24hourly at bed time (medication should be titrated according resolution)

For abdominal cramps, give:
A: hyoscine butyl bromide (PO) 20mg 8-24 hourly (medication should be titrated according resolution)
OR
C: diclofenac (PO) 50mg 8hourly (medication should be titrated according resolution)

For diarrhoea give:
B: loperamide (PO), 4 mg stat, then 2mg after each loose stool. Maximum dose: 16 mg in 24 hours. (medication should be titrated according resolution)

For headaches, give:
A: paracetamol (PO), 1 g 4–6 hourly when required. Maximum dose: 15 mg/kg/dose. Maximum daily dose: 4 g in 24 hours.

For muscle pains, give:
NSAID, e.g.:
A: Ibuprofen (PO), 400 mg 8 hourly, with meals, as required

23.15.3.3 Stimulant withdrawal, including Cocaine and Amphetamine type stimulants (e.g. Methamphetamine)

Non-Pharmacological Management
These patients usually do not require admission, however beware of depression and assess suicide risk. Assess and monitor for psychosis.

Pharmacological Management
No substitute drug available for detoxification. For severe anxiety, irritability and insomnia, give:
Benzodiazepines, short-term, e.g.:
C: diazepam (PO) 5–10mg 8hourly for 5–7 days (medication should be titrated according resolution)

Referral: Refer patients to specialized clinic.

Methaqualone (Mandrax/White pipe) withdrawal
Withdrawal can be dangerous and may lead to seizures or delirium. If withdrawal is symptomatic:
C: diazepam (PO), 5 mg 8 hourly. Reduce over 3–5 days depending on clinical response.

Cannabis withdrawal
Withdrawal is rarely dangerous or poorly tolerated.
Assess for other accompanying psychiatric disorders e.g. mood or psychosis.

23.15.3.4 Benzodiazepine withdrawal

Benzodiazepine addiction may occur after only a few weeks of use. Withdrawal symptoms on abrupt dose reduction or cessation includes anxiety, nervousness, irritability, depersonalization, delirium and seizures, increased sweating, sound sensitivity, nausea, difficulty concentrating, myoclonus, tremor, weakness and fatigue. Gradual tapering of the benzodiazepine is recommended to facilitate discontinuation.

Non-Pharmacological Management
- The therapeutic relationship between client and doctor is extremely important in initiating dose reduction.
- Confirm benzodiazepine dependence – ascertain usage, history of previous withdrawal symptoms; a urine screen may be necessary
- Establish full dosage of all benzodiazepines being taken, including those prescribed by other medical practitioners
- Take time to explain negative impact of ongoing benzodiazepine use, benefits of stopping, and concepts like tolerance and withdrawal
- Encourage the patient not to seek medication from other doctors.
- Evaluate and optimize management of comorbid substance use disorders, mental illness, and general health conditions.
- Avoid abrupt withdrawal of benzodiazepines; be prepared to take time. Negotiate each reduction with the patient. Individualize regular monitoring and motivation.
- Long-term follow-up with repeated motivation may be necessary to prevent relapse.

Pharmacological Management
Replace short-acting benzodiazepine with an equivalent diazepam (long-acting benzodiazepine) dose equivalent doses to diazepam 5 mg are:
D: clonazepam (PO) 0.25–1 mg 24hourly
OR
C: lorazepam (PO) 0.5 mg 24hourly
Higher doses may be required for patients who are dependent on both alcohol and benzodiazepines. Inpatient assessment and initiation of benzodiazepine tapering may be warranted in these patients.

Reduction is done according to clinical response.
C: diazepam (PO).
Reduce daily dose every 1–2 weeks by 10 mg/day until a daily dose of 50 mg. Then reduce every 1–2 weeks by 5 mg/day until a daily dose of 30 mg. Then reduce every 1–2 weeks by 2.5 mg/day until a daily dose of 20 mg. Then reduce every 1–2 weeks by 1.25 mg/day until stopped.

If symptoms reappear, increase the dose a little and reduce dose over longer intervals. No more than one week's duration of therapy is generally issued at one time.

Opioid overdose

Note: Initial doses of Naloxone above 2 mg can induce severe withdrawal, with the risk of vomiting and aspiration; very high doses above 10 mg may even be life threatening

Overdose Don'ts
- Do not leave the person alone by him/herself as they could stop breathing
- Do not induce vomiting or feed orally as the client may aspirate

Admit for continued observation for a minimum of 4 hours after administration of Naloxone. The client should be advised to avoid using any opioids or other drugs that may cause CNS depression for at least 24 hours and to ensure they do not stay alone during that period.

23.16 Psychiatric Disorders Associated with Epilepsy

Epilepsy is a disorder of the brain characterized by an enduring predisposition to generate epileptic seizures and by the biologic, cognitive, psychological, and social consequences of this condition. This association may reflect the anatomical and neurobiological source of both epileptic seizures and the behavioral manifestations. Antiepileptic drugs (AEDs) can play a role in the genesis of psychiatric symptoms; on the other hand, some psychotropic medications can lower the seizure threshold and provoke epileptic seizures.

Clinical Presentation
Major depressive disorder, Bipolar mood disorder, Anxiety disorder, Psychoses, Suicidality

Non-Pharmacological Management
- Psychoeducation to the patient and the family
- Family therapy
- Supportive group therapy
- Occupational therapy

Pharmacological Management
A: carbamazepine (PO) 200-1000mg, in divided doses, per day (symptoms should be monitored and medication titrated accordingly)
OR
A: phenobarbitone (PO) 30-200mg, in divided doses, per day (symptoms should be monitored and medication titrated accordingly)
OR
C: sodium valproate (PO), 500-2000mg in divided doses, per day (symptoms should be monitored and medication titrated accordingly)
OR
S: Levetiracetam (PO), 500-1500mg,12hourly (depending on symptoms' resolution)

If psychosis persists, give
B: haloperidol (PO) 0.75-4.5mg 12hourly. Maximum dose 20mg/day
OR
S: olanzapine (PO) 5-10mg in divided doses, per day. Maximum dose 20mg/day (symptoms should be monitored and medication titrated accordingly)
OR
S: risperidone (PO) 0.5mg 12hourly then increase by 1mg every 2-3days to 2-3mg 12hourly. Maximum dose 16mg/day
OR
S: Aripiprazole (PO) 10-15 mg 24 hourly (titrating depending to individual response)

Note:

- Postictal psychosis remits spontaneously even without treatment but that the use of effective neuroleptics may shorten the duration.
- Interictal psychosis is treated with antipsychotic drugs. Medications that lower the seizure threshold should be avoided.
- Atypical antipsychotic medications may have better profiles than typical antipsychotic medications.
- Medications that lower the seizure threshold should be avoided.
- The doses should be as minimal as possible

23.16.1 Depressive symptoms/signs in patients with epilepsy;

Non-Pharmacological Management

- Psychoeducation to the patient and the family
- Family therapy
- Supportive group therapy
- Occupational therapy

Pharmacological Management

A: carbamazepine (PO) 200-1000mg, in divided doses, per day (symptoms should be monitored and medication titrated accordingly)

OR

A: phenobarbitone (PO) 30-200mg, in divided doses, per day (symptoms should be monitored and medication titrated accordingly)

OR

C: sodium valproate (PO) 500-2000mg in divided doses, per day (symptoms should be monitored and medication titrated accordingly)

AND

A: amitriptyline 12.5-75mg (PO), nocte (symptoms should be monitored and medication titrated accordingly)

OR

S: fluoxetine 1 (PO) 0-20mg in divided doses, per day (symptoms should be monitored and medication titrated accordingly)

OR

S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)

Note:

- In the treatment of epilepsy-related depression, priority should be given to optimizing seizure control, since improved psychosocial functioning tends to accompany seizure remission
- Some anticonvulsant therapies, including sodium valproate, gabapentin, carbamazepine, and lamotrigine, also have antidepressant effects and may prove effective in treating depression in patients with epilepsy.
- Phenobarbitone is known to produce depression.

23.16.2 Mania/hypomania in patients with epilepsy;

Non-Pharmacological Management

- Psychoeducation to the patient and the family
- Family therapy
- Supportive group therapy
- Occupational therapy

Pharmacological Management

A: carbamazepine (PO) 200-1000mg, in divided doses, per day

OR

A: phenobarbitone (PO) 30-200mg, in divided doses, per day

OR

A: sodium valproate (PO) 500-2000mg in divided doses, per day

Note: Symptoms should be monitored and medication titrated accordingly

23.17 Psychiatric Disorders in Pregnancy

In some women, pregnancy and motherhood increase their vulnerability to psychiatric conditions such as depression, anxiety disorders, eating disorders, panic disorder, bipolar illness, and psychoses. These conditions are often underdiagnosed because they are attributed to pregnancy- related changes in maternal temperament or physiology. In addition, such conditions are often undertreated because of concerns about potential harmful effects of medication.

23.17.1 Depression

Several risk factors and psychosocial correlates have been identified as contributing to depression during pregnancy, like; Previous history of depression, discontinuation of medication(s) by a woman who has a history of depression, a previous history of postpartum depression, and a family history of depression.

Several key psychosocial correlates may also contribute to depression during pregnancy: a negative attitude toward the pregnancy, a lack of social support, maternal stress associated with negative life events, and a partner or family member who is unhappy about the pregnancy. The relationship between maternal depression and early childhood problems may be part of a sequence that starts with depressive symptoms during pregnancy.

Non-Pharmacological Management
Psychotherapies
- Cognitive behavioral therapy
- Interpersonal psychotherapy
- Education and support are also important, particularly as pregnancy is a unique experience for women, some of whom may not know what to expect.

Pharmacological Management
A: amitriptyline, (PO), 12.5–75 mg 24hourly at night, increase gradually to a maximum of 150 mg daily. {Elderly: Initially 12.5–50 mg. Max. 75mg)

OR

D: citalopram (PO) ,10-60mg 24hourly morning or evening and symptoms should be monitored, and medication to be tapered

OR

S: fluoxetine (PO) 20-60mg 24hourly (morning)

OR

S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)

Note:
- Full disclosure of both the risk and benefits of various antidepressant medications should be made to the patient and, if possible, her partner prior to starting any Pharmacological management.
- Low doses of antidepressants should be considered when initiating medication.

23.17.2. Panic Disorder
Some women may experience first-onset panic disorder during pregnancy. Women presenting with panic attacks for the first time should be screened for thyroid disorder. The correlation between plasma levels of cortisol in the mother and in the fetus may have implications for the developing fetal brain.

Non-Pharmacological management
- Cognitive behavioral therapy
- Supportive psychotherapy
- Relaxation techniques
- Sleep hygiene
- Dietary counseling

Pharmacological Management
Refer panic disorders

Note:
- Full disclosure of both the risk and benefits of various antidepressant medications should be made to the patient and, if possible, her partner prior to starting any Pharmacological management.
- Low doses of antidepressants should be considered when initiating medication

23.17.3 Obsessive-Compulsive Disorder
Obsessive-compulsive disorder (OCD) is characterized by thoughts that cannot be controlled (obsessions) and repetitive behaviors or rituals that cannot be controlled (compulsions) in response to these thoughts.

Non-Pharmacological Management
- Cognitive behavioral therapy
- Supportive psychotherapy
- Relaxation techniques
- Sleep hygiene
- Dietary counseling

Pharmacological Management
Refer to the specific section above

Note: Treatments for GAD in pregnancy are the same as those in non-pregnant adults.

23.17.4 Bipolar Mood Disorder

Non-Pharmacological Management
- Cognitive behavioral therapy
- Supportive psychotherapy
- Relaxation techniques
- Sleep hygiene
- Dietary counseling

Pharmacological Management
Refer to the specific section above

Note:
- Decision whether to use mood stabilizers must be made following an assessment of risks and benefits.
- Low doses of mood stabilizers should be as low as possible
- Factors to consider include number and severity of previous episodes, level of insight, family supports, and the wishes of the woman
- Careful monitoring of psychological symptoms throughout the pregnancy is of paramount importance

23.17.5 Schizophrenia

Non-Pharmacological Management
- Cognitive behavioral therapy
- Supportive psychotherapy
- Relaxation techniques
- Sleep hygiene
- Dietary counseling

Pharmacological Management
Treat as in the treatment of schizophrenia in non-pregnant woman

Note:
- Women with a history of psychosis require close monitoring during pregnancy
- Psychosis during pregnancy can have devastating consequences for both the mother and her fetus, including failure to obtain proper prenatal care, negative pregnancy outcomes such as low birth weight and prematurity, and neonaticide or suicide
- Treatment of acute psychosis in pregnancy is mandatory and includes mobilization of supports, pharmacotherapy, and hospitalization
- Electroconvulsive therapy may be used for psychotic depression

23.17.6 Post-partum psychosis

Post-partum psychosis (also called puerperal psychosis) is the most severe form of perinatal mental illness and carries a high suicide risk or risk of infanticide if untreated
It is a syndrome associated with:
- Pregnancy or puerperium (commencing within about 6 weeks after delivery)
- Involves significant mental and behavioral features: including delusions, hallucinations, or other psychotic symptoms.
- Rapidly changing mood, disorientation, poor concentration, screaming or muteness and impaired memory of recent events
- Mood symptoms (depressive and/or manic) are also typically present.

Pharmacological Management
Puerperal psychosis in a psychiatric emergency that typically requires in-patient treatment. Ensure safety: Prevent patients from harming themselves or others.
B: haloperidol (PO), 1.5-5mg stat OR (IM), 5mg. Maximum daily dosage of 20mg
OR
A: chlorpromazine (PO), 100-200mg stat OR (IM):100-200mg stat. Max daily dose of 400mg
OR
S: zuclopenthixol Acetate (IM), Adult: 50mg-150mg Stat.
OR
S: olanzapine (PO), 2.5-10mg OR (IM): 2.5-10mg
OR
S: aripiprazole (PO) 10-15 mg 24 hourly (titrating depending to individual response)

Non-Pharmacological Management
- Psychosocial support: Supportive care of the infant while his/her mother undergoes acute treatment. Individual and family psychotherapy is necessary to cope with stressors and improve self-esteem and confidence.
- Psychoeducation
- Referrals and Linkages: Refer to a mental health specialist for follow-up and maintenance treatment.

Note: In other patients with post-partum psychosis, more investigations should be done, to rule out other pathologies

23.17.7 Postpartum depression

Postpartum depression is a mood disorder that can affect individuals after childbirth.

Clinical Presentation

- Persistent feelings of sadness,
- Anxiety
- Fatigue
- Difficult to care for oneself or others.

Non-Pharmacological Management

- Psychotherapies
- Cognitive behavioral therapy
- Interpersonal psychotherapy
- Education and support are also important, particularly as pregnancy is a unique experience for women, some of whom may not know what to expect

Pharmacological Management

A: amitriptyline, (PO), 12.5–75 mg 24hourly at night, increase gradually to a maximum of 150 mg daily. {Elderly: Initially 12.5–50 mg. Max. 75mg)

OR

S: fluoxetine PO) 20-60mg (PO) 24hourly (morning)

OR

S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)

23.18 Autism Spectrum Disorder

Clinical Presentation

DSM-5 states that an individual diagnosed with autism spectrum disorder would have marked difficulties in terms of communication and engagement with others across multiple social situations. These difficulties include:

- Difficulties with demonstrating appropriate behaviours in social contexts
- Difficulties associated with non-verbal communications used for social interactions
- Difficulties associated with failure to initiate or adapt to social interactions

In addition, the DSM-5 also requires the individuals to have characteristic repetitive behavioral patterns, such as repeated stereotypical movements or Highly ritualized behavioral patterns. DSM-5 criteria specified that these behaviours must have started since the early developmental period and has resulted in marked impairments in terms of functioning.

Assessment

- Detailed history from a caregiver and educational institutions.
- Vital signs and physical examination.
- Suicide risk assessment.

Note: Despite exhibiting symptoms since childhood, autism spectrum disorder can sometimes be initially diagnosed in adulthood.

Investigations

- Baseline lab Investigations: FBC, LFT, RFT, VDRL, RBS, BS for M.P.s, HIV, TFT, Pregnancy Test,
- Specific test, e.g.(toxicology)
- Imaging (C.T. scan and MRI).
- Other investigations may be considered based on the patient's presentation.

If a patient tests positive for any of the above tests, manage accordingly and refer where appropriate

Non-Pharmacological Management

For children

- Every pre-school child diagnosed with autism should have an individualized intervention plan that sets out the goals, type(s), frequency and intensity of intervention, in order to address particular developmental and educational needs
- An individualized intervention plan should consist of a variety of quality programs and activities. This includes attendance in comprehensive early intervention programs, programs targeting specific needs and also positive engagement with parents and/or caregivers
- Alternative-augmentative communication systems may be recommended for pre-school children with autism because the expanded (spoken or written) communication may stimulate speech acquisition in non-verbal children and enhance expression in verbal children.
- Visual strategies are useful interventions for children with autism because they offer visual support to communication, increase spontaneous imitation and socially communicative behaviour.
- Social skills programmes depend on the functioning level of the preschool child with autism and may include:
    - > Assessment and teaching of social skills interaction in natural settings.
    - > Provision of structure, visual cues and predictability.
    - > Making abstract concepts more "concrete".
    - > Activities that enable purposeful and appropriate interaction with typically developing peers.
    - > Goals focusing on fostering self-appreciation and self-esteem

For the parents

- Parents and caregivers should be encouraged to discuss the need for practical emotional support. This enables information to be provided, referrals made and support services made available
- Parents and caregivers are recommended to consult appropriate professionals when considering educational placement for their child with autism

Pharmacological Management

S: risperidone (PO). 0.5- 4 mg (For Tantrums, aggressive episodes, self-injurious behaviours, hyperactivity)

OR

S: methylphenidate (PO), 5-15mg (immediate release) OR 18-36mg for extended release. (For comorbid hyperactivity)

OR

B: haloperidol (PO), 1.5-20mg, (For Aggressive behaviour, irritability, and uncooperativeness)

OR

S: aripiprazole (PO), 2-15mg, (For Irritability)

OR

S: clozapine (PO), 25-400mg, (For Disruptive behavior)

OR

S: venlafaxine (PO), 37.5-225mg, (For Aggression, self-injurious behaviour, and hyperactivity)

OR

S: fluoxetine (O), 10-80 mg, (For Repetitive behaviors)

OR

S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)

Pharmacological management in Autism should be symptomatic management depending on how the child is presenting, e.g. comorbid with ADHD, psychosis or overstimulation

23.19 Attention Deficit / Hyperactivity Disorder (ADHD)

DSM-5 states that an individual diagnosed with attention-deficit and hyperactivity disorder would have difficulties in terms of functioning, mainly due to (a) inattention and/or (b) hyperactivity and impulsivity.

The DSM-5 states that these inattentive and/or hyperactivity and impulsivity symptoms must be present before the age of 12 years old. In addition, these symptoms must have resulted in impaired functioning in at least 2 different social situations.

Clinical Presentation

The DSM-5 requires the individual to fulfill at least 6 of the following signs and symptoms of inattention:

- Failing to pay close attention to details
- Concentration difficulties
- Difficulties with sustaining attention at tasks
- Daydreaming and does not seem to be able to follow normal conversations
- Difficulties with organization of tasks
- Reluctance to participate in tasks that involve much attention
- Frequently loses important objects
- Easily distractible
- Forgetfulness about daily activities.

The DSM-5 also specified that only 5 of the above signs and symptoms of inattention need to be fulfilled if individuals are 17 years of age and above.

DSM-5 also requires the individual to fulfil at least 6 of the following signs and symptoms of hyperactivity and impulsivity:

- Moving about and unable to sit still
- Leaves seat even when required to remain seated
- Climbs or runs about in inappropriate situations
- Always having excessive energy and always on the move
- Chats excessively
- Impulsive and gives answers even before being asked to
- Having difficulties waiting for his/her turn
- Unable to carry out normal conversation due to frequent interruptions

Assessment

- Detailed history from a caregiver and educational institutions
- Observation of symptoms
- Examination: physical and mental state examination
- Psychometric tools: conners comprehensive behavioral rating scale
- Screen for comorbidities, e.g., Anxiety and Depression
- Routine blood work: FBC, LFTs, UECs, Thyroid Function Test, Calcium levels, Urinalysis
- EEG to rule out seizures
- Imaging- CT scan or MRI brain

Non-Pharmacological Management

- Parent-training/ education programs
- Refer parents to educational programs to learn about ADHD, its management and coping strategy.
- For parents, the program should include individual or group-based parent-training/education programs.
- For children and youth with ADHD, the program should include CBT or social skill training.
- Offer training to the teachers on behavioral interventions in the classroom to help the child to cope with ADHD

Behaviour therapy

- Positive reinforcement of positive behaviour including reward system and praises. The parents can consider using a star chart to promote positive behaviour at home.
- Environmental modifications aim at improving attention e.g. placing the child in the front row of class, minimizing distractions etc.
- Combination of behaviour therapy and medication is better than medication alone.

Pharmacological Management

Age above six years:

CNS stimulants are used to improve the ability to sustain attention and academic sufficiency

S: methylphenidate 5mg to 10mg (PO) 12hourly taken after breakfast and after lunch.

OR

S: methylphenidate extended-release (XL) 18-36mg (PO) 24hourly.

OR

Non- stimulants,

S: Atomoxetine (PO) (0.5mg/kg 24hourly for the first three days and then increase to 1.2mg/kg according to the response).

Medications may also be used to manage comorbid conditions

23.20 Anxiety disorders in children

Anxiety disorders in children are persistent fears or worries that disrupt their ability to participate in play, school, or typical age-appropriate social situations.

Clinical Presentation

Common symptoms of anxiety disorders in children:

- Irritability
- Trouble sleeping or waking with bad dreams.
- Restlessness
- Outbursts of anger
- Difficulty concentrating
- Being tense or fidgety or using the toilet often
- Being too clingy, which is not age-appropriate.
- Physical symptoms like fatigue, headaches, or stomachaches

Types of Childhood Anxiety Disorders

Anxiety Disorder	Clinical Manifestations / Diagnostic Features
Separation Anxiety Disorder	At least three of the following symptoms: • Recurrent excessive fear when anticipating or experiencing separation from major attachment figures (e.g., parents/guardians) • Excessive worry about losing a major attachment figure • Persistent refusal to go to school or away from home • Excessive fear of being alone or away from loved ones • Recurrent nightmares involving separation themes • Recurrent physical symptoms (e.g., headaches, abdominal pain) when separation occurs or is anticipated • Excessive fear or distress when away from parent's/caregivers Additional criteria: • Symptoms persist for ≥4 weeks • Causes significant impairment in social, academic, or occupational functioning
Selective Mutism	• Consistent failure to speak in specific social situations where speaking is expected • Symptoms persist for ≥1 month • Failure to speak is not due to language barriers or lack of knowledge • Not better explained by a communication disorder • Child speaks normally in familiar settings but becomes mute in specific situations or around certain people

Management of Anxiety Disorders in Children treatment plan that works best for the child and family should be developed with a multidisciplinary approach. In the treatment of very young children, involving parents and other important caregivers is crucial, and when appropriate, the school can also be included in the management process.

Non-Pharmacological Management

The Mainstay of treatment of mild to moderate anxiety disorders in children is psychotherapy. Various psychotherapeutic interventions are effective, including:

- Cognitive behaviour therapy (CBT),
- Problem-solving therapy,
- Psychodynamic psychotherapy,
- Family therapy,
- Relaxation techniques.

It's important to tailor the supportive therapy approach to each child's unique needs and consider the severity of their anxiety symptoms. Additionally, involving parents and caregivers in the therapeutic process enhances the overall effectiveness of anxiety management strategies for children

Pharmacological Management

Medication is only prescribed for severe anxiety. A combination of medication and psychotherapy has better outcomes than either of the interventions alone

S: fluoxetine (PO), 10-40mg

OR

S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)

OR

S: sertraline (PO), 25-50mg 24hourly

OR

S: venlafaxine (PO), 37.5-225mg 24hourly

OR

A: amitriptyline (PO), 25-100mg 24hourly

Note: Amitriptyline is not preferred unless its cost is a hindrance or where a child has side effects from the other options. In the same breadth, benzodiazepines are to be avoided due to the risk of addiction.

23.21 Enuresis

Clinical Presentation

As per **DSM-5**

- Repeated voiding of urine into bed or clothes (whether involuntary or intentional)
- Behavior must be clinically significant as manifested by either a frequency of twice a week for at least three consecutive months or the presence of clinically significant distress or impairment in social, academic (occupational), or other important areas of functioning.
- Chronological age is at least 5 years of age (or equivalent developmental level).
- The behavior is not due exclusively to the direct physiological effect of a substance (such as a diuretic) or a general medical condition (such as diabetes, spina bifida, a seizure disorder, etc.).

Non-Pharmacological Management

- Fluid restriction at night especially 1 hour before the desmopressin dose until the next morning, or at least 8 hours after the dose. If child wakes up during the night, limit the amount that he or she drinks.
- Star chart: effective in one-third of cases
- Alarm: Child must wake up and urinate.

Pharmacological Management

A: amitriptyline (PO) 25mg nocte (medications should be titrated according to symptoms resolution)

OR

C: imipramine (PO) 100mg nocte (medications should be titrated according to symptoms resolution)

23.22 Oppositional Deviant Disorder

Oppositional defiant disorder (ODD) is listed in the DSM-5 under Disruptive, impulse-control, and conduct disorders and defined as "a pattern of angry/irritable mood, argumentative/defiant behavior, or vindictiveness.

This behavior is usually targeted toward peers, parents, teachers, and other authority figures, including law enforcement officials. Unlike Conduct Disorder (CD), those with ODD do not generally show patterns of aggression towards random people, violence against animals, destruction of property, theft, or deceit

Clinical Presentation
Signs and symptoms
DSM-5, it states that a person must exhibit four out of the eight signs and symptoms to meet the diagnostic threshold for ODD. These symptoms include:

- Often loses temper
- Is often touchy or easily annoyed
- Is often angry and resentful
- Often argues with authority figures or, for children and adolescents, with adults
- Often actively defies or refuses to comply with requests from authority figures or with rules
- Often deliberately annoys others
- Often blames others for their own mistakes or misbehavior
- Has been spiteful or vindictive at least twice within the past six months

23.23 Sleep-Wake Disorders

Sleep-wake disorders are changes in sleeping patterns or habits that can negatively affect health. The following are common types of sleeping disorders: Insomnia disorder, Hypersomnolence disorder, Narcolepsy, Sleep-related breathing disorders, Circadian rhythm sleep-wake disorders, Parasomnia and Substance/medication-induced sleep disorders.

23.23.1 Insomnia

Insomnia refers to difficulty in getting to sleep or staying asleep, occurring at least three nights per week, is present for at least three months, and occurs despite adequate opportunities for sleep.

Types of insomnia:
a) Transient or short-term insomnia
This type of insomnia often occurs in the aftermath of a stressful life event — for example, losing a loved one or going through relationship issues. It can also happen if you work shifts or have jet lag. One might be unable to relax, experience disturbed sleep, and may be unable to pinpoint any real reason for their inability to sleep.

b) Chronic insomnia
Chronic insomnia is characterized by experiencing non-restorative sleep, difficulty falling asleep and maintaining sleep for at least one month, leading to daytime exhaustion. With chronic intermittent insomnia, one experiences a sleeping pattern with a few nights of good sleep alternating with many nights of insomnia.

Causes
Poor sleep hygiene, Sleep-related breathing disorders, medical conditions, Disrupted sleep-wake schedule, Hormonal changes, Limb movements during sleep, and Circadian rhythm disorder.

Clinical Presentation
- Inability to initiate sleep resulting in significant distress or impairment.
- Difficulty initiating or maintaining sleep.
- Anxiety or depression commonly coexist with insomnia.
- Waking up early in the morning.
- Difficulty falling asleep at night.
- Difficulty in paying attention, focusing on tasks, or remembering.
- Not feeling well rested after a night's sleep.
- Increased errors or accidents.
- Daytime tiredness or sleepiness

Diagnostic Criteria for Insomnia Disorder

Criterion	Description
A. Sleep complaint	Predominant complaint of dissatisfaction with sleep quantity or quality associated with one or more of the following:
	Difficulty initiating sleep (in children: difficulty initiating sleep without caregiver intervention)
	Difficulty maintaining sleep characterized by frequent awakenings or difficulty returning to sleep after awakening (in children: inability to return to sleep without caregiver intervention)
	Early-morning awakening with inability to return to sleep
B. Functional impairment	Sleep disturbance causes clinically significant distress or impairment in social, occupational, educational, academic, behavioral, or other important areas of functioning
C. Exclusion criteria	Insomnia is not better explained by another sleep-wake disorder and is not attributable to substances (e.g., drugs of abuse, medications), coexisting mental disorders, or medical conditions

Assessment
It is mainly done to rule out any physical or mental illness that would present with similar sleep disturbances.
- History taking, especially on the sleep schedule and sleep hygiene
- Mental status exam
- Vital signs and physical examination
- Suicide risk assessment

Investigations
- Baseline lab Investigations: FBC, LFT, RFT, VDRL, RBS, BS for MPs, HIV, TFT, Pregnancy Test.
- Specific test (toxicology).
- Imaging (CT scan and MRI).

Other investigations may be considered based on the patient's presentation. If a patient tests positive for any of the above tests, manage accordingly and refer where appropriate

Management of Insomnia
Insomnia management utilizes various interventions, including managing underlying conditions (for non-primary insomnia) and psychosocial &pharmacotherapy interventions. Psychosocial interventions are the first line of treatment with CBT being the most effective psychotherapeutic technique

Non-Pharmacological Management

Intervention	Recommendation/Description
Psycho-educational interventions	Provide education on the relationship between thoughts, feelings, behaviours, and sleep as a core component of management
Sleep hygiene education	Promote healthy sleep habits to improve sleep initiation and maintenance
Consistent sleep schedule	Go to bed at the same time each night and wake up at the same time each morning, including weekends
Sleep environment optimization	Ensure the bedroom is quiet, relaxing, and maintained at a comfortable temperature
Reduce screen exposure	Remove televisions, computers, smartphones, and other electronic devices from the bedroom
Dietary modification	Avoid large meals, caffeine, and alcohol before bedtime
Physical activity	Encourage regular daytime exercise to improve sleep quality
Cognitive Behavioural Therapy (CBT)	Identify and modify maladaptive thoughts, feelings, and behaviours contributing to insomnia; reframe misconceptions and promote healthy sleep practices

Note: Psychosocial management is the mainstay of treatment for insomnia.

Pharmacological Management
Benzodiazepines are used in the acute management period, with a maximum duration of two weeks, as the drugs have a strong propensity for addiction. They can also be used for a maximum of one week if used in combination with antidepressants to allow for the antidepressant medication to take effect. Ensure to taper off the medication gradually when stopping.

C: diazepam 5–10 mg PO at night for a maximum of 2 weeks
OR
C: lorazepam 1–2 mg PO at night for a maximum of 2 weeks

Note: Short-acting benzodiazepines are often preferred for insomnia because they theoretically produce less next-day drowsiness, although many patients still experience these effects.
Benzodiazepines should not be taken with alcohol or with opioids commonly found in prescription pain medications and cough syrups, as this can have serious side effects, including slowed or difficult breathing and even death.

Sedative antidepressants
These can be prescribed for more than four weeks and have a lower propensity to addiction. Therefore, they are used for long-term management of insomnia in combination with other psychological interventions
Sedating antidepressants is a good option if the patient has comorbid depression and anxiety disorders; however, Avoid in the elderly and patients with medical comorbidities. their use should be avoided in elderly persons and patients with medical comorbidities.

A: amitriptyline (PO): initial dose 25mg, increase by 25mg weekly with a maximum of 50mg/day
OR
S: zolpidem at 5-10mg at night. Suitable for long-term management of insomnia and usage by in-patients with multiple medical comorbidities and older patients. It has fewer side effects compared to benzodiazepines and less addictive potential.

Antipsychotics
This is a good option if the patient has comorbid mood or psychotic symptoms.
S: quetiapine (PO) 50 mg nocte and increase by 25 mg every two days, titrated against response, a maximum dose of 100mg per day.
OR
S: aripiprazole (PO) 10-15 mg 24 hourly (titrating depending to individual response)

Note: Combination pharmacotherapy may be used in certain situations where one mode of treatment is ineffective or side effects limit dose optimization for the initial medication. Combination medication should consider patient comorbidities and drug-drug interactions

Referral and Linkage
- To a psychiatrist in case of non-response to medication
- Psychologist for other psychotherapy techniques
- Refer to a social worker for social and economic assessment and support.
- Linkage with community resource persons
- Refer to an occupational therapist to promote the person's ability to fulfill their daily routines and roles.

23.23.2 Hypersomnolence disorder

Hypersomnolence disorder (hypersomnia), is a condition characterized by excessive daytime sleepiness and prolonged night time sleep. It can be a symptom of other sleep disorders like narcolepsy or obstructive sleep apnea, but it can also exist as a primary sleep disorder, like idiopathic hypersomnia

Clinical Presentation

- Excessive daytime sleepiness
- Prolonged nighttime sleep
- Sleep inertia
- Difficulty staying awake and alert
- Cognitive impairment
- Anxiety or irritability upon waking

Types of Hypersomnolence disorder

a) Idiopathic Hypersomnia: This is a primary sleep disorder where the cause is unknown.
b) Hypersomnia due to other conditions: It can be a symptom of other sleep disorders like narcolepsy, obstructive sleep apnea, or medical/psychiatric conditions.
c) Hypersomnia due to medication or substance use: Certain medications and substance use can also lead to hypersomnolence.

Non-Pharmacological Management

- Lifestyle adjustments: Maintaining a regular sleep schedule, optimizing sleep hygiene, and managing stress.
- Cognitive Behavioral Therapy for Insomnia (CBT-I): This therapy can help improve sleep habits and reduce sleep-related anxiety.

Pharmacological Management

S: modafinil (PO) 200mg 24hourly, in the morning.

OR

S: methylphenidate (PO), 20-30mg 12hourly or 8hourly and take 30 to 45 minutes before meals. Maximum dose is 60 mg per day.

23.24 Somatic Symptom Disorder

Clinical Presentation

As per **DSM-5**

- One or more somatic symptoms that are distressing or result in significant disruption of daily life.
- Excessive thoughts, feelings, or behaviors related to the somatic symptoms or associated health concerns as manifested by at least one of the following:
  > Disproportionate and persistent thoughts about the seriousness of one's symptoms.
  > Persistently high level of anxiety about health or symptoms.
  > Excessive time and energy devoted to these symptoms or health concerns DSM-5 specified time duration of at least 6 months of the presentations.

Non-Pharmacological Management

- Regular appointments: Patients diagnosed with somatic symptom disorder should have a fixed, regular physician whom they can seek help from and be seen on a regular basis.
- Avoid unnecessary investigation but physical examination should be performed if new complaints arise.
- Offer empathy to the sufferings experienced by the patient.
- Psychotherapy:
  > Self-help techniques
  > Supportive psychotherapy
  > Cognitive behaviour therapy (e.g. challenge cognitive distortions, activity scheduling to enhance physical activities).
- Increase in social and occupational functioning

Pharmacological management

A: amitriptyline (PO) 25-50mg 24hourly (medications should be titrated according to symptoms resolution)

OR

C: imipramine (PO) 100mg 24hourly (medications should be titrated according to symptoms resolution)

OR

S: fluoxetine (PO) 10-20mg 24hourly (medications should be titrated according to symptoms resolution)

OR

S: escitalopram (PO) 10-20 mg nocte (titrating according to individual response)

23.25 Functional Neurological Disorder (formerly Conversion Disorder)

Clinical Presentation

As per **DSM-5**

- One or more symptoms of altered voluntary motor or sensory function.
- Clinical findings provide evidence of incompatibility between the symptom and recognized neurological or medical conditions.
- The symptom or deficit is not better explained by another medical or mental disorder.
- The symptom or deficit causes clinically significant distress or impairment in social, occupational, or other important areas of functioning or warrants medical evaluation

Non-Pharmacological Management

- Psycho-education
- Cognitive behavioral therapy (CBT): This is a treatment that shows how your thoughts, feelings and behaviors connect. It can help you spot thoughts that trigger certain emotions, which can then affect how you act and respond.
- Psychodynamic therapy: This explores past trauma and emotional conflicts throughout your development. It can help you understand how symptoms may link to past events.
- Family therapy: Family therapy can help your loved ones understand the condition and offer support.
- Biofeedback: This uses sensors to help you see how your body reacts to stress. It can help you learn to manage certain body functions to reduce symptoms.
- Physical therapy: This may improve movement and coordination. It also encourages better movement patterns and prevents muscle weakness.
- Medication: This treatment may help if the patient has depression, anxiety or chronic pain.

23.26 Wernicke's Encephalopathy

Wernicke's Encephalopathy (WE) is an acute neuropsychiatric syndrome that results from thiamine deficiency. It is linked to significant morbidity and mortality. If untreated, it can progress to Korsakoff Syndrome, which is characterized by a disproportionate impairment in memory compared to other cognitive functions. Common causes include a staple diet of unpolished rice, chronic alcohol abuse, malnutrition, recurrent vomiting and diarrhoea, gastrointestinal surgery, magnesium deficiency, unbalanced nutrition, cancer, and chemotherapeutic treatments.

Clinical presentation

- May present with relatively non-specific Common symptoms or signs include:
- Ocular abnormalities
- Mental status changes (Delirium)
- Incoordination and gait ataxia
- Other symptoms include
- Hypotension and tachycardia
- Seizures
- Hearing loss
- Hypothermia
- Late-stage symptoms include Hyperthermia, Increased muscle tone, spastic paresis, Choreic dyskinesia, Coma

Management

C: thiamine hydrochloride 500mg dissolved in 100ml of NS given by infusion over 30 minutes, 8 hourly for 3 days.
If an effective response is observed,

THEN

C: thiamine 250mg IV/IM daily for 5 days,

Prophylactic treatment in people with alcohol intoxication, severe alcohol withdrawal and people with poor diet and signs of malnutrition:

C: thiamine 250mg IM once daily for 3-5 consecutive days.

THEN

C: thiamine 100mg (PO)daily for at least 3 months.

Give Thiamine before or concomitantly with intravenous administration of glucose if WE is suspected, as glucose alone can precipitate the disorder in thiamine-deficient individuals.

Management of vitamin b12 deficiency with neuropsychiatric symptoms

S: hydroxocobalamin (IM) 1mg 24hourly for 1 week, then weekly for 4 weeks, then monthly thereafter until maximum improvement has occurred.

OR

S: methyl cobalamin 500µgm (PO) 8hrly until maximum improvement has been observed. Stop if the underlying cause is corrected.

AND

A: folic acid (PO) 2mg once two weeks after starting treatment.

CHAPTER TWENTY- FOUR

NUTRITION DISORDERS

Nutrition disorders can be caused by an insufficient intake of food or certain nutrients, or by inability of the body to absorb and use nutrients, or by over consumption of certain foods.

This chapter serves as an essential component of the Standard Treatment Guidelines (STG), focusing on the comprehensive management of nutrition-related disorders. Malnutrition, in all its forms including undernutrition (wasting, stunting, underweight), micronutrient deficiencies (Iron Deficiency Anaemia – IDA, Vitamin A Deficiency - VAD, Iodine Deficiency Disorder - IDD) and overnutrition (overweight and obesity), representing a significant public health challenge with far reaching implications for individual health outcomes and national development.

The primary objective of this chapter is to provide healthcare professionals with evidence-based guidance for the prevention, early detection, diagnosis, and management of common nutrition disorders. It aims to standardize approaches to nutritional assessment, intervention, and monitoring, ensuring that patients receive timely, appropriate, and effective care.

By adhering to the principles and recommendations outlined herein, healthcare providers will be better equipped to improve nutritional status, enhance treatment outcomes, and ultimately contribute to a healthier population.

24.1 Micronutrient Deficiencies

Micronutrient deficiency often termed as "hidden hunger" remains a critical public health challenge, despite the nation's steady economic growth and its status as a "food basket" for East Africa. While the country produces a surplus of staple cereals like maize and rice, a significant portion of the population suffers from a lack of essential vitamins and minerals necessary for physical growth, cognitive development, and immune function.
The most micronutrient of public health importance in Tanzania includes; Iron, Vitamin A, Iodine, and Zinc. These deficiencies disproportionately affect the most vulnerable segments of the population namely children under five and women of reproductive age.

24.1.1 Iron Deficiency Anaemia (IDA)

Iron deficiency anemia (IDA) typically develops gradually. As iron stores are depleted, the body’s ability to produce hemoglobin the protein in red blood cells that carries oxygen is compromised, leading to a variety of systemic symptoms.
Anaemia according to WHO is a condition in which the number of red blood cells or their oxygen-carrying capacity is insufficient to meet physiologic needs, which vary by age, sex, altitude, smoking, and pregnancy status.

Table 24.1 Haemoglobin (Hb) levels (g/dl) and severity of anaemia at sea level

Population group and age	No anaemia	Mild anaemia	Moderate anaemia	Severe anaemia
Children, 6-59 months	11.0 and above	10.0-10.9	7.0-9.0	<7.0
Children, 5-11 years	11.5 and above	11.0-11.4	8.0-10.9	<8.0
Children, 12-14 years	12.0 and above	11.0-11.9	8.0-10.9	<8.0
Non-pregnant women (15 years and above)	12.0 and above	11.0-11.9	8.0-10.9	<8.0
Pregnant women	11.0 and above	10.0-10.9	7.0-9.9	<7.0
Men, 15 years and above	13.0 and above	11.0-12.9	8.0-10.9	<8.0

Clinical Presentation
These symptoms arise because the body’s tissues are not receiving enough oxygen (hypoxia):

- Fatigue: The most common complaint; a persistent feeling of tiredness or lack of energy.
- Dyspnea on Exertion: Shortness of breath during physical activity.
- Palpitations: A sensation of a racing or irregular heartbeat as the heart pumps harder to compensate for low oxygen levels
- Pallor: Visible paleness, most easily observed in the conjunctiva (inner eyelids), mucous membranes, and nail beds.
- Dizziness or Lightheadedness: Often felt when standing up quickly.

Specific Features of Iron Deficiency
Certain physical signs are highly suggestive of iron deficiency specifically, rather than just general anemia:

- Koilonychia: Also known as "spoon-shaped nails," where the nails become thin, brittle, and concave.
- Glossitis and Stomatitis: A smooth, sore, or "beefy" red tongue and cracks at the corners of the mouth (angular cheilitis).
- Pica: A specialized craving for non-nutritive substances. Common forms include: Pagophagia: Craving and chewing ice; Geophagia: Craving dirt or clay.
- Plummer-Vinson Syndrome: A rare triad of IDA, esophageal webs, and dysphagia (difficulty swallowing).
- Restless Legs Syndrome (RLS): An irresistible urge to move the legs, often worsening at night.

Investigations

- Hemoglobin (Hb): The concentration of the oxygen-carrying protein. According to the WHO, anemia is generally defined as:
  > Men: <13 g/dL
  > Women (non-pregnant): <12 g/dL
  > Pregnant Women: <11 g/dL
- Hematocrit (Hct): The percentage of total blood volume made up of red blood cells (RBCs).
- Mean Corpuscular Volume (MCV): Measures the average size of RBCs. This is the most helpful value for classification:
  > Microcytic (Low MCV): Small cells; common in iron deficiency or thalassemia.
  > Normocytic (Normal MCV): Normal size; common in chronic disease or acute blood loss.
  > Macrocytic (High MCV): Large cells; common in B12 or Folate deficiency.

Non-Pharmacological Management

Dietary management (Refer FBDG & National Clinical Nutrition & Dietetics Guideline)

While diet alone is rarely sufficient to treat established anemia, it is crucial for maintaining levels once stores are restored.

- Encourage consumption of foods rich in iron, folate, proteins and other nutrients needed for blood production. This includes: green leafy vegetables such as spinach, amaranths, pumpkin leaves, sweet potato leaves etc.; citrus fruits such as passion fruits, lemon, oranges etc.; beetroots & rosella etc.
- Encourage consumption of Iron rich food: Found in animal products (red meat, poultry, fish etc). It is more easily absorbed by the body.
- Non-Heme rich food: Found in plant-based sources (legumes, leaf green vegetables, fortified cereals, nuts). Absorption is lower and more dependent on the presence of Vitamin C.
- Provide foods rich in Vitamin B12, folate, Vitamin E and C
- Reduce intake of beverages that contain phenolic compounds and tannin such as tea leaves, wheat brans.
- Encourage consumption of fortified food rich in Iron & folate such as fortified wheat and maize flour and bio fortified food such as High-Iron Beans (HIB) etc.

Pharmacological Management

Supplementation with iron and folic acid or Multiple Micronutrient Supplementation (MMS)

Iron and Folic Acid supplementation:
For Pregnant Women (Daily Use)
A: ferrous Sulfate (PO) 200mg (60 mg elemental iron
AND
A: folic Acid 0.4mg 24hourly for at least 90 consecutive days during pregnancy

For Post Natal women
A: ferrous Sulfate (PO) 200mg (60 mg elemental iron
AND
A: folic acid 0.4mg 24hourly for at least 90 consecutive days during pregnancy

Multiple Micronutrient Supplementation (MMS)
A: multiple micronutrient supplement (MMS) 1 tablet PO once daily

Maternal anemia and micronutrient deficiencies are primary drivers of adverse pregnancy outcomes, notably low birth weight (LBW), small-for-gestational-age (SGA) births, prematurity, and neonatal mortality.

Evidence, both globally and locally indicates that MMS significantly enhances maternal nutritional status and birth outcomes

Table 24.2 Description of the type of MMS that is recommended in Tanzania (One tablet components).

Component	Chemical entity	Amount
Vitamin A	Retinyl acetate	800 mcg RAE
Vitamin C	Ascorbic acid	70 mg
Vitamin D	Cholecalciferol	5 mcg (200 IU)
Vitamin E	Alpha tocopheryl succinate	10 mg α-TE
Vitamin B_1	Thiamine mononitrate	1.4 mg
Vitamin B_2	Riboflavin	1.4 mg
Vitamin B_3	Niacinamide	18 mg NE
Vitamin B_6	Pyridoxine HCl	1.9 mg
Folic acid	Folic acid	680 mcg DFE (400 mcg)
Vitamin B_{12}	Cyanocobalamin	2.6 mcg
Iron	Ferrous fumarate	30 mg
Iodine	Potassium iodide	150 mcg
Zinc	Zinc oxide	15 mg
Selenium	Sodium selenite	65 mcg
Copper	Cupric oxide	2 mg

Recommended use of MMS

a) For supplementation (Pregnant women without anemia)

MMS recommended has 30mg of elemental Iron and should be provided daily for all pregnant women.
A: multiple micronutrient supplement (MMS) 1 tablet 24hourly for 12 weeks post childbirth.

b) Women with high risk for neural tube disease (NTD):
The group of women who require higher dosage of folic acid include – Women with a history of neural tube disease in previous pregnancy, women who themselves had neural tube disease, family history of neural tube disease, and women who are using anti-folate medication e.g. Sodium valproate for epilepsy.

A: folic acid (PO) 5mg 24hourly for 90 days prior to conception
OR
A: folic acid (PO) 5mg 24hourly for the first 12 weeks of pregnancy
OR
A: folic acid (PO) 400mcg 24hourly

c) Use of MMS in pregnant women with sickle cell disease (SCD)
Folic acid supplementation is essential due to increased red blood cell turnover.

- Iron should only be given if iron deficiency is confirmed by laboratory testing, due to the risk of iron overload.
- MMS/Iron supplementation should NOT be used routine.
- It is recommended to use folic acid 5 mg daily for pregnant women with sickle cell disease.

d) Use of MMS for Anemia Prophylaxis during Post-Partum Period
Providing MMS during breastfeeding, has the potential to influence breastmilk micronutrient composition, infant growth, maternal cognition, and maternal and infant micronutrient status.

- Post-delivery women should continue with 1tablet of MMS 24hourly for 6 to 12 weeks, but it can be extended up to 6months.
- Postpartum anemic patient should continue with 24hourly tablet of MMS with additional prescription of iron tablet from other available iron tablets that can provide elemental Iron of 30 to 90mg per day to meet a demand of 60 to 120mg/day until hemoglobin of 11g/dl is reached

For treatment of anaemia refer Haematology chapter 3

24.1.2 Iodine Deficiency Disorders (IDD)

Clinical Presentation

- Goitre enlarged thyroid gland from over activity.
- Hypothyroidism - dry skin, weight gain, puffy face, frequent constipation, and lethargy from under-active thyroid
- Hyperthyroidism - exophthalmia, rapid pulse, and weight loss from over-active thyroid
- Cretinism

Table 24.3: Criteria for Assessing Iodine Deficiency Using Urinary Iodine Concentration.

Micronutrient indicators	**Urinary iodine concentration for determining iodine status in the population**	
Median urinary iodine (µg/l)	**Iodine intake**	**Iodine status**
Pregnant women		
< 150	Insufficient	Severe iodine deficiency
150 – 249	Adequate	Adequate iodine nutrition
250 – 499	Above requirements	May pose slight risk of more than adequate iodine intake
> 500	Excessive	Risk of consequences Adverse health
Lactating women and children < 2 years		
< 100	Insufficient	Severe iodine deficiency
> 100	Adequate	Adequate iodine nutrition
School age children (6 years or older) [c]		
<20	Insufficient	Severe iodine deficiency
20 – 49	Insufficient	Moderate iodine deficiency
50 – 99	Insufficient	Mild iodine deficiency
100 – 199	Adequate	Adequate iodine nutrition
200 – 299	Above requirement	May pose slight risk of more than adequate iodine intake
> 300	Excessive	Risk of consequences adverse health

Table 24.4: Epidemiologic criteria for assessing iodine nutrition based on median urinary iodine concentrations in different target groups

Population group	MUIC (ug/L)		
	Insufficient	Adequate	Above requirement and excessive
School aged children	<100	100-299[a]	> 300[a]
Adults (women reproductive age)	<100	100-299[a]	≥ 300[a]
Pregnant women	<150	150-249	> 250
Lactating women	<100	> 100	
Children < 2 years	<100	> 100	

[a] adjusted based on best available scientific evidence to date

Non-Pharmacological Management

Dietary management (Refer FBDG & National Clinical Nutrition & Dietetics Guideline)

- Use of iodated salt (strategy for control of iodine deficiency worldwide)
- Use of iodine rich foods like: drinking water (reflecting amount of I2 present in the soil), Fish, Sea weeds (Sea weeds are rich in iodine but are a rare component of the diet).

Pharmacological Management

A: iodized oil (PO) 400mg repeated after one to two years

AND

C: potassium iodide solution (PO) 21mg stat

24.1.3 Vitamin A Deficiency (VAD)

Clinical presentation

- Night blindness or inability to see in the dark
- White foamy patches on the eye (Bitot's spot) or conjunctival and corneal dryness
- Keratomalacia or wrinkling and cloudiness of cornea
- Corneal ulceration or the cornea becomes soft and bulges

Investigations

Common indicators of VAD used for population surveys/assessments

- Clinical eye signs (Exophthalmia)
- Serum Retinol Concentration

Table 24.5 Serum Retinol Concentration

Public Health Importance	Serum or plasma retinol: <0.70 µmol/l in preschool-age children or pregnant women
Mild	> 2% - < 10%
Moderate	> 10% - < 20%
Severe	> 20%

Non-Pharmacological Management

Dietary consumption of vitamin-A rich foods

Recommended to use animal source Vitamin A and plant source vitamin A (Provitamin A)

a) Animal Sources: Liver (glandular meats), eggs, whole milk, small fish (sardines/dagaa) etc. Contains "Retinol," which is highly bioavailable and easily absorbed.

b) Plant sources: dark leaf green vegetables such as Amaranth (mchicha), pumpkin leaves (majani ya maboga), sweet potato leaves (matembele), and cassava leaves (kisamvu) etc.

> Biofortified Crops such as Vitamin A Maize and Orange Sweet Potatoes.

> Orange/Yellow Plants such as Orange-Fleshed Sweet Potatoes (OFSP), carrots, ripe mangoes, and pawpaw.

c) Fortified food: oil fortified with vitamin A (consider food fortification logo).

Pharmacological Management

Vitamin A supplementation/prophylaxis

a) Under-five children supplementation (6 – 59 months)

A: retinol (vitamin A) (PO) 6 monthly up to the age of 5years.

Table 24. 6: Administration of retinol (vitamin A)

Age range	Dose units	Frequency	Route of Administration
Infants 6 –11 month	100,000 IU (30 mg RE) vitamin A	6 monthly	Oral liquid, oil-based preparation of retinol palmitate or retinol acetate
Children 12 – 59 months	200,000 IU (60 mg RE) vitamin A	6 monthly	

b) Postnatal Supplementation

Postnatal mothers are eligible for a one-time -dose Vitamin A supplement (200,000 IU) within 4 to 8 weeks after delivery.

Pharmacological Management

For children 6- 59months and children refer to table 24.4

For adults (except women of reproductive age)

A: retinol (vitamin A) (PO) 200,000 IU stat.

In case of Exophthalmia and Measles:

For infants < 6 months' give

A: retinol (vitamin A) (PO) 50,000IU immediately on diagnosis repeat next day and on day 1

For infants 6-11months

A: retinol (vitamin A) (PO) 100,000IU immediately on diagnosis repeat next day and on day

For children 12-59 months

A: retinol (vitamin A) (PO) 200,000IU immediately on diagnosis repeat next day and on day

For all adults except women of reproductive age

A: retinol (vitamin A) (PO) 200,000IU immediately on diagnosis repeat next day and on day

For exophthalmia or Bitot's sport for women of reproductive age

A: retinol (vitamin A) (PO) 10,000IU 24hourly for 4weeks

Note:
Children who received a prophylactic dose within the previous month should not receive the treatment dose of vitamin A.

Referral: All complicated cases

24.1.4 Zinc Deficiency

Zinc deficiency is particularly prevalent among children under five and is a major contributor to stunting and recurrent infections.

Non-Pharmacological Management

Dietary management (Refer FBDG & Clinical Nutrition & Dietetics guideline)

- Animal Proteins: Small fish (dagaa), poultry, and liver are the most "bioavailable" sources (easiest for the body to use).
- Legumes: Beans and lentils (though these should be soaked or fermented to reduce phytates and improve zinc uptake).
- Pumpkin Seeds: A locally available and highly potent plant source of zinc.
- Food Fortification: fortification of wheat and maize flour with zinc (consider food fortification logo).
- Biofortified crops; Zinc bio-fortified beans

Pharmacological Management

In Management of Diarrhea: Zinc is a mandatory part of the "Integrated Management of Childhood Illness" (IMCI) protocol.

Children 6 months to 5 years:

A: zinc sulfate (PO) 20 mg 24hourly for 10–14 days.

Infants under 6 months:

A: zinc sulfate (PO) 10 mg 24hourly for 10–14 days.

24.2 Undernutrition

24.2.1 Malnutrition

Classes of malnutrition are severe wasting and/or nutritional oedema and moderate wasting

Table 24.7: Classification and Diagnostic Criteria of Acute Malnutrition in Children

Age Group	Classification	Diagnostic Criteria
0–6 months	Severe Acute Malnutrition (SAM)	• Weight-for-Length (WFL) < -3 SD AND/OR • Presence of bilateral pitting oedema of feet AND/OR • Infant fails to gain weight or loses >10% of initial weight
6–59 months	Severe Acute Malnutrition (SAM)	• Nutritional oedema of any grade AND/OR • Weight-for-Height Z-score (WHZ) / Weight-for-Length Z-score (WLZ) < -3 SD AND/OR • MUAC <11.5 cm (115 mm)
6–59 months	Moderate Acute Malnutrition (MAM)	• WHZ/WLZ ≥ -3 SD to < -2 SD AND/OR • MUAC ≥11.5 cm to <12.5 cm (115–124 mm) AND • No nutritional oedema
0–59 months (general definition)	Moderate Wasting	• Weight-for-Height (WFH) < -2 z-score • For children 6–59 months: MUAC ≥115 mm and <125 mm
0–59 months (general definition)	Severe Wasting / SAM	• Weight-for-Height (WFH) < -3 z-score • For children 6–59 months: MUAC <115 mm • AND/OR presence of bilateral pitting oedema

MUAC = Mid-Upper Arm Circumference, **WHZ =** Weight-for-Height Z-score, **WLZ =** Weight-for-Length Z-score

Note: Nutritional oedema automatically classifies the child as Severe Acute Malnutrition (SAM) regardless of anthropometric measurements.

Table 24.8: Clinical Presentation of Acute Malnutrition

Clinical Feature	Wasting (Marasmus/Severe Wasting)	Nutritional Oedema (Kwashiorkor/ Oedematous Malnutrition)
Body weight/appearance	Severe weight loss and wasting	Reduced fat and muscle tissue may be masked by oedema
Body habitus	Extremely emaciated	Oedematous appearance
Ribs	Prominent ribs	May be less visible due to oedema
Limbs	Very thin limbs	Swollen limbs due to oedema
Muscles	Marked muscle wasting with “old man” appearance	Muscle wasting may be present but less obvious
Oedema	Absent	Bilateral pitting oedema beginning in feet/lower legs and may progress to trunk, face, hands, and arms
Skin changes	Usually absent	Cracked, peeling skin; fragile skin prone to ulceration and infection
Hair changes	Usually absent	Hair becomes blond/yellow/red, sparse, dry, thin; easily pluckable; bald patches
Infections	Frequent infections with minimal signs	Frequent infections (e.g. URTI, otitis media, URI)
Electrolyte imbalance	Common	May occur, often associated with dehydration
Dehydration	May occur	Frequently present but may be masked by oedema
Behaviour/mental status	Alert and irritable	Apathetic, lethargic, miserable when left alone; irritable when handled
Mortality risk	Increased risk	High risk of death

Note: Children may present with both wasting and nutritional oedema (marasmic-kwashiorkor) and should be managed as Severe Acute Malnutrition (SAM).

Diagnostic criteria

Infants less than 6 months

- Weight for Length less than <-3SD
- Bilateral pitting oedema of feet

Investigations

- RBG
- MRDT +/- BS for MPS
- FBP and ESR
- CRP
- Urinalysis and urine culture and sensitivity
- Blood culture and sensitivity
- Serum electrolytes
- HIV rapid test
- Chest Xray
- Sputum/gastric aspirates for TB
- Infant is too weak to suck effectively
- The infant does not gain weight or lose more than 10% of the initial weight.

Table 24.9 Summary of medical complications and danger signs

Appetite	No appetite or unable to eat
Vomiting	Persistent/severe
Temperature	Hypothermia (Axillary Temperature <35.5°C, Rectal Temperature <36.5 °C) High fever (≥38.5 °C)
Respiratory symptoms and signs	Cough and fast breathing (as per IMCI guidelines) ;Lower chest in-drawing
Anaemia	Severe palmar pallor and jaundice
Dehydration	Severe dehydration based on recent history of fluid loss (watery diarrhoea/vomiting) with weight loss
Alertness	Extremely weak and lethargic, unconscious, fitting/convulsions
Infections	Open skin lesions, extensive infection

Note

- All children with complicated wasting and/or nutritional oedema are at risk of complications or death.
- Stabilize before referral and Refer urgently.

Management of Severe Wasting and/or with oedema;

General guidelines for management of SAM: Refer to current National IMAM guidelines

Pharmacological /Nutritional Management

Phase of Treatment	Therapeutic Feed	Dosage/Administration
Initial/Stabilization Phase	**A:** F-75 therapeutic milk	Give 130 mL/kg/day divided into 8–12 feeds/day (every 2–3 hours) for children with appetite and no severe complications. Continue until appetite improves and oedema reduces (usually 2–7 days).
THEN		
Transition/Rehabilitation Phase	**A:** F-100 therapeutic milk	Give 130–200 mL/kg/day divided into 6–8 feeds/day to promote catch-up growth after stabilization.
OR		
Alternative Rehabilitation Feed	**A:** Ready-to-Use Therapeutic Food (RUTF)	For children ≥6 months with good appetite and no complications: give according to body weight. Approximate dosage: 200 kcal/kg/day (about 2–3 sachets/day depending on weight).

Approximate RUTF Dosage by Weight

Weight (kg)	Sachets per Day*
3.5 – 4.9	1.5 – 2 sachets
5.0 – 6.9	2 – 2.5 sachets
7.0 – 8.4	2.5 – 3 sachets
8.5 – 9.4	3 – 3.5 sachets
9.5 – 10.4	3.5 – 4 sachets
10.5 – 11.9	4 – 4.5 sachets
≥12	4.5 – 5 sachets

Note

- F–100 and Ready Therapeutic food is used when appetite has returned (taking at least 80%) and when oedema has resolved
- For children 6–59 months start with 2hourly feeds (12feeds per day), and gradually decrease the frequency of feeding and increase the volume of each feed until the patient is getting 3hourly feeds (8feeds per day)

Table 24.10 If the child is conscious and has hypoglycaemia

Medicine	Child Dose	Frequency	Duration
B: dextrose 10% **OR** **C:** sucrose solution 10% **OR** Glucose gel for difficult cannulation	50ml bolus	Stat	
A: F-75 therapeutic milk	3ml/kg/Feed	Every 3minutes	2hours
	11ml/kg/Feed	2hourly	2days

Treatment of dehydration in Severe Malnourished Children: Refer to IMCI guidelines

Growth Faltering/Failure to Thrive
Children and infants who have either:
Unsatisfactory weight gain (growth curve flattening or weight loss) on the Road to Health chart/ booklet.
OR
Low weight for age, i.e. WHZ < –2 but > –3

Note: Babies who were premature and are growing parallel to or better than the Z-score line, should not be classified as having failure to thrive or not growing well.

Non-Pharmacological Management
Refer; (Food Based Dietary Guideline & MIYCAN guideline)

Table 24.11 Feeding recommendations for all children

Age Group	Feeding Frequency (per day)	Amount per Serving (in addition to breast milk)	Texture/Consistency	Food Variety
At 6 months (start complementary feeding)	2–3 meals + frequent breastfeeding	Start with 2–3 tablespoons(“tastes”)	Thick porridge/pap	Breast milk + animal foods + legumes + staples (porridge/local foods) + fruits and vegetables + micronutrient powder (country-specific).
6 to <9 months	2–3 meals + frequent breastfeeding; 1–2 snacks may be offered	Start with 2–3 tablespoons/feed, gradually increase to ½ of a 250 mL cup/bowl	Thick porridge/pap; mashed/pureed family foods	breast milk + animal-source foods + legumes + staple foods + fruits and vegetables + micronutrient powder (where indicated)
9 to <12 months	3–4 meals + breastfeeding; 1–2 snacks may be offered	½ of a 250 mL cup/bowl	Finely chopped family foods; finger foods; sliced foods	Family foods including staples, animal foods, legumes, fruits, and vegetables
12 to 24 months	3–4 meals + breastfeeding; 1–2 snacks may be offered	¾ to 1 full 250 mL cup/bowl	Sliced foods; family foods	Family foods including staples, animal foods, legumes, fruits, and vegetables
24–59 months	3 family meals/day + snacks between meals	Age-appropriate portions	Family foods	staple foods + animal-source foods + legumes + fruits + vegetables

Special Considerations

Situation	Recommendation
1. If the child is not breastfed	Add 1–2 extra meals/snacks/day according to age group **+** give 1–2 cups of milk/day **+** 2–3 cups of extra fluids, especially in hot climates
2. Responsive/Active feeding	Be patient and actively encourage the child to eat
3. Hygiene	• Feed using a clean cup and spoon (avoid bottles due to risk of diarrhoea) • Wash hands with soap and water before preparing food, eating, and feeding children

24.3 Overnutrition

Overweight and Obesity (Adiposity Based Chronic Disease - ABCD)
Obesity is a chronic disorder of excessive accumulation of fat in the body, whereas overweight refer to the excess amount of body weight in all tissues.

Management of Obesity and Overweight

Aim of nutritional management is to:

- Achieve and maintain ideal body weight by bringing about gradual weight loss
- Correct fault food habits

Table 24.12 Nutrition Assessment

Assessment Domain	Parameters/Components	Interpretation/Purpose
Anthropometric Assessment	**Body Mass Index (BMI)** Overweight Obesity Class I Obesity Class II Obesity Class III	 25–29.9 kg/m² 30–34.9 kg/m² 35–39.9 kg/m² ≥40 kg/m²
	Waist Circumference (WC) Men Women	**Assesses central obesity risk** >94 cm = Increased risk; >102 cm = Substantially increased risk >80 cm = Increased risk; >88 cm = Substantially increased risk
	Waist-to-Hip Ratio (WHR) Men Women	**Assesses abdominal obesity** ≥0.90 ≥0.85
	Children (Weight-for-Height) Overweight Obesity	 > +2 SD > +3 SD
Biochemical Assessment	Fasting blood glucose, HbA1c	Assess diabetes risk
	Lipid profile (Total cholesterol, LDL, HDL, triglycerides)	Assess dyslipidaemia/cardiovascular risk
	Liver function tests (ALT, AST, GGT)	Assess for non-alcoholic fatty liver disease (NAFLD)
	Thyroid function tests (TSH, T3, T4)	Rule out hypothyroidism
	Vitamins and minerals (Vitamin D, Iron, Vitamin B12)	Detect deficiencies
	Cortisol level	Assess stress/endocrine disorders
Clinical Assessment	Weight history	Identify trends in weight gain/loss
	Chronic diseases	Identify comorbidities
	Medication history	Identify medication-related weight effects
	Family history	Assess hereditary risk
	Blood pressure assessment	Screen for hypertension
	Physical signs	e.g., acanthosis nigricans, joint problems
Dietary Assessment	24-hour dietary recall	Assess recent food intake
	Food Frequency Questionnaire (FFQ)	Assess usual intake over time
	Eating pattern assessment	Evaluate snacking, eating out, high-calorie foods/drinks

Table 24.13: Nutrient–Drug Interactions

Medicine/Class	Nutrient Interaction/Effect
Metformin	Decreased absorption of **vitamin B12** and **folic acid**
Orlistat	Reduced absorption of fat-soluble vitamins (**A, D, E, K**) and beta-carotene
Calcium and Vitamin D supplementation	Risk of low bone mineral density if inadequate intake
Diuretics	May cause **potassium** and **magnesium depletion**
Metoprolol (Beta-blockers)	May mask hypoglycaemia symptoms and alter glucose metabolism

Non-Pharmacological Management

Dietary Management (Refer FBDG & National Clinical Nutrition & Dietetics Guideline)

Lifestyle-first approach remains the core of obesity management in Tanzania.

- Control total energy intake based on individual
- assessment by limiting energy intake from total fat and simple sugars.
- Put the client on a weight reduction diet regime of 30-25kcal/kg /day.
- High fiber, restricted fat diets based on individual assessment is recommended
- Offer nutrition education and counseling to the clients with emphasis on weight management, fat diets and other unhealthy practices in weight control
- Recommend suitable exercise program and encourage physical activity for gradual weight loss
- Recommend support systems for the clients who need behavior modification

Note

- A maximum reduction of 1000kcal daily is required to lose about 1kg a week and a reduction. Drastic reduction of calorie intake is however not advisable.
- Diet adjustments should be gradual as such people experience excessive appetite. Use of appetite suppressants is not recommended

Table 24.14 Nutritional Management

Nutrients	Nutritional Goal	Recommendation
Fat	20–35% of total calorie intake	Choose lower-fat alternatives- Include monounsaturated & polyunsaturated fats
Protein	0.9 g/kg/day	Include protein to enhance satiety and meet needs - opt for lean meats, skinless poultry, fish, eggs, legumes, tofu, low-fat dairy
Carbohydrates	45–65% of total calorie intake	Switch to whole grains - Choose low energy dense foods- Prefer foods with lower kcal/100g
Fiber	20–35 grams per day	Increases satiety- Include legumes, fruits, vegetables, whole grains
Sugar & Beverages	<10% of total calorie intake	Limit added sugars- Choose low-calorie beverages, Water is best, Limit alcohol consumption

Table 24.15 Recommended strategies in weight management

Strategy Area	Component	Details/Recommendations
Intermittent Fasting	16:8 Method	Eat within an 8-hour window; fast for 16 hours daily
	5:2 Method	Eat normally 5 days/week; fast 2 days/week (~500 kcal on fasting days)
Dietary Modifications	Portion Control	Reduce portion sizes; follow National Food-Based Dietary Guidelines
Education & Counseling	Nutrition Education	Teach balanced eating, label reading, managing emotional eating, meal planning
Behavioral Strategies	Behavior Change Support	Set realistic goals, self-monitor, build support systems, address barriers
Physical Activity	Exercise Recommendations	Promote regular activity tailored to individual preferences and capabilities
Monitoring & Follow-up	Ongoing Evaluation	Regularly assess progress, reassess goals, and adjust nutrition care plan as needed

Bariatric surgery

Bariatric Surgery Treatment indications and approach consideration. Surgery for obesity should be considered as a treatment of last resort after dieting, exercise, psychotherapy, and drug treatments have failed.

- Metabolic and bariatric surgery (MBS) is recommended for all individuals with a body mass index (BMI) higher than 35 kg/m2, regardless of the presence, absence, or severity of comorbid conditions.
- Metabolic and bariatric surgery (MBS) should be considered for individuals who have metabolic disease and a BMI between 30 and 34.9 kg/m2
- Metabolic surgery should be a recommended option to treat type 2 diabetes mellitus in appropriate surgical candidates with class III obesity (BMI ≥40 kg/m2), regardless of the level of glycemic control or complexity of glucose-lowering regimens, as well as in patients with class II obesity (BMI 35.0-39.9 kg/m2) with inadequately controlled hyperglycemia despite lifestyle and optimal medical therapy
- Metabolic surgery should also be considered to be an option to treat type 2 diabetes in patients with class I obesity (BMI 30.0-34.9 kg/m2) and inadequately controlled hyperglycemia despite optimal medical treatment by either oral or injectable medications (including insulin)
- Consider bariatric surgery in "carefully selected" patients with a body mass index (BMI) higher than 40 kg/m2 who have severe comorbidities (e.g., nonalcoholic fatty liver disease [NAFLD]) or in those with a BMI higher than 50 kg/m2 who have milder comorbidities

Surgical options

Types of bariatric surgery include the following:

- Correct fault food habits Restrictive procedures (e.g., adjustable gastric banding, sleeve gastrectomy)
- Restrictive procedures with some malabsorption (e.g., Roux-en-Y gastric bypass)
- Malabsorptive procedures with some restriction (e.g., biliopancreatic diversion with duodenal switch)
- Bariatric surgery can be performed either via an open approach or via a laparoscopic approach. The laparoscopic approach has become the more popular one.

Table 24.16: Non-Pharmacological Management

Post-operative Management

Intervention	Recommendation
Pre-operative diet	High-protein liquid diet/protein shakes for approximately 2–3 weeks (14–21 days) before surgery as indicated
Post-operative diet progression	Fluid diet → pureed diet → soft diet → regular healthy diet as tolerated
Multivitamin supplementation	Use for at least 14 days, then continue long-term if nutritional intake is inadequate or based on deficiency risk
Dietary counselling	Lifelong dietary modification and portion control
Eating behaviour modification	Avoid overeating, reduce high-calorie foods, encourage mindful eating
Physical activity	Encourage regular physical activity as tolerated
Follow-up monitoring	Monitor weight loss, nutritional deficiencies, complications, and comorbidities

Note: Patients undergoing bariatric surgery require long-term monitoring for deficiencies of iron, vitamin B12, folate, calcium, and vitamin D.

Table 24.17 Lifestyle

Stages of Management	Nutrient Recommendations	Food Sources
Pre-operative Diet	Low-calorie, high-protein liquid diet	Protein shakes, broth, sugar-free gelatin, clear fluids
Post-operative Diet	Phased approach: 1. Clear liquids → 2. Full liquids → 3. Pureed foods → 4. Soft solids → 5. Regular bariatric diet	Gradually introduce: clear broth → protein shakes → blended meats, soft-cooked veggies
Lifelong Supplementation	Daily multivitamin with minerals - Vitamin B12, iron, calcium, vitamin D (per procedure type)	Supplements: chewable or liquid initially, then tablets/capsules as tolerated
Smaller Portions	- Frequent, small meals/snacks (5–6/day) - Portion-controlled (¼–½ cup)	Use small plates, measure servings, eat slowly
Protein Focus	Goal: 60–80 g protein/day (varies by surgery and person)	Lean meats, dairy, legumes, protein powders/supplements
Fluid Separation	No fluids 30 minutes before/after meals Total fluid intake: ~1.5–2 L/day	Water, herbal tea, sugar-free drinks (sip slowly throughout day)

Provide the rest of energy 60% from carbohydrates which should be mainly in complex form; starches and dietary fiber. Limit simple forms like sugars

Minerals and Vitamins
Provide adequate amount of essential nutrients like minerals and vitamins to maintain a good nutrition status
Generally, increase intake of the following food:

- Vegetables such as broccoli, mushroom, zucchini, cabbage, lettuce, cucumber
- Fruits such as pineapple, cherimoya, peach, grapefruit
- Tubers such as sweet potatoes
- Low fat milk
- Diuretic foods such as celery, apples, watermelon (diuretic drugs are not recommended)

Pharmacological Management
Refer to Chapter 19 - Endocrine and Metabolic disease conditions

Note: Pharmacotherapy is considered only for BMI ≥ 30 kg/m² (or ≥ 27 with comorbidities like diabetes or hypertension) and when lifestyle changes alone fail

24.4 Nutrition Management for Infectious Diseases

Nutritional Management in TB, HIV and AIDS

Refer to National Guideline for Nutritional Care & Support of People Living with HIV and Nutrition Implementation Guideline for MDR-TB Patients in Tanzania

- Maintain and improve nutrition status of a person living with HIV/ AIDS thus delay the progression from HIV to AIDS related diseases.
- Ensure adequate intake of all nutrients thus preventing development of nutritional deficiencies.
- Preservation of lean body mass.
- Maintain body weight and fitness.
- Improve performance of immune system.
- Replenishment of nutrient losses incurred during infection.
- Minimizing symptoms of malabsorption.
- Regeneration of glycogen stores.
- Maintain laboratory values within normal limits.

Note: Control side effects due to medication and monitor drug – nutrient interaction

Table 24.18: Side Effects related to TB drugs and food intake recommendations to minimize them.

Medicine	Food Recommendation	Avoid	Common Side Effects/Considerations
Rifampicin	Take 1 hour before or 2 hours after meals	Alcohol; antacids within 1 hour	Nausea, vomiting, loss of appetite
Isoniazid	Take 1 hour before or 2 hours after meals; give Vitamin B6 (pyridoxine) 10 mg daily	Alcohol	May interfere with nutrient metabolism; peripheral neuropathy
Ethambutol	May be taken with food	Alcohol	Gastrointestinal discomfort; visual disturbances
Streptomycin	Increase fluid intake	—	Taste changes, nausea
Pyrazinamide	May be taken with food	Alcohol	Nausea, hepatotoxicity, joint pains
Ethionamide	Take with or after meals; supplement with Vitamin B6	Alcohol	Abdominal discomfort, nausea
Ofloxacin	Take 2 hours before or after food	Antacids, milk products	Gastrointestinal upset
Cycloserine	Supplement with Vitamin B6	Alcohol	Neurological side effects, irritability

Nutrient Requirements and Dietary Management in TB, HIV and AIDS Patients

Energy
Most patients with chronic tuberculosis, HIV and AIDS are malnourished, energy needs are increased in order to minimize weight loss and achieve a desirable weight. An additional 300- 500 kcal (35 -40 kcal per ideal body weight) is recommended. This will help in protein sparing.

Protein
An intake of 1.2- 1.5 g of protein per kg body weight is required to generate serum albumin levels per day, due to tissue wasting and repair of worn-out tissues.

Fats/ oils
These should provide 25-30% or less of the total energy requirements of an individual.

Vitamins and minerals
The body should be provided with liberal amounts of vitamins and minerals. In TB conversion of beta carotene to retinol is affected in the intestinal mucosa. The client should be supplemented with vitamin A (as per the National Vitamin A supplementation schedule) and encouraged to eat vitamin A rich food. Patients on isoniazid should ideally be supplemented with 10mg of pyridoxine B6 daily since the drug inhibits its absorption. Additional amounts of vitamin C is recommended in the diet to facilitate healing of lesions. Other antioxidants (Vit A, C, and E, folic acid, zinc and selenium) neutralize free radicals and prevent the production of peroxides from lipids.

Water
At least 8 glasses or more of safe drinking water per day

24.5 Dumping Syndrome.

It is a rapid gastric emptying occurs when food especially sugar moves from stomach into small bowel too quickly.

Nutritional implications
Loss of nutrients, Weight loss.

Aims of nutrition management
- Provide adequate calories and nutrients to support tissue healing
- Prevent weight loss
- Correct hypoglycemia in the short term

Dietary Management
After surgery the following should be done:
- All fluids and foods by mouth should be withheld for 3 to 5 days and the patient fed by nasogastric tube
- Ice chips should be held in mouth or small, infrequent sips of water should be given. Some people tolerate warm water better than ice chips or cold water
- Low carbohydrates, clear liquids such as soups, or diluted unsweetened fruit juices should be given and limited to ½ to 1 cup servings, however, at least 6 cups of fluids should be consumed daily to replace losses resulting from diarrhea. Carbonated beverages and milk are not recommended in the initial stages of the diet
- The post-gastrotomy diet then begins with gradual progression to a general diet as tolerated. Bland foods should be started first, but a more important priority is offering the patient foods he/she likes and can tolerate. By the 5th to 7th day most patients can tolerate solid foods
- For persons near desirable body weight about 1.5g to 2g protein should be given (35Kcal to 45Kcal/kg)
- Pectin, a dietary fibre found in fruits and vegetables maybe helpful in treating dumping syndrome. Pectin delays gastric emptying, slow carbohydrate absorption and reduces glycemic response, though small dry meals are of more benefit
- Vitamin and mineral supplementation maybe necessary depending on the extent of surgery and whether the symptoms of dumping syndrome persist
- Generally, liquids are served between meals rather than with meals to slow the passage of the food mass. Limit simple carbohydrates
- Lie down immediately after eating to help slow the transit of food to the intestines. Clients who experience reflux should not lie down after eating. Beware that lactose intolerance may develop and produce discomfort in relation to milk and milk products.

24.6 Clinical Nutrition

24.6.1 Critical Care Nutrition Support

The goal of nutrition management is to preserve lean body mass

Oral Nutrition Supplement

Oral nutritional supplements (ONS) should be used whenever possible to meet patient's needs, when dietary counseling and food fortification are not sufficient to increase dietary intake and reach nutritional goals.

Enteral and Parenteral Nutrition

Where nutritional requirements cannot be met orally or, expected to be impossible >3 days or expected to be below half of energy requirements for >1week, enteral nutrition (EN) should be administered. This should be assessed on a case-by-case basis and the long-term impact of nutrition deficit considered.

Parenteral nutrition (PN)

Parenteral nutrition (PN) should be considered when EN is not indicated or unable to reach targets over 3-7 days despite use of appropriate management strategies, and calorie and protein delivery is consistently <50% of prescribed targets. Supplemental PN should be considered after other measures to improve EN have been attempted or insertion of a post-pyloric enteral feeding tube is deemed unsafe and calorie and protein intake remain significantly less than prescribed targets (i.e. <50% over a 3-7day period)

Figure 24.1 Critical care Nutritional Support Algorithm

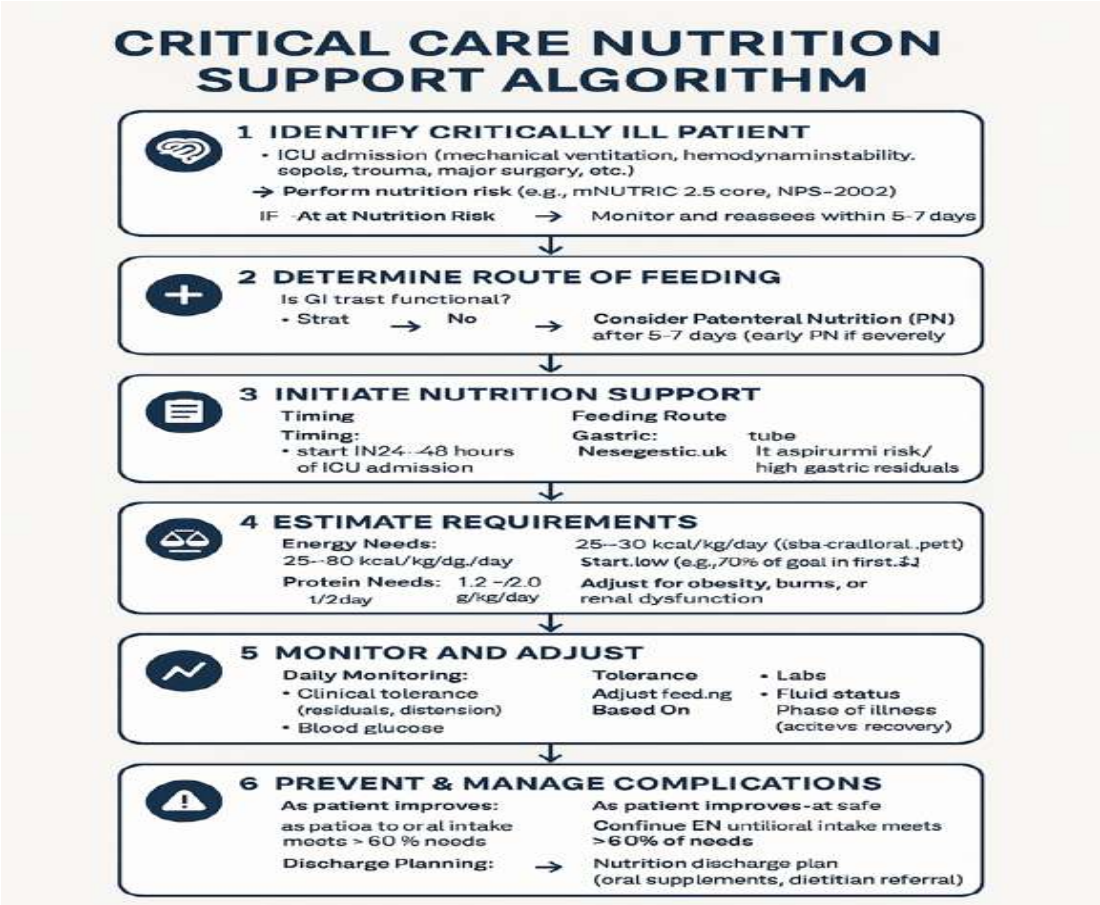


Table 24.19 Nutritional Assessment

Nutritional Assessment	Details
Anthropometric Assessment	• Measure weight, height, and BMI • Assess Z-scores and growth charts (especially in children)
Biochemical Assessment	• Assess albumin, prealbumin, transferrin, and C-reactive protein (CRP) • Check serum electrolytes • Platelet count • White blood cell count (WBC) • Neutrophil count • Haemoglobin • Random blood glucose (RBG) • Liver enzymes: AST and ALT
Clinical Assessment	• Assess for muscle wasting • Evaluate weight loss • Assess reduced functional status • Monitor fluid balance
Medical History Assessment	• Identify medical conditions affecting nutrition such as liver disease, kidney disease, Diabetes Mellitus, heart disease, and other chronic illnesses
Functional Assessment	• Assess the patient's ability to tolerate enteral nutrition or parenteral nutrition
Dietary Assessment	• Assess daily nutrient intake • Assess energy intake • Assess protein intake to determine adequacy

Note: This assessment should be conducted before initiating enteral nutrition, parenteral nutrition, or specialized nutritional support and repeated periodically to monitor progress.

Table 24.20 Nutritional Managements

Care/Nutrient Requirement	Dietary Recommendation
Early Enteral Nutrition	• Initiate within 24–48 hours if not contraindicated • Benefits: reduces infection risk, maintains gut integrity, and shortens ICU stay
Adequate Protein	Required for wound healing, immunity, and muscle preservation: • 1.2–2.0 g/kg/day (standard requirement) • 2.5–3.0 g/kg/day for severe catabolic states (e.g., trauma, sepsis, burns)
Caloric Goals	• 20–35 kcal/kg/day, individualized according to clinical condition • For undernourished patients: start with 10–20 kcal/kg/day, then gradually increase • Avoid overfeeding or underfeeding
Micronutrient Requirements	• Thiamine – supports energy metabolism • Ascobic Acid: 500–1000 mg/day (antioxidant support) • Vitamin D: 400–1000 IU/day (immune and bone health) • Zinc sulfate: 20–30 mg/day (wound healing) • Selenium: 50–100 mcg/day (immune support) • Magnesium sulfate: 300–400 mg/day (muscle and nerve function)
Monitoring and Adjustment	Regularly assess clinical condition, laboratory parameters, fluid balance, and nutrient intake to optimize nutrition support
Parenteral Nutrition	Use when enteral nutrition is not feasible, contraindicated, or insufficient; reserve for specific clinical indications
Specialized Diets	Modify diet according to clinical needs (e.g., low-sodium diet, low-fat diet, diabetic diet, renal diet)

Note: Prefer enteral nutrition over parenteral nutrition whenever the gastrointestinal tract is functional.

Nutritional Management

Table 24.21: Oral Nutritional Supplements

A. Ready-to-Drink Formulations

Formulation Type	Volume	Calories	Protein	Indications	Contraindications/Cautions
Hypercaloric (2.0 kcal/mL), high-protein, fiber-free formula	200 mL	400 kcal	20 g	• Inadequate oral intake • Chronic wasting • Liver disease	• Not suitable for children <3 years • Use with caution in children <6 years • Contraindicated in galactosemia
High-protein, high-calorie (1.5 kcal/mL) formula enriched with EPA/DHA (fish oil) and MCT	200 mL	300 kcal	20 g	• Oncology cachexia • Acute/chronic respiratory conditions • Immunocompromised patients	• Not suitable for children <3 years • Use with caution in children <6 years • Contraindicated in galactosemia

Formulation Type	Volume	Calories	Protein	Indications	Contraindications/Cautions
High-protein, high-calorie (1.5 kcal/mL) formula with fiber and modified carbohydrate profile (low glycaemic index)	200 mL	300 kcal	15 g	• Diabetes Mellitus • Hyperglycemia • Insulin resistance • Impaired glucose tolerance	• Not suitable for children <3 years • Use with caution in children <6 years • Contraindicated in galactosemia

B. Powder Formulations

Formulation Type	Amount	Calories	Protein	Indications	Contraindications/Cautions
Soy-protein based, high-energy supplement enriched with L-glutamine	30 g	120 kcal	15 g	Building/regaining strength	• Use caution in patients with Diabetes Mellitus • Not suitable for children <12 years • Contraindicated in soy/milk protein allergy
Balanced dual-protein (soy + milk) supplement enriched with fiber, antioxidants, and bone-support nutrients	100 g	430 kcal	18 g	Adults unable to meet nutritional requirements through regular diet	Use based on clinical assessment
Child-specific soy and milk protein formula enriched with DHA, probiotics, and prebiotics	100 g	470 kcal	15 g	Children ≥2 years	Use according to pediatric nutritional assessment
Low-glycaemic, high-protein, fiber-enriched supplement with 35 nutrients and no added sucrose	100 g	408 kcal	22 g	Diabetes Mellitus	Use according to clinical assessment

Table 24.22: Enteral Feeds

Type of Enteral Feed	Calories (per 100 mL)	Protein (per 100 mL)	Indications	Contraindications/Cautions
High-protein, high-calorie (1.5 kcal/mL) tube feed enriched with Omega-3 fatty acids, fiber, and MCT	150 kcal	10 g	• Cancer • Cachexia • Chronic wasting disease •Immunocompromised patients • Ventilated patients • Electrolyte abnormalities • Fluid restriction	• Not suitable for children <1 year • Use caution in children <6 years • Contraindicated in galactosemia
Peptide-based (oligomeric) high-protein enteral formula	133 kcal	6.7 g	• Malabsorption • Pre-operative nutrition support • Inflammatory Bowel Disease • Post-total gastrectomy • Hemodialysis • Disease-related malnutrition • Post long-term parenteral nutrition	• Not suitable for children <3 years • Use caution in children <6 years • Contraindicated in galactosemia
Diabetes-specific high-protein enteral formula (modified carbohydrate, high MUFA, fiber)	105 kcal	4.5 g	• Diabetes Mellitus • Hyperglycemia • Insulin resistance • Impaired glucose tolerance	• Not suitable for children <3 years • Use caution in children <6 years • Contraindicated in galactosemia
Standard polymeric formula (1.0 kcal/mL), fiber-free	100 kcal	3.8 g	• Anorexia • Convalescence • Low-residue feeding • Jejunostomy feeding	• Not suitable for children <3 years • Use caution in children <6 years • Contraindicated in galactosemia
Iso-caloric (1.0 kcal/mL) enteral formula enriched with prebiotic fiber	100 kcal	3.8 g	• Long-term tube feeding • Anorexia • Convalescence	• Not suitable for children <3 years • Use caution in children <6 years • Contraindicated in galactosemia

Parenteral Feeds

Total Parenteral Nutrition (TPN) is a life-sustaining medical treatment that bypasses the normal digestion process, delivering a complete nutrient mix directly into the bloodstream through a central vein. It is used when the gastrointestinal tract is non-functional or inaccessible.

Table 24.23: Nutrition Composition

TPN is a complex "all-in-one" admixture (often called a 3-in-1 or TNA) tailored to a patient's specific metabolic needs.

Component	Contents	Function
Macronutrients	Dextrose (carbohydrates), amino acids (protein), lipid emulsions (fat)	Provide energy and prevent muscle wasting
Electrolytes	Sodium, potassium, magnesium, calcium, chloride, phosphate	Maintain fluid balance, nerve conduction, and bone health
Vitamins	Multivitamin infusion (MVI)	Support metabolic processes and immune function
Trace Elements	Zinc, copper, manganese, chromium, selenium	Promote wound healing and enzyme activity
Fluid	Sterile water for injection	Provides hydration and serves as nutrient carrier
Additives (when indicated)	Insulin, Heparin, H2 blockers	Control blood glucose, prevent catheter clotting, reduce gastric acid secretion

Table 24.24: Steps for Administration of TPN

Step	Procedure	Rationale
1. Hand hygiene	Perform hand washing/surgical scrub and wear gloves	Prevent catheter-related bloodstream infections
2. Prime tubing	Use dedicated TPN administration set with inline filter	Remove air and filter precipitates
3. Filter selection	Use 1.2-micron filter for 3-in-1 TPN (with lipids) OR 0.22-micron filter for 2-in-1 formulations	Ensures safe infusion
4. Scrub catheter hub	Clean injection port with alcohol/chlorhexidine for at least 15 seconds	Reduces infection risk
5. Connect and infuse	Use dedicated catheter lumen and infusion pump; do not gravity infuse	Ensures controlled infusion rate
6. Monitor infusion rate	Start at prescribed gradual rate (e.g., 40 mL/hour) and titrate as ordered	Prevents fluid overload and hyperglycaemia

Table 24.25: Monitoring During TPN Administration

Parameter	Frequency
Blood glucose	Daily or as indicated
Electrolytes	Daily initially
Liver function tests	Regularly
Fluid balance	Daily
Weight	Regularly
Signs of infection	Continuous monitoring
Catheter complications	Regular assessment

Note: Enteral nutrition should always be preferred over parenteral nutrition whenever the gastrointestinal tract is functional. TPN should only be used when clearly indicated and requires close monitoring for complications such as infections, electrolyte disturbances, liver dysfunction, and hyperglycaemia.

Indications

- Non-functional GI tract: Short bowel syndrome, severe malabsorption, or paralytic ileus.
- Severe Bowel Obstruction: Intestinal blockages that cannot be bypassed.
- Gastrointestinal Fistulas: High-output fistulas where feeding would prevent healing.
- Severe Malnutrition: Pre-operative support for patients who cannot eat for >7 days.
- Critical Illness: Severe pancreatitis or intractable vomiting/diarrhea.

Contraindications

- Functional GI tract: If the "gut works, use it" (Enteral nutrition is always preferred).
- Hemodynamic Instability: Severe shock or dehydration must be corrected first.
- Short-term use: If the patient is expected to resume eating within 5 days.
- Terminal Illness: When the prognosis does not warrant invasive nutritional support.
- Inability to gain venous access: Lack of central line capability.

TPN Dosage

The dosage for Total Parenteral Nutrition (TPN) is a highly individualized process.

For adults, it is calculated based on ideal body weight (IBW), while for children, it is based on actual weight in kilograms and their specific developmental stage.

Adult TPN Dosage (General Guidelines)

Adult requirements focus on maintaining lean body mass and providing enough energy for metabolic stress without "overfeeding," which can damage the liver.

Pediatric TPN Dosage (Age-Dependent)

Children have much higher metabolic demands per kilogram than adults because they require nutrients for both maintenance and rapid growth.

Table 24.26: Micronutrient Considerations in Parenteral Nutrition

Parameter	Adult Recommendation	Pediatric Recommendation	Key Consideration
Electrolytes	Adjust daily based on serum laboratory results	Adjust daily based on serum laboratory results	Monitor sodium, potassium, magnesium, calcium, phosphate, and chloride closely
Trace Elements	Standard daily multi-trace element preparation (MTE-5)	Individualized according to age/weight requirements	Monitor for deficiency or toxicity
Multivitamins	Standard daily multivitamin preparation (MVI-13)	Pediatric-specific multivitamin formulation	Adjust according to age and clinical status
Zinc	3–5 mg/day	400 mcg/kg/day (especially infants)	Important for growth, wound healing, and skin integrity

Table 24:27: TPN Initiation Schedule (Prevention of Refeeding Syndrome)

Day	Recommended TPN Dose	Monitoring Requirement
Day 1	Start at 50% of calculated caloric goal	Monitor electrolytes, fluid balance, and blood glucose
Day 2	Increase to 75% of goal if electrolytes are stable	Check potassium, phosphate, magnesium
Day 3	Increase to 100% of caloric goal	Continue close monitoring for refeeding syndrome

Note:

- To reduce the risk of Refeeding Syndrome, closely monitor: Potassium, Phosphate, Magnesium, Blood glucose and Fluid status
- Correct electrolyte abnormalities before advancing TPN to full nutritional goals.

24.7 Clinical Conditions, Disorders and their Nutritional Management

24.7.1 Gastrointestinal Disorders

Inflammatory Gastroduodenal Disorders (Peptic ulcer diseases, Gastritis, gastroenteritis)

Peptic Ulcers: These are ulcers of the stomach or duodenum or both. Commonly caused by infection e.g. H Pylori and mucosal injuries (acid, NSAID, iatrogenic) they increased risk of bleeding and perforation. Gastritis: inflammation of the lining of the stomach. It can develop suddenly (acute gastritis) or gradually over time (chronic gastritis).

Gastroenteritis: Is the inflammation of the stomach and small intestines, often caused by viral, fungal, or bacterial infections, leading to diarrhea, vomiting, and abdominal pain.

Risks factors

Helicobacter pylori (H. pylori) infection, Nonsteroidal anti-inflammatory drugs (NSAIDs), smoking, alcoholism, stress, people older than 60 years, prior peptic ulcer and radiation treatments

Table 24.28: Nutritional Management in Gastrointestinal Disorders

Disease Condition	Nutritional Assessment	Nutrient–Drug Interactions
Inflammatory Gastroduodenal Disorders *(e.g., Peptic Ulcer Disease, Gastritis, Gastroenteritis)*	**Anthropometric assessment:** • Weight • Height • BMI **Biochemical assessment:** • Complete blood count (CBC) – assess anaemia • Serum albumin/prealbumin	• Proton Pump Inhibitors may reduce absorption of iron, vitamin B12, and calcium Antacids: • Calcium-containing antacids → may lower potassium and magnesium • Aluminiumhydroxide → may cause phosphorus depletion • Sodium bicarbonate → may reduce iron absorption and increase sodium retention • Histamine H2 receptor antagonists may reduce iron and vitamin B12 absorption

	• Electrolytes (Na, K, Ca, Mg) • Stool/fecal tests for *Helicobacter pylori*, occult blood, parasites, malabsorption • Vitamin/mineral tests **Clinical assessment:** • Weight changes • Signs of nutrient deficiencies • Iron deficiency • Vitamin B12 deficiency • Abdominal examination • Skin assessment **Dietary assessment:** • 24-hour dietary recall • Diet diversity • Food frequency questionnaire (FFQ) • Food record • Review quantity/quality of diet • Medication, supplements, and herbal use	• Iron supplements should be taken at least 2 hours before or after antacids • Magnesium supplements may interact with aluminum/magnesium-containing antacids
Functional Gastrointestinal Disorders	Refer to above nutritional assessment	Assess based on medications prescribed and potential nutrient interactions

Note: Nutritional management should be individualized based on disease severity, gastrointestinal symptoms, nutrient deficiencies, and medication use.

Table 24.29: Nutrient Prescription for Inflammatory Gastroduodenal Disorders

Category	Nutrient	Recommended Intake	Key Considerations
Non-Pharmacological Management	Energy	25–30 kcal/kg/day	Maintain energy requirements based on patient weight, age, and activity level
	Protein	1.0–1.5 g/kg/day	Supports tissue repair and ulcer healing; encourage easily digestible protein sources such as lean meat, eggs, and dairy products
	Carbohydrates	45–60% of total energy intake	Prefer complex carbohydrates such as whole grains, vegetables, and low-acid fruits; avoid excessive sugar and refined carbohydrates
	Fats	20–30% of total energy intake	Encourage healthy fats (e.g., olive oil); avoid fried and high-fat foods that delay gastric emptying
	Fiber	20–25 g/day (moderate intake)	Prefer soluble fiber (e.g., oats, bananas, apples); reduce insoluble fiber if it worsens symptoms
	Fluids	30–35 mL/kg/day	Maintain hydration; avoid caffeine, alcohol, and carbonated beverages that may irritate the gastric mucosa
Pharmacological Management (Micronutrient Supplementation)	**A:** ascorbic acid (Vitamin C)	75–90 mg/day(higher intake may be beneficial)	Supports collagen synthesis and ulcer healing; sources include strawberries, broccoli, and bell peppers
	A: retinol (Vitamin A)	700–900 micrograms/day	Promotes epithelial repair and immune support; sources include carrots, sweet potatoes, and spinach
	A: zinc sulfate	8–11 mg/day	Supports tissue repair and immune function; sources include meat, seafood, nuts, and legumes
	A: iron supplements	8–18 mg/day	Prevents anaemia related to chronic blood loss; sources include lean meat, poultry, and fortified cereals

Note

- Avoid foods that worsen symptoms such as: Spicy foods, Alcohol, Excess caffeine, Carbonated drinks, Highly acidic foods (if poorly tolerated).
- Nutrition therapy should be individualized based on symptom tolerance and underlying cause (e.g., Helicobacter pylori infection, NSAID-induced ulcer disease).

Table 24.30: Nutritional Management Considerations in Functional Gastrointestinal Disorders

Condition	Definition/Risk Factors	Nutritional Assessment	Nutrient–Drug Interactions
Constipation	**Definition:** Difficulty passing stool or bowel movement frequency <3 times/week. **Risk factors:** • Low fiber intake • Low fluid intake • Physical inactivity • Ignoring urge to defecate • Medications • Stress	**Anthropometric assessment** • Weight • Height • Age • BMI **Biochemical assessment** • Stool/fecal tests **Clinical assessment** • Abdominal examination **Dietary assessment** • Food intake review • Food diary • Food frequency questionnaire (FFQ)	**Laxatives** • Polyethylene Glycol and Lactulose: chronic use may cause potassium and magnesium loss and affect absorption of vitamins A, D, E, and K **Stimulant Laxatives** • Bisacodyl: may impair absorption of fat-soluble vitamins, calcium, and magnesium
Irritable Bowel Syndrome (IBS)	**Definition:** Functional bowel disorder characterized by abdominal cramping, bloating, and altered bowel habits. **Risk factors/triggers:** • Food triggers • Stress • Infections • More common in females <50 years		• **Antispasmodics** may reduce gastric motility and slow nutrient absorption • **Laxatives:** long-term use may deplete electrolytes and reduce vitamin absorption • **Antibiotics** may reduce vitamin K and B-vitamin synthesis by gut flora • **Corticosteroids** may reduce calcium, zinc, potassium, and vitamin C levels and increase bone loss risk • **Sulfasalazine** may reduce folate absorption • **Cholestyramine** may reduce absorption of fat-soluble vitamins, vitamin B12, folate, calcium, and iron
Hemorrhoids	**Definition:** Swollen veins in the anal canal. **Risk factors:** • Chronic constipation • Excessive straining • Ageing • Inflammatory Bowel Disease • Crohn's Disease • Ulcerative Colitis		• **Laxatives** may cause electrolyte imbalance • **Excess fiber supplements** may interfere with calcium, iron, and zinc absorption • **Paracetamol** and NSAIDs may irritate the gastrointestinal tract and impair iron absorption • **Vitamin K-rich foods** may interact with anticoagulants • **Corticosteroids** may reduce calcium absorption and increase bone loss risk • **Probiotics** may be less effective when taken with antibiotics

Note: Dietary interventions such as adequate fluid intake, fiber optimization, and trigger-food identification should be individualized based on symptoms and underlying disease.

Table 24.31: Nutritional Management of Constipation, Irritable Bowel Syndrome, and Hemorrhoids

Condition	Nutritional Management
Constipation	**Increase dietary fiber intake:** • Adult men: ~34 g/day • Adult women: ~28 g/day • Adolescents (14–18 years): 25.2–30.8 g/day • Children (9–13 years): 22.4–25.2 g/day • Children (4–8 years): 16.8–19.6 g/day• Toddlers (1–3 years): 14 g/day **Encourage fluid intake:** • Above maintenance requirements: 1500 + (weight in kg – 20) × 20 mL/day **Promote regular physical activity:** • Encourage regular exercise (≥30 minutes on most days)
Irritable Bowel Syndrome (IBS)	• Reduce intake of trigger foods such as high-fat foods, alcohol, caffeine, and poorly absorbed carbohydrates • Consider elimination trials of single foods/nutrients (e.g., lactose, gluten) or multiple food triggers • Consider short-term low-FODMAP diet for suspected food intolerance • Encourage fluid intake above maintenance requirements • Encourage physical activity (20–30 minutes most days of the week) • Promote adequate sleep/rest • Consider medication if symptoms persist despite diet and lifestyle modification
Hemorrhoids	• Increase fiber intake to 25–35 g/day using fruits, vegetables, and whole grains • Increase fiber gradually to reduce bloating/gas • Drink 8–10 glasses of fluid/day • Avoid highly processed low-fiber foods • After surgery: begin with low-fiber/soft diet, then gradually resume adequate fiber intake for bowel regularity

Note: Dietary fiber should be increased gradually and accompanied by adequate fluid intake to avoid worsening bloating or constipation symptoms.

24.7.2 Hepatic Disorders

Group of disorders that damages the liver and impair its functions. They can be caused by viruses, drugs, alcohol, or inherited conditions. The common ones are hepatitis, acute liver failure, Liver Cirrhosis, fat liver disorders and can be caused by viruses, toxic substances and injuries.

Hepatitis

Hepatitis is an inflammation of the liver that is caused by a variety of infectious viruses and noninfectious agents leading to a range of health problems, some of which can be fatal.

Risk factors: Risk factors vary by type of hepatitis

Table 24.32: Nutritional Assessment in Hepatitis

Assessment Domain	Details
Anthropometric Assessment	• Weight • Height • BMI
Biochemical Assessment	• Basic metabolic panel • Electrolytes: Iron (Fe), Copper (Cu), Magnesium (Mg), Sodium (Na), Chloride (Cl), Potassium (K) • Liver enzymes: ALT, AST • Viral markers: HBsAg, HCV RNA, viral load • Vitamin levels: A, D, E, K, B12
Clinical Assessment	• General appearance: wasting, jaundice, pallor, dehydration, oedema • Vital signs: heart rate, blood pressure, temperature, oxygen saturation • Abdominal examination: ascites, tenderness
Dietary Assessment	• 24-hour dietary recall • Food diary • Food Frequency Questionnaire (FFQ)

Table 24.33: Nutrient–Drug Interactions in Hepatitis

Medication/Class	Nutritional Considerations
Antiviral medicines for Hepatitis B / Hepatitis C	May cause nausea, vomiting, and reduced appetite
Diuretics (for ascites)	May cause potassium, magnesium, and calcium depletion
Corticosteroids	Reduce calcium and vitamin D absorption; increase risk of osteoporosis
Lactulose / Rifaximin (hepatic encephalopathy)	Protein intake may need adjustment depending on encephalopathy severity
Immunosuppressants	Monitor for food–drug interactions that alter drug metabolism

Non-Pharmacological Management/ Nutritional Management

Nutrient/Intervention	Dietary Recommendation
Dietary modification	• Low-protein, low-fat diet initially if clinically indicated • Provide balanced diet
Feeding strategy	• Use central parenteral nutrition only when enteral feeding is not possible • Progress to small frequent meals of soft/regular foods
Energy requirements	• 30–35 kcal/kg/day to prevent muscle wasting
Protein requirements	• 1.2–1.5 g/kg/day (adjust in Hepatic Encephalopathy)
Carbohydrates	• Emphasize complex carbohydrates for glucose stability
Fat intake	• Encourage healthy fats (e.g., omega-3 fatty acids) • Use MCTs if fat malabsorption occurs • Reduce fat intake if steatorrhea or diarrhoea develops
Fluid and sodium	• Restrict sodium to 2 g/day in ascites/oedema • Monitor fluid intake
Meal pattern	• Encourage small frequent meals
Caffeine	• Moderate caffeine intake may be beneficial in slowing fibrosis progression

Pharmacological Management

Medicine, dose and frequency	Indication/Notes
C: cholecalciferol (Vitamin D3) (PO) 800–2000 IU once daily (adjust based on serum vitamin D levels)	For vitamin D deficiency and prevention of bone disease in chronic liver disease
A: zinc sulfate (PO) 220 mg once to three times daily (equivalent to approximately 50 mg elemental zinc per capsule/tablet)	For zinc deficiency, poor wound healing, reduced appetite, or Hepatic Encephalopathy
A: magnesium oxide (PO) 400–800 mg once or twice daily **OR** **A:** magnesium sulphate IV 1–2 g over 1 hour**,** may repeat based on serum magnesium level and clinical status	For documented magnesium deficiency

24.7.3 Post Liver Transplant Nutrition Management

Non-Pharmacological Management

Nutrient/Intervention	Short-Term Care (Immediate Post-Transplant)	Long-Term Care
Calories	Provide 20–30% above normal requirements OR determine using indirect calorimetry; increase further if weight gain is required	Maintenance: 30–35 kcal/kg/day depending on activity level
Protein	1.3–2 g/kg/day	1 g/kg/day
Fat	20–30% of total calories	<30% of total calories, with <10% from saturated fat
Carbohydrates	50–70% of total calories	50–70% of total calories; restrict simple sugars

Pharmacological Management

Nutrient/Intervention	Short-Term Care (Immediate Post-Transplant)	Long-Term Care
B: Calcium carbonate / Calcium citrate	800–1200 mg/day PO	1–1.5 g/day PO; consider concurrent Vitamin D3 supplementation
Sodium supplementation	2–4 g/day	3–4 g/day
A: Magnesium oxide / Phosphorus	Encourage intake of magnesium- and phosphorus-rich foods; supplement if deficient	Continue dietary intake; supplement based on laboratory values
Potassium supplementation	Supplement or restrict depending on serum potassium levels	Supplement or restrict depending on serum potassium levels
C: Multivitamin + minerals	Supplement to recommended daily intake (DRI/RDA levels)	Continue multivitamin supplementation as needed; ensure adequate vitamin D intake

Note:

- Correct electrolyte abnormalities before high-calorie advancement.
- Monitor:
  >Serum Na^+, K^+, Mg^{2+}, phosphate daily in early post-transplant phase
  >Renal function (important for potassium dosing)
- Avoid rapid potassium infusion unless in ICU setting with cardiac monitoring.
- Sodium and potassium doses must always be individualized based on laboratory results and fluid status.

24.7.4 Cardiovascular Diseases

Cardiovascular disease is a class of diseases that affect the heart and blood vessels (arteries and veins). It is one of the major leading causes of death globally.
Common examples of cardiovascular disease include; coronary heart disease (CHD)/coronary artery disease (CAD)/ ischemic heart disease (IHD), Myocardial infarction (MI) and Hypertension

Table: 24.34: Nutritional assessment for Cardiovascular diseases

Nutritional Assessment	Nutrient-Drug Interaction
1.**Anthropometric Measurements** Weight, height, BMI classification, body composition analysis (visceral fats, muscle mass, total fat), Z-score, waist circumference, waist hip ratio, Weight-Height Ratio (WHtR), growth pattern index/percentile ranks, weight history. waist hip ratio **2.Biochemical Tests** Total cholesterol, LDL, HDL, triglycerides, electrolytes level, Creatinine Kinase (CK), CRP, HbA1C, glucose level, test (gastric emptying time, resting metabolic rate). **3.Clinical Assessment** Observe hair, eyes-xanthelasma, skin-palmar xanthoma, mouth, edema, bowel sound, muscle and subcutaneous fat wasting, oral health, suck/chewing/swallow/breath ability, appetite. **4. Dietary Assessment** 24hrs dietary recall, diet diversity, FFQ, Food record, check on quantity, quality, medication, nutritional supplement and herbal use, food allergy, vomiting, food and nutrients administration, knowledge/beliefs/attitude/behavior, factor affecting acces to food, physical activity and function	1. **Diuretics** can cause Vitamin B12, Magnesium (Mg^{2+}), Sodium (Na), Potassium (K), Zinc, thiamine, and Vitamin C to be low in the body. **2. ACE inhibitors** cause depletion of zinc and vitamin B12 **3. Long-acting calcium blockers** can possibly cause depletion of Vitamin D, Calcium (Ca^{2+}) and Potassium (K). 4. **Angiotensin II receptor** blockers can raise serum potassium (K) level. Also, it can cause depletion of zinc and vitamin B12.

Nutrition management of CHD/IHD

- Dietary Approach to Stop Hypertension (DASH) diet
- Reduced sodium intake to be limited to 1500mg (2/3 teaspoon) per day.
- Consumption of diet rich in fruits and vegetables
- Diet high in fiber especially plant-based foods and whole grains.
- Ensure physical activity
- Avoid smoking and alcohol.
- Stress management Prevent and control obesity

Table 24.35: DASH diet composition

Nutrient	Daily Quantity
Total fat	27% of total calories
Saturated fatty acids (SFA)	6% of total calories
Carbohydrates	55% of total calories
Protein	18% of total calories
Cholesterol	150 mg/day
Dietary fiber	31 g/day
Potassium	4700 mg/day
Magnesium	500 mg/day
Calcium	1240 mg/day

Table: 24.36: Activity level and energy requirements

Activity Level	Energy Requirement
Sedentary individuals	20–25 kcal/kg/day
Moderately active	25–30 kcal/kg/day
Active	30–35 kcal/kg/day
Very active	35–40 kcal/kg/day

Hypertension

Hypertension (HTN) is when your blood pressure, the force of blood flowing through your blood vessels, is consistently too high, a diastolic blood pressure (DBP) of above 80mmHg and systolic blood pressure (SBP) of above 130mmHg. Uncontrolled hypertension can affect various body organs and can lead to impaired vision, kidney failure, stroke, paralysis, heart attack and brain damage.

Nutrition assessment & nutrient drug interaction; refer CVD

Nutritional management

- Provide low calorie diet if the patient is overweight/ obesity until ideal body weight is achieved
- Regulate fat intake, encourage intake of unsaturated fats (oils), Fats should be 20% of total kilocalorie.
- Restrict alcohol intake.
- Restrict excess sodium intake, limit to 1500 mg per day.
- Avoid stimulants, food/drinks containing caffeine and spirits.
- Avoid cigarette smoking, which may lead to atherosclerosis.
- In some cases, such as pulmonary edema, congestive cardiac failure, ascites, it may be necessary to restrict fluid intake 1500mls per day.
- Encourage physical activity for those living a sedentary lifestyle.

Table 24.37: Food groups' distribution for a DASH dietary plan of 2000 kcal.

Food Group	Number of Daily Servings (2000 kcal diet)	Sources / Examples
Whole grains	6–8 servings/day	1 slice brown bread; ½ cup cooked brown rice; whole wheat; mtama (sorghum); sougham; dona; oats
Vegetables	4–5 servings/day	1 cup raw leafy vegetables; ½ cup cooked vegetables
Fruits	4–5 servings/day	1 medium fruit or ½ cup fruit juice (e.g. bananas, papaya, passion fruit, baobab, mango, pineapple, guava, avocado/parachichi, watermelon, oranges)
Milk & dairy products (fat-free or low-fat)	2–3 servings/day	1 cup milk or yoghurt
Lean meats, poultry & fish / eggs	≤6 servings/day	1 oz cooked meat/poultry/fish OR 1 egg
Nuts, seeds & legumes	4–5 servings/week	⅓ cup or 1.5 oz nuts; ½ cup cooked legumes (e.g. groundnuts, Bambara nuts, pumpkin seeds, cashew nuts, beans, sesame seeds, soybeans, cowpeas, pigeon peas, lentils)
Sweets, fats & oils	Fats & oils: 2–3 servings/day Sweets: ≤5 servings/week	1 tsp soft margarine or vegetable oil 1 tbsp sugar, jelly or jam

24.7.5 Nutrition Management for Renal Conditions

1.Acute kidney injury (AKI)

It represents an abrupt reduction in glomerular filtration rate (GFR), resulting in the reduced ability of the kidney to excrete metabolic wastes with dysregulation of fluid, electrolytes, and acid-base homeostasis.

Nutrition diagnosis

- Altered nutrition-related lab values related to impaired kidney function as evidenced by hyperkalemia (serum potassium 6.0 mEq/L) and hyperphosphatemia (serum phosphorus 6.8 mg/dL).
- Fluid retention related to oliguria secondary to AKI as evidenced by edema, weight gain of 3 kg in one week, and elevated blood pressure.
- Inadequate energy intake related to poor appetite and nausea from AKI as evidenced by oral intake below 50% of estimated needs and 5% weight loss in one week.
- Risk for electrolyte imbalance related to renal dysfunction and altered excretion as evidenced by hypokalemia (serum potassium 3.1 mEq/L) following diuretic use.
- Excessive fluid intake related to inappropriate hydration management in AKI as evidenced by pulmonary edema and serum sodium dilution.
- Food and nutrition-related knowledge deficit related to unfamiliarity with AKI dietary modifications as evidenced by patient-reported uncertainty about low-potassium foods.

Drugs nutrient interactions

- **Furosemide:** causes urinary loss of potassium, zinc, magnesium, calcium, sodium dehydration.
- **Thiazide Diuretics** cause nausea, anorexia, hyponatremia, hypokalemia, hyperuricemia, hyperglycemia.
- **Spironolactone:** causes hyperkalemia, dry mouth, nausea, vomiting, gastritis, diarrhea.
- **Aluminium hydroxide suspension:** causes constipation, Aluminium toxicity, increased thiamine requirements, impaired iron and folate absorption.
- **Sevelamer Hydrochloride:** causes increased calcium absorption if taken with calcium, diarrhea, nausea, vomiting, dyspepsia, peripheral oedema, decrease LDL, increase HDL.
- **Calcium:** causes constipation, increased Ca-P product, hypercalcemia, calcium citrate increases Aluminium absorption, nausea and vomiting.

Table 24.38: Nutritional Requirements in Acute Kidney Injury (AKI)

Nutrient / Fluid	Rationale	Conservative Management (Non-dialysed)	Hemodialysis / Kidney Replacement Therapy (KRT)
Protein	• Prevent net negative nitrogen balance associated with hyper catabolism • Reduce serum urea and improve urinary output • Maintain somatic and visceral protein status • Replace protein losses during KRT • Help correct hyperkalemia **Examples**: Fish, chicken, low-fat soy products, low-fat dairy products (yoghurt, cottage cheese, milk)	0.6–0.8 g/kg/day	Intermittent Hemodialysis (IHD):1.2–1.5 g/kg/day CRRT: 1.7–2.0 g/kg/day Hypercatabolic state:1.7 g/kg/day (maximum 2 g/kg/day)

Nutrient / Fluid	Rationale	Conservative Management (Non-dialysed)	Hemodialysis / Kidney Replacement Therapy (KRT)
Energy	• Spare protein for synthesis • Prevent tissue protein catabolism • Adjust for stress-induced hyperglycemia **Examples:** Whole grains, rice, pasta	25–30 kcal/kg/day Use usual body weight for normal-weight patients Use ideal body weight for obese or critically ill patients Indirect calorimetry preferred	20–30 kcal/kg/day in patients with any stage of AKI Indirect calorimetry preferred
Electrolytes	• Sodium restriction during oliguric phase • Control potassium to prevent hyperkalemia and cardiac arrhythmias	Sodium: 20–40 mEq/day (2–3 g/day) during oliguric phase Potassium: 30–50 mEq/day during oliguric phase Phosphorus: 10–15 mg/kg/day (may require phosphate binders)	Requirements may increase with dialysis, diuresis, and anabolism
Fluid	• Control fluid during early oliguric phase • Balance intake with output • Maintain normal blood pressure	Urine output + 500–750 mL/day (maintain fluid balance) Increase fluid during diuresis	Urine output + 500–750 mL/day + additional 1000 mL/day Increase fluid during diuresis and during CRRT

2. Chronic Kidney Disease (CKD) or Chronic renal failure (CRF)

It is defined as decreased kidney function of estimated Glomerular Filtration Rate (eGFR) of < 60 mL/min per 1.73 m2, or markers of kidney damage, or both, in a period of at least 3 months, regardless of the underlying cause.

Drugs nutrient interactions

- Furosemide causes urinary loss of potassium, zinc, magnesium, calcium, sodium dehydration.
- Thiazide Diuretics cause nausea, anorexia, hyponatraemia, hypokalaemia, hyperuricemia, hyperglycaemia.
- Spironolactone causes hyperkalemia, dry mouth, nausea, vomiting, gastritis, diarrhea.
- Aluminium hydroxide suspension causes constipation, Aluminium toxicity, increased thiamine requirements, impaired iron and folate absorption.
- Sevelamer Hydrochloride causes increased calcium absorption if taken with calcium, diarrhea, nausea, vomiting, dyspepsia, peripheral oedema, decrease LDL, increase HDL.
- Calcium causes constipation, increased Ca-P product, hypercalcaemia, calcium citrate increases Aluminium absorption, nausea and vomiting.

Nutritional management

Table 24.39: Recommended Nutrient Intake for Chronic Kidney Disease (CKD) in Adults

Nutrient	Non-Dialysis CKD	Hemodialysis	Peritoneal Dialysis
Protein	0.6–0.8 g/kg/day During illness: 1.0 g/kg/day	>1.2 g/kg/day	>1.2 g/kg/day During peritonitis: >1.5 g/kg/day
Energy	30–35 kcal/kg/day*	30–35 kcal/kg/day*	30–35 kcal/kg/day* (including calories absorbed from dialysate)
Sodium	<2400 mg/day	<2400 mg/day	<2400 mg/day
Potassium	<2000 mg/day	<2000 mg/day	Not usually restricted unless clinically indicated
Phosphorus	800–1000 mg/day	800–1000 mg/day	800–1000 mg/day; use phosphate binders if elevated
Fluid	Previous 24-hour urine output + 500 mL/day If edematous: previous 24-hour urine output + 300 mL/day	Previous 24-hour urine output + 500 mL/day (adjust based on interdialytic weight gain and edema status)	Individualized based on urine output, ultrafiltration losses, edema status, and clinical condition

Table 24.40: Practical approaches to lowering potassium intake

Fruit category	Amount of K+	Intakes	Types of fruits
Low potassium fruits	20-150 mg/serving	3 exchanges daily	Mango, pineapple, tangerines, apple, watermelon, pears, lemon
Medium potassium fruits	150-250 mg/serving	2 exchanges daily	Papaya, oranges
High potassium fruits	250-500 mg/serving	1 exchange daily	Passion fruit, guava, banana, avocado, jackfruit

1. Nephritic Syndrome

Nephritic syndrome is a disorder of the glomerular (clusters of microscopic blood vessels in the kidneys with small pores through which blood is filtered). It is characterized by body tissue swelling (oedema), high blood pressure, proteinuria, azotemia, decreased urine output and the presence of red blood cells in the urine.

Nutritional assessment

Anthropometric Data: Monitor body weight and changes for signs of fluid retention or malnutrition.

2. Renal transplant

A kidney transplant is a surgical procedure to place a kidney from a live or deceased donor into a person whose kidneys no longer function properly.

Nutrient-drug interactions

- **Mycophenolate mofetil** can cause diarrhea, constipation, nausea & vomiting
- **Tacrolimus** may cause increased blood sugar (glucose) levels, nausea and diarrhea.
- **Cyclosporin** (Neural /S& immune) may cause potassium (K+) retention & increase blood K+ levels, increases blood lipids levels e.g. cholesterol & triglycerides, & increased blood. May cause nausea & vomiting. It is recommended that this medication is taken with food.
- **Prednisone** may increase loss of vitamin K, vitamin C, selenium and zinc. Also, may increase the loss of vitamin B6, leading to breakdown and loss of protein.

Nutrition management for recipient post-transplant

- The diet prescription is based on the kidney functions as indicated by the following: urine output, serum creatinine, blood urea nitrogen (BUN), potassium and phosphorus
- NPO for 8 hours first day after operation
- Initially clear liquids within 24 hours, are given to the patient during the early post-operative period, and then progresses to semi solid then regular foods as tolerated.
- Finally, the patient is placed on an essentially normal diet.

Table 24.41: Non-Pharmacological Nutritional Management After Kidney Transplant

Nutrient	Recommended Intake / Guidance
Protein	• Initially: low-protein diet providing 15–20% of total kcal • Pre-operative: 1.3–1.4 g/kg/day • Post-operative (if graft function is adequate): adjust based on clinical status • Chronic rejection: 0.7–1.1 g/kg/day • Stable transplant: 0.8–1.0 g/kg/day • Increase intake if patient is receiving high doses of prednisone
Calories	• First month post-transplant and during treatment of acute rejection: 30–35 kcal/kg/day • After first month: provide adequate calories to achieve optimal weight-for-height • No more than 50% of calories from carbohydrates • Encourage complex carbohydrates and avoid simple sugars • Low-carbohydrate diet may be needed for excessive post-transplant weight gain related to increased appetite and steroid therapy
Fats	• Provide 20–25% of total kcal from fats • Increase intake of polyunsaturated fats • Reduce intake of saturated fats
Fluids	• Strict monitoring of fluid input and output, particularly in the early post-transplant period • Include both oral and intravenous fluid sources

Table 24.42: Pharmacological Nutritional Management After Kidney Transplant

Nutrient / Electrolyte	Recommended Intake / Supplementation
Sodium	2000–3000 mg/day Restriction helps reduce fluid retention and elevated blood pressure
Potassium	Restrict only if hyperkalemia develops
Phosphorus	Serum phosphorus often decreases after transplant May require supplementation: 1,200 mg/day Encourage high-phosphorus foods such as dairy products, eggs, and meat
Calcium	1,200 mg/day
Iron	Supplementation may be required after surgery based on clinical assessment

24.7.6 Neurological Diseases and Disorders

Neurological disorder is any disorder of the nervous system that includes structural, biochemical or electrical abnormalities in the brain, spinal cord or other nerves. It can result in a range of symptoms such as pain, paralysis, muscle weakness, poor coordination, loss of sensation, seizures, and altered levels of consciousness

Table 24.43: Nutritional Management Considerations in Neurological Disorders

Disease Condition	Nutritional Assessment	Nutrient–Drug Interactions
Epilepsy / Seizure Disorders	**Anthropometric:** Weight, height, BMI **Biochemical:** Hemoglobin, electrolytes (K, Na, Cl, Mg, phosphorus, calcium), folic acid, vitamin D, albumin, transferrin, prealbumin, total proteins, procalcitonin, CRP, creatinine, BUN, eGFR, liver enzymes, urine ketones **Clinical:** Epilepsy type, seizure frequency, treatment regimen, medication side effects, medication review **Dietary:** 24-hour recall, FFQ, 3–7-day food diary	• Phenytoin, Carbamazepine, and Phenobarbitone may cause vitamin D deficiency and reduced calcium absorption → increased risk of osteoporosis/fractures • Excess vitamin B6 may reduce effectiveness of AEDs • Oxcarbazepine and Carbamazepine may cause hyponatremia • AEDs may alter zinc and selenium metabolism • Long-term AED use may reduce biotin levels
Stroke	**Anthropometric:** Weight, height, BMI, mid-upper arm circumference **Biochemical:** Albumin, glucose, lipid profile, hemoglobin, electrolytes, CRP **Clinical:** Dysphagia, muscle weakness, cognitive impairment, comorbidities (hypertension, diabetes) **Dietary:** Usual intake, nutrient adequacy, food preferences, hydration status, appetite changes	• Warfarin ↔ vitamin K interaction • Aspirin and Clopidogrel ↔ omega-3 fatty acids • Atorvastatin and Simvastatin ↔ grapefruit interaction • AEDs ↔ folate and vitamin D • Furosemide ↔ potassium and magnesium • Lisinopril ↔ potassium • Prednisone ↔ calcium and vitamin D • Antihypertensives ↔ excess sodium
Cerebral Palsy (CP)	**Anthropometric:** Weight, height, BMI, growth monitoring **Biochemical:** Iron, vitamin D, calcium, vitamin B12, hydration status, serum albumin **Clinical:** Dysphagia, oral health, gastroparesis, reflux **Dietary:** Quantity/quality of intake, food preferences, dietary variety	• Phenytoin and C: sodium valproate may reduce folate levels • Baclofen may affect magnesium levels; dehydration may worsen sedative effects • Anticoagulants ↔ vitamin K • Long-term anticonvulsants may require calcium and vitamin D supplementation
Brain Tumour	**Anthropometric:** Weight, height, BMI, recent weight changes, lean body mass loss **Biochemical:** Vitamin D, iron, electrolytes, blood glucose **Clinical:** Nausea, vomiting, dysphagia, fatigue, altered taste, GI symptoms, steroid side effects **Dietary:** Calorie/protein intake, micronutrient adequacy, hydration	• Dexamethasone and Prednisone may cause weight gain, hyperglycemia, muscle wasting • Temozolomide may cause nausea/vomiting and reduced intake • Phenytoin and C: sodium valproate may reduce folate, vitamin D, and calcium absorption • Omeprazole may reduce magnesium, calcium, and vitamin B12 absorption • Bevacizumab may reduce appetite
Peripheral Neuropathy	**Anthropometric:** Weight, BMI **Biochemical:** Vitamin B12, vitamin B1, vitamin D, vitamin E, blood glucose, HbA1c, liver/kidney function, electrolytes (Mg, K) **Clinical:** Signs of deficiencies, numbness/tingling, medical history, GI symptoms **Dietary:** Intake assessment for vitamins B1, B6, B12, E	• Metformin may reduce vitamin B12 absorption • Cisplatin and Paclitaxel may cause vitamin/mineral deficiencies • Phenytoin and Carbamazepine may interfere with folate, vitamin D, and calcium metabolism • Prednisone may cause calcium/vitamin D deficiency • Statins may reduce coenzyme Q10 • Furosemide and thiazides may cause potassium/magnesium imbalance

Table 24.44: Non-Pharmacological Nutritional Management in Neurological Disorders

Disease Condition	Macronutrient Recommendations / Dietary Management	Food Sources
Epilepsy / Seizure Disorder	Calories: Children 80–120 kcal/kg/day; Adults 25–30 kcal/kg/day Protein: 1–1.2 g/kg/day Fat: 70–80% of total kcal(ketogenic diet; MCT preferred)	Healthy fats: Fish, nuts, flaxseeds, olive oil, avocado Protein: Eggs, poultry, meat, yogurt
Stroke	Protein: 1.0–1.5 g/kg/day Fat: 20–35% of total kcal(unsaturated fats/omega-3s) Fiber: 25–30 g/day Emphasize complex carbohydrates	Fish, legumes, lean meat, eggs, olive oil, nuts, seeds, whole grains, fruits, vegetables
Cerebral Palsy (CP)	Protein: 1.0–1.5 g/kg/day Energy: Adjust according to mobility (↑ for spasticity, ↓ for low activity) Fiber: 14 g/1000 kcal	Eggs, cheese, poultry, soft legumes, cooked vegetables, mashed beans, soft fruits, thickened fluids
Brain Tumor	Adequate calories for increased metabolic demand High protein for healing and muscle preservation Small frequent meals	Fish, poultry, dairy, legumes, berries, citrus fruits, nuts, soups
Peripheral Neuropathy	Balanced carbohydrate intake Healthy fats (omega-3 fatty acids) Small frequent meals	Salmon, sardines, flaxseeds, walnuts, whole grains, fruits, vegetables

Table 24.45: Pharmacological Nutritional Management in Neurological Disorders

Disease Condition	Micronutrient Supplementation / Pharmacological Management (Dose)	Food Sources
Epilepsy / Seizure Disorder	**C**: Cholecalciferol (Vitamin D3): 600–2000 IU/day PO (adjust based on serum levels and AED use) **AND** **C**: Calcium supplementation: 1000–1200 mg/day PO **AND** **C**: Magnesium supplementation: 200–400 mg/day PO **AND** **C**: Vitamin B-complex: 1 tablet PO daily (or based on deficiency status)	Leafy greens, dairy products, fortified foods, fish
Stroke	**C**: Sodium: restrict to <2000 mg/day **AND** **C:** Potassium: 3500–4700 mg/day (if no renal impairment) **AND** **B**: Magnesium: 310–420 mg/day PO **AND** **B**: Vitamin B6: 1.3–2 mg/day PO **AND** **C**: Vitamin B12: 2.4 mcg/day PO (higher if deficient) **AND** **A**: Folate: 400 mcg/day PO **AND** **C**: Cholecalciferol (Vitamin D3): 600–800 IU/day PO **AND** **A**: Ascorbic acid 75–90 mg/day PO **AND** **D**: Alpha Tocopherol (Vitamin E): 15 mg/day PO **AND** **D**: Selenium: 55 mcg/day PO	Liver, leafy greens, eggs, fortified milk, fatty fish
Cerebral Palsy (CP)	**C**: Calcium: 1000–1300 mg/day PO **AND** **C**: Cholecalciferol (Vitamin D3): 600–1000 IU/day PO **AND** **A**: Iron: 3–6 mg/kg/day PO (elemental iron if deficient) **AND** **C**: Vitamin B12: 2.4 mcg/day PO **AND** **A**: Folate:400 mcg/day PO	Yogurt, fortified foods, meat, fortified cereals
Brain Tumor	**C**: Calcium: 1000–1200 mg/day PO **AND** **D**: Cholecalciferol (Vitamin D3): 600–2000 IU/day PO **AND** **C**: Ascorbic acid: 75–90 mg/day PO **AND** **D**: Alpha Tocopherol (Vitamin E): 15 mg/day PO **AND** **A**: Electrolyte replacement: individualized based on losses (e.g., oral rehydration solution as needed)	Fortified milk, tofu, sardines, electrolyte drinks

Disease Condition	Micronutrient Supplementation / Pharmacological Management (Dose)	Food Sources
Peripheral Neuropathy	**C**: Vitamin B1 (Thiamine): 50–100 mg/day PO **AND** **B:** Vitamin B6 (Pyridoxine): 25–100 mg/day PO (avoid >100 mg/day due to neurotoxicity) **AND** **C**: Vitamin B12: 1000 mcg/day PO or as indicated for deficiency **AND** **D:** Cholecalciferol (Vitamin D3): 600–2000 IU/day PO **AND** **D**: Alpha Tocopherol (Vitamin E): 15–400 IU/day PO **AND** **B**: Magnesium: 200–400 mg/day PO **AND** **C**: Calcium: 1000–1200 mg/day PO **AND** **C**: Potassium: individualized based on serum levels	Meat, fish, dairy, eggs, fortified grains, leafy greens, bananas, seeds, nuts

CHAPTER TWENTY- FIVE

POISONING

Poison is any substance (liquid, solid, gas), that is harmful to the body, when ingested, inhaled, injected or absorbed through the skin. There is a variability of the clinical presentation and poisonings vary by nature of poison, victims' age group, intention, geographic region, and level of economic development. Poisons can be classified according to whether the chemical is metallic versus nonmetallic, organic versus inorganic, or acidic versus alkaline.

Common Poisons

The common poisoning in our settings are:

- Household agents:
  > Chemicals e.g. detergents, Kerosene, Disinfectants and bleach
  > Pesticides e.g. Organophosphate, malathion (insecticide), nuvan top and rat poison.
  > Medicines e.g. Acetylsalicylic Acid, Paracetamol, Anticonvulsants (carbamazepine), Hematinic (Iron and Vitamins),
- Major tranquilizers and herbal products
- Foods e.g. Mushroom, infected foods

General Principles of Management of Poisoning

In managing a patient who has been exposed to toxins holistic approach should be considered.

Note

- A low respiratory rate with decreased oxygen saturations may indicate hypoventilation. A normal saturation does not exclude hypercarbia or indeed hypoxia in carbon monoxide poisoning. If in any doubt, arterial blood gases should be measured. Tachypnoea can be seen with metabolic acidosis (e.g. tricyclics, methanol), anxiety, and stimulant drug overdose and as an early feature of salicylate poisoning (respiratory alkalosis).
- Supplementary oxygen via facemask should be given to all patients initially, taking account of pulse oximetry (noting the limitations described above).
- Many drugs exhibit cardiovascular toxicity hypotension and or cardiac arrhythmias in overdose (e.g. tricyclics, b-blockers, digoxin, lithium). ECG should be recorded, intravenous access established and initial fluid resuscitation given as appropriate
- General examination may give corroborating evidence of significant ingestions or clues in unknown overdoses (SSRIs, tricyclics, phenothiazines) have serotonergic or anticholinergic effects with pupil dilatation, and extrapyramidal movements, whilst opioid type drugs will cause sedation and pin point pupils.
- Temperature, blood glucose (low in b-blocker, ethanol poisoning)
- Weight is important in identifying a toxic dose against the weight and may guide treatment, for example in paracetamol overdose.
- Examination for injury (intentional or un-intentional self-harm) suggest appropriate methods for treatment, or the presence of other substances such as alcohol.
- If clinical condition allows, an assessment of the patient's mental state should be made.

Resuscitation and stabilization which is key to every poison refer to EMD Chapter 1

Airway, breathing and circulation should be reassessed and treated accordingly as a priority. Refer Approach to patient with Emergency conditions chapter 1.

Use the tabulated Toxidromes 25.1 to identify toxins and apply the antidotes

Table 25.1 able: Common Toxidromes and Clinical Features to help identification of toxins.

Toxidrome	Mental Status	Pupils	Vital Signs	Other Manifestations	Examples of Toxic Agents
Sympathomimetic	Hyper alertness, agitation, hallucinations, paranoia, anxiety, delirium	Mydriasis	Hyperthermia, tachycardia, hypertension, widened pulse pressure	Diaphoresis, tremors, hyperreflexia, seizures, hyperpyrexia	•Cocaine, •Amphetamines, •Ephedrine, •Theophylline, •Caffeine, •Phencyclidine (PCP), •Lysergic acid •Diethylamide (LSD); withdrawal from narcotics, benzodiazepines, alcohol, long-term beta-blocker therapy

Toxidrome	Mental Status	Pupils	Vital Signs	Other Manifestations	Examples of Toxic Agents
Cholinergic	Confusion, drowsiness, coma, headache, insomnia, giddiness	Miosis	Bradycardia, hypotension, tachypnea/bradypnea, hypothermia	Salivation, urinary incontinence, defecation, gastric cramping, hypermotility, emesis, diaphoresis, lacrimation, GI cramps, bronchoconstriction, muscle fasciculations, weakness, seizures	•Organophosphate insecticides, •Carbamate insecticides, •Nerve agents, •Nicotine, •Physostigmine, •Edrophonium
Anticholinergic	Agitation, hallucinations, delirium, coma	Mydriasis	Hyperthermia, tachycardia, hypertension, tachypnea	Dry flushed skin, dry mucous membranes, decreased bowel sounds, urinary retention, myoclonus	•Antihistamines, •Tricyclic antidepressants (TCAs), •Antiparkinsonian agents, •Atropine, •Antispasmodics
Hallucinogenic	Hallucinations, perceptual distortions, depersonalization, agitation	Mydriasis (usually)	Hyperthermia, tachycardia, hypertension, tachypnea	Nystagmus	•Phencyclidine (PCP), MDMA, MDEA
Opioid	CNS depression, coma	Miosis	Bradypnea, apnea	Hyporeflexia, pulmonary edema, needle marks	•Heroin, •Morphine, •Methadone, •Diphenoxylate
Sedative-hypnotic	CNS depression, confusion, stupor, coma	Variable	Often normal; hypothermia, bradycardia, hypotension, bradypnea, apnea	Hyporeflexia	•Benzodiazepines, •Barbiturates, •Alcohol •Zolpidem
Serotonin syndrome	Confusion, agitation, coma	Mydriasis	Hyperthermia, tachycardia, hypertension, tachypnea	Tremors, myoclonus, hyperreflexia, clonus, diaphoresis, flushing, trismus, rigidity, diarrhea	•MAOIs, •SSRIs, •Meperidine, •Dextromethorphan, •Tricyclic Anti-depressants (TCA)

Note: PCP, Phencyclidine; LSD Lysergic acid; TCA, tricyclic antidepressant; MDMA, 3,4 methylenedioxymethamphetamine; MDEA, methylenedioxymethamphetamine; CNS, central nervous system; GI, gastrointestinal; MAOI, monoamine oxidase inhibitor; SSRI, selective serotonin reuptake inhibitor,

Table 25.2 Toxins causing Dysrhythmias

Heart rate	Narrow QRS	Wide QRS
Tachycardia	Amphetamines	Antihistamines
	Anticholinergic agents	Cocaine
	Theophylline	Propoxyphene, Sodium channel blockers and Tricyclic antidepressants
Bradycardia	α-Adrenergic lytic agents	β-Adrenergic blocking agents
	β-Adrenergic blocking agents, Calcium channel antagonists, Cardiac glycosides, Class Ia antiarrhythmics And Sodium channel blockers	Calcium channel antagonists

Note: For patients presenting with cardiac problems, consider reading ECG and use the table below to interpret possible causes;

Management Protocol of a poison (specific and non-specific antidotes)

Investigations

The toxidromes are created to assist diagnosis. History should be taken although it may be inaccurate depending on the patient condition and hence the following laboratory tests should usually be obtained for guidance:

- Complete blood count
- Liver function test
- Serum lactate
- Arterial blood gas
- Electrocardiogram
- Urine pregnancy test in all women of childbearing age
- Basic serum electrolytes, blood urea nitrogen (BUN), and creatinine
- Toxicological screening where necessary (urine and Blood serum should be taken)

Sympathomimetics investigations

- RBG-bedside,
- ECG,
- Serum electrolytes
- Renal function test,
- Liver function test,
- Creatinine kinase,
- Clotting screen: PT/PTT/INR,
- Full Blood Count,
- Arterial blood gas,
- Serum osmolality and osmolality gap.
- Abdominal X-ray may be useful in diagnosing.

Cholinergic investigations

- Glucose,
- BUN,
- Electrolytes,
- Prothrombin time,
- Liver function test,
- Cholinesterase measurements

Measurement of drug or toxin concentrations in body fluids is not required in most poisonings, but in some exposures, it does influence management. The list of drug concentrations that may assist patient assessment and management are shown here;

Table 25.3: List of drugs or toxins requiring measurement of drug concentrations

Toxic Feature	Methods to reach Diagnosis	Immediate Stabilization	Definitive Management
Signs of COPD	H&P, CXR	O2, NIPPV	Bronchodilators, steroids
Pulmonary edema	H&P, CXR, pro-BNP	O2, NIPPV	Nitrates, diuretics
Pulmonary embolism	H&P, d-dimer, chest CT	O2	Anticoagulation, thrombolysis (massive PE only)
Acute respiratory distress syndrome	H&P, CXR	O2, NIPPV	Ventilatory support
Myocardial infarction	H&P, ECG	O2, nitrates, aspirin, anticoagulation	Revascularization (thrombolysis or PCI)
Metabolic acidosis	H&P, metabolic panel, blood gas	O2	Directed at underlying cause

Psychosocial Intervention

The investigations depend on the poison ingested:

25.1 Acute Alcohol Intoxication

Is a clinically harmful condition that usually follows the ingestion of a large amount of alcohol

Clinical Presentation

- Confusion, Vomiting, Seizures.
- Slow breathing (fewer than eight breaths a minute).
- Irregular Breathing
- Skin that looks blue, gray or pale.
- Low body temperature (hypothermia).
- Trouble staying conscious or awake

Non-pharmacological Management

- Airway assessment and observation of the development of respiratory function should be done.
- Prevent aspiration by placement of the patient in a lateral position).

Refer the Mental Health Chapter 23 for other psychological management

Pharmacological Management
For dehydration or electrolyte imbalance:
A: sodium chloride 0.9% IV infusion according to hydration status and electrolyte requirements.

If hypoglycemia is present: then correct with
C: dextrose 50% IV, 25 g stat (50 mL IV bolus)
OR
B: dextrose 10% IV infusion as clinically indicated.

For patients with alcohol use disorder, malnutrition, or altered mental status:
C: thiamine injection 100 mg IV/IM stat, then 100 mg IV/IM/PO once daily
AND
A: folic acid 1 mg IV/PO once daily
AND/OR
A: magnesium sulfate 1–2 g IV infusion stat (repeat based on serum magnesium levels)
AND/OR
B: multivitamin injection IV once daily according to product formulation.

For nausea and/or vomiting:
D: ondansetron 4–8 mg IV/PO every 8–12 hours as needed
OR
B: metoclopramide 10 mg IV/PO every 8 hours as needed.

For severe agitation or violent behavior:
B: haloperidol 2.5–5 mg IM/IV stat, repeat as needed

Note:
- Prolonged vomiting can lead to hyponatremia; this should not be corrected too rapidly since it can induce a central pontine myelinolysis
- Depending on the severity of the intoxication and complications e.g. Wernicke encephalopathy, alcoholic hepatitis, or dysrhythmias, patients may have to be admitted to the hospital for further treatment
- Call the Poison Control Centre at a Toll-free phone number 0800112031 for information.

Management of Ingested Poisons
Ingested toxins are suspected in any patient with signs and symptoms irrespective of reported dose ingested.

Clinical Presentations
- General clinical features: Nausea, vomiting, drowsiness, blurred vision, and dizziness
- Central Nervous System toxicity: Altered level of consciousness, convulsions, acute confusion and coma,
- Renal Toxicity: Acute kidney injury/failure and papillary necrosis
- Metabolic derangement: Metabolic acidosis, respiratory acidosis, hypoglycemia.
- Allergic reactions: Urticaria, angioedema, anaphylaxis
- Haematological toxicity: Aplastic anaemia, agranulocytosis

Non-Pharmacological Management
Gastric decontamination – Functional removal of an ingested toxin from the gastrointestinal tract to reduce absorption. This may include:

1. Gastric evacuation:
Forced emesis is not recommended and is highly discouraged.
Gastric lavage is not routinely recommended and should only be considered in life-threatening poisoning when:
>Poison was ingested within 30 minutes to 1 hour, AND
>No safer alternative decontamination method is available.

2. Intragastric binding:
Use of single-dose or multiple-dose activated charcoal may be considered depending on the poison ingested, timing of ingestion, and contraindications. Limitations should be assessed before use.

3. Enhanced gastrointestinal transit:
Whole bowel irrigation may be considered in selected cases. Routine use of cathartics is not recommended.

Contraindications to Gastric Lavage:

- An unprotected airway in an unconscious patient increase aspiration risk
- Ingestion of corrosives or petroleum products e.g. kerosene,
- Bowel obstruction
- Bowel perforation
- GI bleeding
- Identify the specific agent and remove or adsorb it as soon as possible.

Note

- Treatment is most effective if given as quickly as possible after the poisoning event, ideally within 1 hour.
- If the patient has swallowed kerosene, petrol, or petrol-based products (note that most pesticides are in petrol-based solvents) or if the patient's mouth and throat have been burned (for example with bleach, toilet cleaner or battery acid) do not vomit the patient but give water orally? Never use salt as an emetic as this can be fatal.

Pharmacological Management
A: charcoal, activated (PO) single dose (if available) within one hour of ingestion and do not induce vomiting; given by mouth or NG tube according to the dosage below:
Children below one year: 1g/kg Children 1-12 years of age: 25–50g
Adolescents and adults: 25–100g

AND

A: sodium lactate compound (ringer's lactate)(IV) 30ml/kg 2liters for 24hours if Shock is present

OR

A: sodium chloride 0.9% (IV) 30ml/kg 2liters for 24hours if Shock is present

Note: Toxins for which multiple doses of activated charcoal are indicated includes Carbamazepine, Dapsone, Digoxin, Paraquat, Phenobarbitone, Quinine, Slow-release preparations such as theophylline, Amanita phalloides fungus, Multiple doses may also be considered in life threatening overdose of other drugs (e.g. tricyclic antidepressants).

Content mixing:

- Mix the charcoal in 8–10 times the amount of water, e.g. 5g in 40 ml of water.
- If possible, give the whole amount at once; if the child has difficulty in tolerating it, the charcoal dose can be divided.
- If charcoal is not available, then induce vomiting but only if the patient is conscious by rubbing the back of the patient throat with a spatula or spoon handle;

Referral: Consider transferring patient to next referral level hospital, where this can be done safely, if the patient is:

- Unconscious or deteriorating conscious level
- Burns to mouth and throat
- Severe respiratory distress
- Cyanosed
- Heart failure

25.1.1 Food Poisoning

Food poisoning, also called foodborne illness, is illness caused by eating contaminated food. Infectious organisms including bacteria, viruses, and parasites or their toxins are the most common causes of food poisoning as listed in the table. Large intestine and small intestine have an intermediate incubation from about 1 to 3 days.

Large intestine
Infections of the large intestine or colon can cause bloody, mucous diarrhea associated with crampy abdominal pain.

- Campylobacter spp, is the common one cause of food-borne disease
- Shigella spp contaminate food and water and cause dysentery (severe diarrhea often containing mucus and blood).
- Salmonella spp infections often occur because of poorly or undercooked cooked and/or poor handling of the chicken and eggs. In individuals with weakened immune systems, including the elderly, the infection can enter the bloodstream and cause potentially life- threatening infections.
- Vibrio parahaemolyticus can contaminate saltwater shellfish and cause a watery diarrhea.

Small Intestine Infection

Diarrhea due to small bowel infection tends not to be bloody, but infections may affect both the small and large intestine at the same time.

- E. coli (enterotoxigenic) is the most common cause of traveler's diarrhea. It lacks symptoms such as fever or bloody diarrhea.
- Vibrio cholerae, often from contaminated drinking, water produces a voluminous watery diarrhea resembling rice-water.
- Viruses such as Norwalk, rotavirus and adenovirus tend to have other symptoms associated with an infection including fever, chills, headache, and vomiting.
- Botulism is caused by Clostridium botulinum toxin and may present with fever, vomiting, mild diarrhea, numbness, and weakness leading to paralysis.

Pharmacological Management

Category	Clinical Condition / Indication	Management
Rehydration Therapy	Adults (mild–moderate dehydration)	**A:** oral rehydration salts (ORS) solution PO as tolerated after each loose stool
	Adults (severe dehydration/unable to tolerate oral fluids)	**A:** sodium chloride 0.9% IV infusion **OR** **A:** sodium lactate compound (ringer's lactate)IV infusion according to dehydration status and ongoing fluid losses
	Children 2–5 years (mild–moderate dehydration)	**A:** oral rehydration salts (ORS) solution PO after each loose stool according to dehydration status
	Children (severe dehydration)	**A:** sodium chloride 0.9% IV infusion **OR** **A:** sodium lactate compound (ringer's lactate)IV infusion according to pediatric dehydration protocols
Symptomatic Treatment	Non-bloody diarrhea (adults only; no suspected invasive infection)	**D:** bismuth subsalicylate 524 mg PO every 30–60 minutes as needed (maximum 8 doses in 24 hours) **OR** **D:** bismuth subsalicylate 1048–1050 mg PO every hour (maximum 4 doses in 24 hours); use for not more than 2 days
	Nausea/Vomiting	**D:** ondansetron 4–8 mg PO/IV every 8 hours as needed **OR** **B:** metoclopramide 10 mg PO/IV every 8 hours as needed
Antibiotic Therapy	Suspected Cholera	**A:** doxycycline 300 mg PO stat **OR** **B:** azithromycin 1 g PO stat
	Severe Shigellosis	**A:** ciprofloxacin 500 mg PO every 12 hours for 3 days
	Invasive Salmonella infection (high-risk patients)	**B:** ceftriaxone 1–2 g IV once daily for 7–14 days **OR** **A:** ciprofloxacin 500 mg PO every 12 hours for 5–7 days
	Suspected Giardiasis / protozoal infection	**A:** metronidazole 400–500 mg PO every 8 hours for 5–7 days

25.1.2 Shellfish poisoning

Shellfish poisoning occurs when oysters, clams, scallops, or mussels) are eaten by humans. shellfish poisonings fall into four groups based on the specific toxins or chemicals that poison humans it includes:

- Amnesic shellfish poisoning (ASP)
- Diarrheal shellfish poisoning (DSP)
- Neurotoxic shellfish poisoning (NSP)
- Paralytic shellfish poisoning (PSP)

Clinical presentation

- Permanent short-term memory loss, brain damage, death (by Amnesic shellfish causative being domoic acid)
- Diarrhea, nausea, vomiting (Diarrheal shellfish by okadaic acid, azaspiracid)
- Slurred speech, nausea, vomiting (Neurotoxic shellfish caused by brevetoxins)
- Paresthesias, coordination loss, speech defects, nausea, vomiting, death (Paralytic shellfish caused by saxitoxin, neosaxiton and gonyautoxins I to IV

Non-Pharmacological Management

- Oral charcoal may be used to patients that are seen early after ingestion of large amounts of food
- Resuscitation and stabilization refer to EMD Chapter 1

Pharmacological Management
There is no specific antidote for shellfish poisoning.

For dehydration due to vomiting/diarrhea:
A: oral Rehydration Salts (ORS) PO for mild dehydration
OR
A: sodium chloride 0.9% IV infusion
OR
A: sodium lactate compound (ringer's lactate) IV infusion for moderate to severe dehydration.

For nausea/vomiting:
D: ondansetron 4–8 mg IV/PO every 8 hours as needed
OR
B: metoclopramide 10 mg IV/PO every 8 hours as needed

Severe respiratory paralysis may require mechanical ventilation/supportive ICU care.

25.1.3 Herbal Poisoning

Investigations

- Basic blood count, renal function, liver function, and electrocardiogram
- Heavy metal screening if suspected or if symptoms are non-specific
- Analysis methods exist for some herbal toxins only—Colchicine (HPLC, GCMS), tropane alkaloids (GCMS, oxalate (GCMS), vinca alkaloids (HPLC), cardioactive steroids (immunoassay)—check with the Poison Control Centre for Toxicology test.

Table 25.5: Organ Toxicities and Toxidromes Associated with Xenobiotics / Herbal Medicines

Clinical System / Toxicity	Clinical Features (Toxidrome)	Common Xenobiotics / Herbal Medicines
Cardiac toxicity	Sodium channel blockade → widened QRS, hypotension, shock	Aconitum species
	Digoxin-like effects → arrhythmias, bradycardia	Digitalis species, Bufo toads
Central nervous system (CNS)	Seizures	Strychnine, Thujone-containing plants, camphor, eucalyptus essential oils
	Sedation, CNS depression	Valeriana species, Kava kava
Dermatological toxicity	Blistering lesions	Cantharidin (blister beetles)
Hematological toxicity	Coagulopathy, bleeding tendency	Ginger, garlic, ginkgo ("G-herbs")
	Agranulocytosis / bone marrow suppression	Colchicine, Podophyllotoxin
Hepatotoxicity	Hepatitis, liver injury	Germander and multiple herbal agents
	Veno-occlusive disease	Pyrrolizidine alkaloid–containing plants (e.g. comfrey, Senecio, Heliotropium species)
Nephrotoxicity	Acute renal failure	Aristolochia species
	Hypertension, hyperkalemia	Licorice
Anticholinergic toxicity	Delirium, mydriasis, dry skin, urinary retention	Datura metel
	Hallucinations, agitation, coma	Atropa species, Hyoscyamus species, Mandragora officinarum
Sympathomimetic toxicity	Hypertension, tachycardia, hyperthermia, agitation	Ephedra species, Citrus aurantium (bitter orange)
Salicylate poisoning	Tinnitus, metabolic acidosis, respiratory alkalosis	Willow bark, checkerberry

Non-Pharmacological Management

- Ask specifically regarding the use of such products and a matched clinical feature using the above Toxidrome
- Secure sample for identification
  > Actual herbs or product used
  > Prescription or packaging
- Good resuscitative, symptomatic, and supportive care
- Instruct patients and family to stop using the product
- Consider outpatient monitoring of renal function, liver function, and blood counts
- Report case to regulating authority
- Report unusual cases to the National Poison Control Center via a Toll-free phone 0800112031

Pharmacological Management
Activated charcoal may be administered in acute ingestion of herbal toxins if: Presentation is within appropriate time window

A: charcoal, activated PO/NG
Adults: 50 g PO/NG stat
Children: 1 g/kg PO/NG (maximum 50 g)
Use only if ingestion is recent (usually ≤1 hour) and airway is protected and Airway is protected

For shock or severe dehydration due to vomiting/diarrhea:
A: sodium lactate compound (ringer's lactate)(Ringer's lactate) IV infusion
OR
A: sodium chloride 0.9% IV infusion
30 mL/kg IV bolus initially, then continue fluid resuscitation up to 2 liters within first 24 hours, guided by clinical response.

25.1.4 Management of Skin Contamination

- Remove all clothing and personal effects and thoroughly flush all exposed areas with copious amounts of running water running for:
  > 5-minutes for non-irritants or mild irritants
  > 15-20 minutes for moderate to severe irritants and chemicals that cause acute toxicity if absorbed through the skin
  > 30 minutes for most corrosives
  > 60 minutes for strong alkalis (e.g., sodium, potassium or calcium hydroxide)
- Use non-abrasive soap and water for oily substances
- Attending staff should take care to protect themselves from secondary contamination by wearing gloves and apron
- Removed clothing and personal effects should be stored safely in a see-through plastic bag that can be sealed, for later cleansing or disposal.

25.1.5 Management of Eye Contamination

Non-Pharmacological Management

- Immediately irrigate the affected eye with clean running water for 15–20 minutes, ensuring that contaminated runoff does not enter the unaffected eye.
- Evert the eyelids and ensure all conjunctival surfaces are adequately irrigated.
- For acid or alkali exposure, irrigate t54he eye with copious amounts of water OR normal saline for at least 30 minutes, then reassess.
- Continue irrigation for an additional 30 minutes if symptoms persist or ocular pH remains abnormal.
- Remove contact lenses if present.
- Perform thorough eye examination where possible, including:
  > Visual acuity assessment
  > Fluorescein staining to assess corneal injury
  > Examination for retained foreign material

Pharmacological Management
To facilitate irrigation where severe blepharospasm or pain limits eye opening:
C: tetracaine hydrochloride ophthalmic 0.5% eye drops, 1–2 drops into affected eye stat prior to dexamethasone

Referral: Urgently refer to an ophthalmologist if:

- Significant conjunctival injury
- Corneal ulceration or corneal burns
- Persistent pain
- Reduced visual acuity
- Chemical burns from strong acids/alkalis
- Retained foreign body
- When further ophthalmic evaluation cannot be performed

25.1.6 Management of Inhaled Poisoning

Non-Pharmacological Management

- Remove the patient from the source of exposure immediately and move to fresh air.
- Ensure rescuers avoid exposure to toxic fumes/gases.
- Thoroughly ventilate the contaminated area.
- If vomiting occurs, place the patient in the recovery position (head turned to the side) to prevent aspiration.
- Initiate cardiopulmonary resuscitation (CPR) if there are signs of cardiac arrest.
- Contact National Poison Control Centre: 0800 112031 for further guidance.

Monitor for delayed respiratory complications such as: Upper airway edema, Bronchospasm, Chemical pneumonitis, delayed pulmonary edema (observe for 24–48 hours where indicated)

Pharmacological Management

Table 25.6: Oxygen therapy: Administer oxygen and titrate according to pulse oximetry:

Severity	Oxygen Delivery	Flow Rate
Mild hypoxia/distress	Nasal cannula	2–6 L/min (24–40% oxygen)
Moderate hypoxia/distress	Face mask/Venturi mask	6–10 L/min (24–50% oxygen)
Severe hypoxia/distress	Non-rebreather mask	10–15 L/min (50–90% oxygen)
Apnea/respiratory arrest	Bag-valve-mask ventilation	10–15 L/min (~100% oxygen)

Target oxygen saturation:
94–96% in most patients
88–92% in patients with Chronic Obstructive Pulmonary Disease

Clinical Condition	Management
Bronchospasm	**B:** salbutamol 5 mg nebulization every 6–8 hours as needed **OR** **A:** epinephrine (adrenaline) 0.3–0.5 mg IM (1:1000 solution), may be repeated every 5–15 minutes if severe airway edema/anaphylaxis is suspected
Adjunct bronchodilator therapy (≥12 years)	**S:** ipratropium bromide inhalation 250–500 micrograms every 6–8 hours Maximum daily dose: 2 mg
Adjunct bronchodilator therapy (6–12 years)	**S:** ipratropium bromide inhalation 250 micrograms every 6–8 hours Maximum daily dose: 1 mg
Adjunct bronchodilator therapy (0–5 years)	**S:** ipratropium bromide inhalation 125–250 micrograms every 6–8 hours Maximum daily dose: 1 mg
Severe airway compromise	Perform endotracheal intubation if: severe airway edema, respiratory failure, reduced consciousness, or inability to maintain airway

Note:
Corticosteroids are not routinely recommended. Consider only in:
- Significant airway inflammation
- Reactive airway disease
- Severe chemical pneumonitis (specialist guidance recommended)

25.2 Specific poisons

25.2.1 Corrosive Compounds Poisoning

Examples: sodium hydroxide (drain/oven cleaners), potassium hydroxide, acids, bleach, disinfectants.

Non-Pharmacological Management

- Assess airway, breathing, and circulation immediately.
- Remove contaminated clothing if dermal exposure occurred.
- If ingestion is recent and patient is fully conscious with intact airway reflexes: Give small amounts of water OR milk (100–200 mL in adults; age-appropriate amounts in children) for dilution.
- Avoid large-volume dilution.
- **Do NOT** induce vomiting.
- **Do NOT** perform gastric lavage.
- **Do NOT** administer activated charcoal (ineffective and may interfere with endoscopy).
- Keep patient nil per mouth if severe pain, drooling, vomiting, or suspected perforation.

Pharmacological Management

Clinical Condition	Management
Hypoxia/respiratory distress	Administer oxygen therapy according to oxygen saturation and severity of respiratory distress
Pain	**A:** Paracetamol 1 g PO/IV every 6–8 hours as needed OR appropriate analgesia based on severity
Severe pain	**C:** Morphine 2.5–5 mg IV slowly as needed

Surgical / Specialist Review

Urgently arrange surgical/gastroenterology review for suspected:

- Esophageal burns
- Esophageal rupture
- Gastrointestinal perforation
- Mediastinitis
- Peritonitis
- Persistent vomiting
- Severe chest pain
- Severe abdominal pain
- Hematemesis

Upper GI endoscopy may be required within 12–24 hours depending on severity.

25.2.2 Petroleum Compounds Poisoning

Examples: kerosene, gasoline, turpentine, paraffin, paint thinners, petrol

Clinical Presentation

System	Clinical Presentation
Gastrointestinal (GIT)	Abdominal pain, vomiting, bloody stool (rare)
Respiratory System (RS)	Throat irritation/swelling, cough, tachypnea, cyanosis, crepitations, rhonchi, chemical pneumonitis, pulmonary edema
Other Findings	Characteristic smell of paraffin/petroleum products
Central Nervous System (CNS)	Headache, dizziness, euphoria, restlessness, ataxia, convulsions, encephalopathy, coma

Non-Pharmacological Management

- Remove patient from source of exposure immediately.
- Remove contaminated clothing.
- Wash exposed skin thoroughly with soap and water.
- If eye exposure occurs, irrigate with clean water for at least 15–20 minutes.
- **Do NOT** induce vomiting.
- **Do NOT** perform gastric lavage unless under specialist toxicology advice for exceptional circumstances.
- Observe for aspiration pneumonitis and respiratory deterioration.

Pharmacological Management

Oxygen Therapy

Severity	Oxygen Delivery Method	Flow Rate
Mild hypoxia	Nasal cannula	2–6 L/min
Moderate hypoxia	Face mask	6–10 L/min
Severe hypoxia	Face mask with reservoir bag/non-rebreather mask	10–15 L/min

Target oxygen saturation:
94–96% in most patients
88–92% in patients with Chronic Obstructive Pulmonary Disease

Clinical Condition	Management
Bronchospasm/Wheezing	**B:** salbutamol 5 mg nebulization every 6–8 hours as needed
Aspiration pneumonia (only if secondary bacterial infection is suspected)	**B:** amoxicillin + clavulanic acid 1.2 g IV every 8 hours **OR** **B:** ceftriaxone 1–2 g IV once daily
Seizures/Convulsions	**A:** diazepam 5–10 mg IV stat, repeat if necessary
Electrolyte imbalance (e.g. hypokalemia)	**C:** potassium chloride (KCl) (PO) 20–40 mmol PO, 2–3 times daily depending on severity **OR** **C:** potassium chloride 10–20 mmol IV diluted in 100 mL 0.9% sodium chloride, infused over 1 hour, with continuous ECG monitoring if IV route is used or if severe hypokalemia is present
Ventricular arrhythmias / myocardial sensitization	Continuous ECG monitoring if cardiac toxicity is suspected. Avoid Epinephrine. **B:** lidocaine 1–1.5 mg/kg IV bolus, followed by specialist-guided management if ventricular arrhythmias occur

Monitoring:

- Monitor respiratory status
- Monitor oxygen saturation
- Monitor neurological status
- Observe for delayed pneumonitis (up to 24–48 hours)

Note: Consult with a toxicologist for higher-risk exposures, particularly with aromatic or halogenated hydrocarbons via the Poison Control Centre **0800112031**

25.2.3 Kerosene (Paraffin) Poisoning

Kerosene poisoning commonly affects children. The primary target organ is the respiratory system, and aspiration leads to chemical pneumonitis which may be bilateral and interstitial.
Vomiting after ingestion is associated with increased risk of aspiration pneumonitis. CNS symptoms are usually secondary to hypoxia.

Non-Pharmacological Management

- Immediately remove the child from the source of exposure.
- Ensure airway patency and maintain ABC as first priority.
- Remove contaminated clothing and wash skin thoroughly with soap and water.
- Monitor oxygen saturation using pulse oximetry where available.
- Administer supplemental oxygen if hypoxia or respiratory distress is present.
- Provide respiratory support: Intubation and mechanical ventilation if severe hypoxia, respiratory distress, or reduced consciousness.
- Do NOT perform gastric lavage routinely due to high risk of aspiration pneumonitis.
- Gastric lavage may only be considered:
  > If a large ingestion occurred within 1 hour, and
  > Airway is protected by expert endotracheal intubation.

Pharmacological Management

Supportive fluid therapy (ONLY if shock or significant dehydration is present):
A: sodium lactate compound (ringer's lactate)(Ringer's Lactate) IV infusion 30 mL/kg IV bolus stat,
OR
A: sodium Chloride 0.9% IV infusion 30 mL/kg IV bolus stat,
THEN
Reassess, may continue guided fluid replacement up to 2 L over 24 hours in adults, or weight-based maintenance in children.

Note:

- There is no evidence supporting the routine use of corticosteroids in kerosene (paraffin) poisoning; therefore, they are not recommended.
- No specific antidote exists for kerosene poisoning.
- Antibiotics are not routine (only if secondary bacterial infection develops)
- Mainstay of treatment is supportive respiratory care
- Hypoxia is the main cause of CNS symptoms

25.2.4 Organophosphorus and Carbamate Compounds Poisoning

Organophosphates and carbamates are insecticides that inhibit cholinesterase, causing accumulation of acetylcholine and leading to cholinergic toxicity.

Examples

Organophosphates: Malathion, Parathion, TEPP, mevinphos
Carbamates: carbaryl, methiocarb

Exposure occurs via ingestion, inhalation, or dermal absorption.

Clinical Presentation

System / Toxicity Type	Clinical Features
Muscarinic effects (SLUDGE / DUMBBELLS)	Salivation, lacrimation, urination, diarrhea, emesis, bronchorrhea, bronchospasm, bradycardia, miosis
Nicotinic effects	Muscle fasciculations, weakness progressing to paralysis
Central Nervous System (CNS)	Confusion, convulsions, coma
Severe / Respiratory complications	Pulmonary oedema, respiratory depression, respiratory failure

Non-Pharmacological Management

- Immediately remove patient from exposure source.
- If dermal exposure: remove clothing and wash skin thoroughly with soap and water.
- If ocular exposure: irrigate eyes with clean water or normal saline.
- Do NOT induce vomiting (risk of aspiration due to hydrocarbon solvents).
- Give oxygen if SpO_2 < 90%
- Gastric decontamination (NG aspiration) Consider: NG aspiration ONLY in severe ingestion AND when airway is secured (intubated patient)
- Avoid decontamination procedures if airway is not protected due to risk of aspiration and worsening respiratory failure
- Monitor: Respiratory rate, Heart rate, Level of consciousness, Chest secretions (auscultation).

Pharmacological Management

Treatment Category	Management
Atropine (First-line antidote for muscarinic symptoms)	**A:** atropine Adults: 5 mg IV bolus stat, repeat every 5–10 minutes until atropinization achieved: • Dry chest secretions • HR > 80 bpm • SBP > 80 mmHg • Pupils no longer pinpoint • Dry axillae Paediatrics: 0.05 mg/kg IV, then double dose every 5–10 minutes until atropinization
Cholinesterase reactivation (Organophosphate poisoning only)	**S:** pralidoxime 50 mg/kg IV diluted in 15 mL water/normal saline, infused over 30 minutes May repeat once or twice if required Maintenance infusion: 10–20 mg/kg/hour IV infusion
Oxygen therapy	Administer oxygen if SpO_2 < 90% Escalate to ventilatory support if respiratory failure develops
Charcoal, activated (decontamination)	**A:** charcoal, activated PO/NG stat Adults: 50 g single dose Children: 1 g/kg (maximum 50 g) Only if ingestion occurred within 1 hour AND airway is protected

Note:

- Atropine is life-saving and titrated to clinical endpoint (not fixed dose).
- Pralidoxime is indicated only in organophosphate poisoning (not carbamates in most cases).
- Early airway protection is critical in severe poisoning.
- Decontamination must never delay resuscitation.

Table 25.7: List of Common Pesticides, Chemical Poisons and Antidotes

Group	Poisons	Antidote / Management
Agricultural pesticides Organophosphates	Malathion, Acephate, Dichlorvos, Dimethoate, Fenitrothion, Monocrotophos, Phorate, Quinalphos	**A:** atropine 2–5 mg IV (adults) OR 0.05 mg/kg IV (children), then double dose every 3–5 minutes until atropinization: Dry secretions, HR >80 bpm, SBP >80 mmHg). **AND** **S:** pralidoxime 1–2 g IV infusion over 15–30 min, may repeat after 1 hour, then 12-hourly PRN OR 30 mg/kg IV over 20 min followed by 4–8 m g/kg/hour maintenance infusion
Agricultural pesticides Carbamates	Propoxur, Aldicarb, Carbaryl, Carbofuran, Methomyl	**S:** pralidoxime 1–2 g IV infusion over 15–30 min, repeat after 1 hour if needed, then 12-hourly PRN OR 30 mg/kg IV over 20 min followed by 4–8 mg/kg/hour infusion
Organochlorines	Endosulfan, Gamma benzene hexachloride, Heptachlor, Chlordane	Supportive care
Rodenticides (anticoagulant type)	Bromadiolone	**S:** cholestyramine 4 g PO 12–24 hourly, titrate gradually; maintenance 8–16 g/day (max 24 g/day)
Rodenticides (vitamin K antagonists)	Bromadiolone	**B:** Phytomenadione (Vitamin K_1) 2.5–10 mg PO/SC (adults), may increase up to 25–50 mg if required; repeat 12–48 hourly Newborn: Vitamin K 0.5–1 mg IM within 1 hour of birth
Arsenic poisoning	Arsenic compounds	**D:** d-penicillamine 30–40 mg/kg/day PO for 1–6 months (2 hours before or 3 hours after food) **AND** **D:** dimercaprol 3 mg/kg IM every 4 hours for 48 hours, then 3 mg/kg 12-hourly for 10 days
Methanol poisoning	Methyl alcohol	Ethanol therapy (antidote): Loading 600 mg/kg IV OR 600–700 mg/kg PO/NG (diluted) Maintenance: 0.15 mL/kg/hour (IV = 1.4 mL/kg/hour of 10% ethanol)
Ethylene glycol poisoning	Antifreeze compounds	**S:** folinic acid 60 mg IM stat, then 15 mg PO 8-hourly for 48–72 hours Ethanol therapy as above (same dosing regimen) **AND** **C:** thiamine 100 mg IV stat, then 50–100 mg/day IM/IV; then 5–30 mg TDS for 1 month (critically ill)
Cyanide poisoning	Cyanide compounds	**C:** hydroxocobalamin 70 mg/kg IV (usually 5 g) over 15 minutes; may repeat 5 g if needed

Group	Poisons	Antidote / Management
Methemoglobinemia causing agents	Nitrites, nitrates, dapsone, aniline, chlorates, naphthalene	**C:** methylene blue 1 mg/kg IV over 5–30 minutes; repeat after 1 hour if methemoglobin >30% or symptoms persist
Paracetamol poisoning	Paracetamol	**C:** n-acetylcysteine 140 mg/kg loading, then 70 mg/kg every 4 hours for 3 days or until drug undetectable
Iron poisoning	Iron overdose	**D:** deferoxamine 1 g IM initially, then 500 mg 8-hourly for 48 hours
Benzodiazepine overdose	Diazepam, lorazepam, etc.	**D:** flumazenil 0.2 mg IV over 15 seconds, then 0.1 mg every 60 seconds until consciousness restored (maintenance 0.3–0.6 mg depending on response)
Opioid overdose	Morphine, heroin, methadone	**B:** naloxone 0.4–2 mg PO/IV depending on severity, repeat every 2–3 minutes if needed
Isoniazid toxicity	Isoniazid	**B:** pyridoxine 10–25 mg PO every 8 hours for 48 hours
Digoxin toxicity	Digoxin	**S:** Digoxin Immune Fab-Ovine (1 vial binds 0.5 mg digoxin; equimolar dosing required)
Datura poisoning	Datura species	**S:** physostigmine 0.5–2 mg IV slow (max 1 mg/min), repeat after 20 min if needed; maintenance 1–4 mg every 30–60 min PRN
Snake bite	Venomous snake bites	**A:** snake venom antiserum polyvalent: Mild 5 vials; Moderate 5–10 vials; Severe 10–20 vials IV
Dog bite	Rabies exposure	**B:** Human rabies immunoglobulin (HRIG) (half infiltrated into wound, half IM/SC)
Botulism	Clostridium botulinum toxin	**S:** botulinum antitoxin IV infusion start 0.5 mL/min for first 30 minutes, then slow infusion with monitoring for hypersensitivity

25.2.5 Paracetamol Poisoning

It is the commonest taken drug overdose. The toxic dose is highly variable. In general, the recommended maximum daily dose for healthy adults is 4 grams.

Chronic excessive alcohol consumption and Isoniazid can induce CYP2E1, antiepileptics including carbamazepine, phenytoin, and barbiturates induces CYP enzymes thus increasing the potential toxicity of Paracetamol.

Supportive care is essential in paracetamol toxicity. Immediate assess the patient's airway, breathing, and hemodynamic status

Clinical Presentation

- Phase-1: 0.5–24 hours after ingestion: asymptomatic, to nonspecific symptoms (anorexia, nausea, vomiting and malaise). Pallor, diaphoresis
- Phase-2: 18–72 hours after ingestion: Right upper quadrant abdominal pain, anorexia, nausea and vomiting, Tender right upper quadrant, tachycardia, hypotension and oliguria.
- Phase-3: 72–96 hours after ingestion: all of the above and jaundice, coagulopathy, hypoglycemia and hepatic encephalopathy, Acute Renal failure.
- Phase-4: 4th day to 3weeks after ingestion: patient who survive critical illness in phase 3, have complete recovery.

Investigations

- Liver Function Test - Liver transaminases ALT, AST, ALP, Prothrombin Time (PT) with INR (International Normalization Ratio)
- Serum Glucose
- Renal Function Test: Electrolytes, BUN, Creatinine
- ABG-Arterial Blood Gas
- ABG,
- LFTs,
- Full Blood Picture (Leukocytosis and thrombocytopenia)
- Coagulation studies (PT and PTT)

Non-Pharmacological Management

- Resuscitation
- In adults, the initial treatment for paracetamol overdose is gastrointestinal decontamination.
- Usually there is no immediate threat to the airway, breathing and circulation with paracetamol poisoning
- Correct hypoglycemia (Give glucose or sugar or honey)
- If within 1 hour of ingestion of 150mg/kg or more paracetamol give activated charcoal, if available.

Pharmacological Management

Treatment Category	Management
Gastrointestinal decontamination	**A:** charcoal, activated 1 g/kg PO (maximum 50 g), given if within 1–2 hours of ingestion AND airway is protected
First-line antidote (N-acetylcysteine regimen)	**C:** n-acetylcysteine (IV) Adults: 150 mg/kg in 200 mL 5% dextrose over 20 min, THEN 50 mg/kg in 500 mL over 4 hours, THEN 100 mg/kg in 1 L over 16 hours Children <20 kg: 150 mg/kg in 3 mL/kg 5% dextrose over 15 min, THEN 50 mg/kg in 7 mL/kg over 4 hours, THEN 100 mg/kg in 14 mL/kg over 16 hours Severe poisoning: may repeat 100 mg/kg over additional 24 hours
Alternative antidote	**S:** methionine Use if patient is conscious, not vomiting, OR when N-acetylcysteine is not available or poorly tolerated <6 years: 1 g PO every 4 hours for 4 doses ≥6 years: 2.5 g PO every 4 hours for 4 doses

Note: Syrup of ipecac is contraindicated in inducing vomiting to control paracetamol overdose because the vomiting it induces delays the effective administration of activated charcoal and oral acetylcysteine

25.2.6 Acetylsalicylic Acid and other Salicylates Poisoning.

Clinical Presentation

Stage	Clinical Features
Early (Initial) features	• Tinnitus and hearing impairment (classic early sign) • Nausea and vomiting • Hyperventilation (primary respiratory alkalosis → "acidotic breathing" appearance) • Fever (especially in children) • Dizziness and lightheadedness • Dehydration
Late / Severe features	• Confusion, agitation, delirium, bizarre behavior • Ataxia (unsteady gait) • Coma
Signs of severe toxicity (end-organ involvement)	• Seizures • Non-cardiogenic pulmonary edema • Cerebral edema • Rhabdomyolysis • Acute kidney injury • Severe metabolic acidosis

Investigations

- Arterial blood gases (ABG): mixed respiratory alkalosis + metabolic acidosis
- Serum electrolytes: Na^+, K^+, HCO_3^- (also Ca^{2+}, Mg^{2+} if severe)
- Serum salicylate concentration (serial levels important)
- Blood glucose (hypoglycemia may occur, especially in children)
- Renal function tests
- Liver function tests (in severe poisoning)
- ECG (arrhythmias, conduction abnormalities)

Non-Pharmacological Management

- Immediate ABC stabilization
- Charcoal, activated 1 g/kg (max 50 g) if within 1 hour (consider extended window in large ingestions or modified-release preparations)
- Continuous monitoring: Vital signs, Neurological status, Blood glucose (regular monitoring, not fixed 6-hourly in severe cases)
- Maintain adequate hydration
- Avoid acidifying agents
- Early referral to intensive care if moderate–severe poisoning

Pharmacological Management

Indication/Condition	Management
Fluid resuscitation / dehydration	**A:** sodium chloride 0.9% (IV): 20 mL/kg bolus over 15–30 minutes if hypotensive/dehydrated, then continue maintenance/replacement fluids to maintain urine output of 1–2 mL/kg/hour
Hypoglycemia (Adults)	**C:** dextrose 50% (IV): 50 mL bolus (25 g glucose), **THEN** **A:** dextrose 5% infusion IV according to blood glucose monitoring
Hypoglycemia (Children)	**B:** dextrose 10% (IV): 2–5 mL/kg bolus, followed by maintenance dextrose-containing fluids according to blood glucose monitoring
Urinary alkalinization / metabolic acidosis (moderate–severe poisoning)	**D:** sodium bicarbonate (IV): 1–2 mEq/kg slow IV bolus, followed by infusion prepared by adding 150 mEq sodium bicarbonate (3 ampoules of 50 mL of 8.4%) in 1 litre of 5% dextrose, infuse at 150–250 mL/hour (adjust according to clinical status) to maintain urine pH 7.5–8.0 and serum pH 7.45–7.55

Indication/Condition	Management
Hypokalemia	**C:** potassium chloride (IV): 20–40 mEq added to each litre of IV fluid OR 10–20 mEq/hour IV infusion depending on serum potassium level and ECG monitoring
Seizures	**A:** diazepam (IV): 0.15–0.2 mg/kg (maximum 10 mg) slow IV, may repeat once after 5–10 minutes **OR** **C:** lorazepam (IV): 0.1 mg/kg (maximum 4 mg) slow IV, may repeat once if needed

Note: Hemodialysis is required if the concentration exceeds 700mg/liter or in presence of severe metabolic acidosis

25.2.7 Iron Poisoning

Symptoms appear at doses greater than 20mg/kg. Iron levels above 350–500µg/dL are considered toxic, and levels over 1000µg/dL indicate severe iron poisoning. Iron pills can look like candy to children. Intentional overdose can occur among adults, but is rare.

Parameter	Description
Toxic dose of elemental iron	• <20 mg/kg: Usually non-toxic • 20–60 mg/kg: Mild to moderate toxicity • >60 mg/kg: Severe toxicity likely • >120 mg/kg: Potentially fatal poisoning
Serum iron levels	• 350–500 micrograms/dL: Toxic • >500 micrograms/dL: Severe toxicity • >1000 micrograms/dL: Life-threatening poisoning
Common cause	• Iron tablets may resemble candy and are a common cause of accidental poisoning in children
Adult exposure	• Intentional overdose in adults is uncommon

Clinical Presentation

Stage	Clinical Features
Stage I (0–6 hours)	Nausea, vomiting, abdominal pain, diarrhea, hematemesis, melena/black stools
Stage II (6–24 hours)	Apparent clinical improvement (latent phase)
Stage III (12–48 hours)	Shock, metabolic acidosis, GI hemorrhage, hypotension, altered mental status, seizures
Stage IV (2–5 days)	Hepatic failure
Stage V (2–8 weeks)	Gastric outlet obstruction/bowel scarring (rare)

Investigations

- Serum iron level (4–6 hours post ingestion)
- Serum electrolytes
- Blood glucose
- Arterial blood gas
- Liver function tests
- Renal function tests
- Full blood count
- Abdominal X-ray (may show radiopaque tablets)

Non-Pharmacological Management

- ABC stabilization
- IV fluids if dehydrated/shocked
- Whole bowel irrigation may be considered for large ingestion or visible tablets on X-ray
- Routine gastric lavage is generally **NOT** recommended unless:
  > Massive ingestion
  > Presentation within 1 hour
  > Airway protected

Pharmacological Management

Moderate poisoning
D: deferoxamine (IM) 50 mg/kg every 4–12 hours

Severe poisoning
D: deferoxamine (IV infusion) 15 mg/kg/hour

Continue until:

- Clinical improvement
- Serum iron normalizes
- Resolution of metabolic acidosis
- Urine color returns from “vin rose” to normal

25.2.8 Carbon Monoxide Poisoning

Carbon monoxide (CO) is a colorless, odorless gas produced by incomplete combustion of organic compounds. Exposure commonly occurs in private residences due to: Improper use of gasoline-powered generators, Indoor use of charcoal for cooking/heating, Faulty heating systems, House fires, Poor ventilation.

Clinical Presentation

Mild to Moderate Poisoning

- Headache
- Dizziness
- Weakness
- Nausea/vomiting
- Flu-like symptoms
- Blurred vision
- Chest pain
- Shortness of breath

Severe Poisoning

- Confusion
- Loss of consciousness
- Seizures
- Cardiac arrhythmias
- Coma
- Death

Note: Patients may appear "pink" or have normal pulse oximetry readings despite significant hypoxia.

Investigations

- Complete clinical assessment and detailed exposure history
- Identification of probable exposure source/risk factors
- Arterial blood gases (ABG)
- Serum electrolytes
- Carboxyhemoglobin level (if available)
- ECG (if chest pain or arrhythmias suspected)

Non-Pharmacological Management

- Remove patient from exposure source immediately
- Ensure airway, breathing, and circulation (ABC stabilization)
- Administer 100% oxygen via non-rebreather mask or bag-valve mask at 10–15 L/min until symptoms resolve and carboxyhemoglobin levels normalize
- Continuous cardiac monitoring if severe poisoning
- Perform CPR if patient is unconscious and pulseless
- Consider urgent referral for hyperbaric oxygen therapy (if available) in severe poisoning:
  > Loss of consciousness
  > Severe neurological symptoms
  > Pregnancy
  > Significant cardiac ischemia
  > Severe metabolic acidosis

Table 25.8: Carbon Monoxide Elimination Half-Life

Oxygen Therapy	Approximate Carbon Monoxide Half-Life
21% oxygen at normal atmospheric pressure (room air)	4–6 hours (approximately 5 hours 20 minutes)
100% oxygen at normal atmospheric pressure (non-rebreather mask)	60–90 minutes (approximately 1 hour 20 minutes)
100% hyperbaric oxygen (2–3 atmospheres absolute)	15–30 minutes

Note

- Administration of 100% oxygen significantly accelerates dissociation of carbon monoxide from hemoglobin.
- Hyperbaric oxygen therapy should be considered in severe poisoning (e.g., loss of consciousness, neurological symptoms, pregnancy, severe acidosis, cardiac ischemia).
- Public Health Prevention Measures should be done e.g. ensuring proper ventilation

25.2.9 Opioid Poisoning

Opioid poisoning occurs following excessive exposure to opioids due to: Substance abuse, Unintentional overdose, Intentional overdose, Therapeutic medication errors, Neonatal exposure (maternal opioid use during delivery), and Palliative/terminal care dosing errors

Common opioids involved include: Codeine, Diamorphine, Dihydrocodeine, Fentanyl, Heroin, Loperamide, Methadone, Morphine, Opium, or Tramadol. These may be taken alone or in combination with other sedatives.

Risk Factors for Toxicity

- People with opioid use disorder
- Social vulnerability/disadvantaged populations
- Previous opioid exposure for pain treatment
- Concurrent alcohol use
- Concurrent sedative use (e.g., benzodiazepines)

Clinical Presentation

Type	Clinical Features
Early/Acute toxicity	• Drowsiness • Nausea/vomiting • Slurred speech
Severe toxicity (classic opioid toxidrome)	• Respiratory depression/bradypnea • Reduced level of consciousness/coma • Pinpoint pupils (miosis) • Hypotension • Bradycardia *(tachycardia may occur in hypoxia but is not classic)*
Chronic toxicity/adverse effects	• Constipation • Loss of appetite • Nausea/vomiting

Investigations

- Full blood count
- Pregnancy test (where appropriate)
- Liver function tests (ALT/AST)
- Renal function tests (urea, creatinine)
- Creatine kinase (if prolonged immobilization/rhabdomyolysis suspected)
- Arterial blood gas
- Blood glucose
- ECG (recommended in all suspected overdoses, especially Methadone overdose due to QT prolongation)

Non-Pharmacological Management

- Assess and secure airway
- Provide assisted ventilation if required
- Intubate patients unable to protect airway
- Administer supplemental oxygen
- Continuous pulse oximetry and cardiac monitoring

Pharmacological Management

1. hypo-ventilating patient with spontaneous ventilation

Adults and children >20 kg

B: naloxone (IV) 0.4–0.5 mg initially, repeat every 2–3 minutes and titrate upward until respiratory rate ≥12 breaths/min and adequate ventilation is achieved. Maximum cumulative dose typically 10 mg.

Children <20 kg

B: naloxone (IV) 0.01 mg/kg initially (maximum 2 mg/dose); may increase to 0.1 mg/kg if inadequate response.

Note

- Before administering Naloxone, ensure airway support and provide 100% oxygen or assist ventilation using a bag-valve-mask in patients with respiratory depression or apnea until adequate spontaneous breathing resumes.
- Usual initial dose of Naloxone: Adults: 0.4–2 mg IV, Children: 0.1 mg/kg IV (maximum 2 mg per dose)
- In suspected chronic opioid users, Naloxone should be administered slowly and titrated carefully to avoid precipitating acute withdrawal and sudden return of severe pain: Start with 0.04–0.1 mg IV, Repeat every 1–3 minutes as needed until adequate ventilation is restored
- The goal of Naloxone therapy is restoration of adequate respiratory function, not necessarily full consciousness.
- Onset of action is usually within 1–2 minutes IV, with peak response occurring within 3–8 minutes.
- Repeat doses may be required if signs of opioid toxicity persist or recur, particularly with long-acting opioids such as Methadone or Buprenorphine.
- Some patients may require continuous naloxone infusion due to the shorter half-life of Naloxone compared with long-acting opioids.
- Patients with Buprenorphine toxicity may show incomplete response to standard naloxone doses and may require higher doses, prolonged monitoring, and ventilatory support.
- Monitor for recurrent respiratory depression after initial reversal.
- Observe for acute opioid withdrawal symptoms in opioid-dependent patients.

2. Patients with apnea

Newborn with apnea secondary to maternal opioid exposure
B: naloxone (IV/IM) 0.01 mg/kg (maximum 0.4 mg/dose)
Children <20 kg
B: naloxone (IV) 0.1 mg/kg (maximum 2 mg/dose), repeat doses or continuous infusion as required
Adults and children >20 kg
B: naloxone (IV) 0.2–2 mg initially, titrate to clinical response

3. Life-threatening opioid toxicity

Children <20 kg
B: naloxone (IV) 0.1 mg/kg (maximum 2 mg/dose)
Adults and children >20 kg
B: naloxone (IV) 2 mg initially
> Repeat dose every 2–3 minutes until respiratory function improves.
> If a maximum cumulative dose of 10 mg is reached without improvement, consider alternative diagnoses or co-ingestants.
> Continuous infusion may be required for recurrent toxicity, especially with long-acting opioids such as Methadone or Buprenorphine.

Note

- In neonates exposed to maternal opioids, rapid reversal with high doses of Naloxone may precipitate acute opioid withdrawal, which can be severe and potentially life-threatening. Therefore:
  > Use low initial doses of Naloxone
  > Recommended dose: 0.01 mg/kg IV/IM
  > Titrate cautiously based on respiratory response
- Supportive airway management and ventilation remain essential.

Further management of Psychiatric Management of Opioid Toxicity refer Mental Disorders Chapter 23

25.2.10 Heavy Metal Poisoning

This includes mercury, arsenic, cadmium, copper, lead poisoning and thallium
The management of heavy metal toxicity depends on the specific metal, route of exposure and length of time between exposure and clinical presentation of symptoms

25.2.10.1 Lead Poisoning

Lead is a heavy metal with no physiological role in the human body. Common sources include: Lead-based paint and paint dust (especially older buildings), Contaminated water pipes, Industrial exposure, Batteries, Traditional cosmetics/herbal remedies Contaminated soil. Lead poisoning often develops gradually over months to years and may cause irreversible toxicity.

Clinical Presentation

Population Group	Clinical Features
Newborns	Prematurity , Low birth weight , Slowed growth.
Children	Developmental delay, Learning difficulties, Irritability, Loss of appetite, Weight loss, Fatigue, Abdominal pain, Vomiting, Constipation, Hearing loss, Seizures, Pica, Reduced IQ, Anxiety/depression, ADHD-like symptoms.
Adults	Hypertension, Joint/muscle pain, Memory/concentration difficulties, Headache, Abdominal pain , Mood disorders, Reduced sperm count, Miscarriage/stillbirth/prematurity, Anemia, Fanconi syndrome, Wrist drop

Investigations

- Blood lead level (BLL)
- Free erythrocyte protoporphyrin (FEP)
- Erythrocyte protoporphyrin (EP)
- Full blood count
- Liver function tests (ALT/AST)
- Renal function tests (creatinine, BUN)
- Imaging studies as indicated: Abdominal X-ray, Chest X-ray, Bone X-ray.

Non-Pharmacological Management

- Remove source of lead exposure
- Community/environmental assessment
- Maintain adequate hydration and urine output
- Monitor cardiovascular status
- Monitor neurological status
- Assess renal and hepatic function

Pharmacological Management
(Chelation Therapy)

Blood Lead Level / Clinical Status	Management
25–44 micrograms/dL(symptomatic or persistent exposure)	**D:** penicillamine (PO) 30–40 mg/kg/day for 1–6 months, administer 2 hours before or 3 hours after meals
45–69 micrograms/dL	**D:** succimer (PO) 10 mg/kg every 8 hours for 5 days, followed by 10 mg/kg every 12 hours for 14 days
>70 micrograms/dL OR encephalopathy	**D:** dimercaprol (deep IM) 3–5 mg/kg every 4 hours for 48 hours, followed by dose adjustment based on clinical response **AND** **D:** calcium disodium EDTA (ethylene diamine tetra-acetic acid) (IV infusion) 10–20 mg/kg/day divided every 8–12 hours for 5 days

25.2.10.2 Mercury Toxicity

Mercury in all forms is toxic. Poisoning may result from: Mercury vapor inhalation, Accidental or intentional mercury injection, Dermal absorption, Ingestion of mercury-containing compounds, or Consumption of contaminated seafood containing methylmercury (organic mercury).

Clinical Presentation

Type of Mercury	Clinical Features
Inorganic Mercury	Ash-gray mucous membranes, Hematochezia, Severe abdominal pain, Foul breath, Metallic taste, Stomatitis, Gingival irritation, Loosening of teeth, Hypovolemic shock, Acute kidney injury/renal tubular necrosis
Organic Mercury (Methylmercury)	Visual disturbances (scotomata, visual field constriction) , Ataxia, Paresthesia (early sign) , Hearing loss , Dysarthria, Mental deterioration, Tremors, Movement disorders, Paralysis, Death (severe exposure)

Laboratory Investigations

- Blood mercury levels
- Urine mercury levels
- Full blood count
- Renal function tests
- Hair mercury level (chronic exposure)
- Toenail mercury level (chronic exposure)
- CSF mercury level (selected severe neurological cases)
- Plain abdominal X-ray (if ingestion suspected)

Non-Pharmacological Management

- Remove patient from source of exposure
- Maintain Airway, Breathing and Circulation (ABC)
- Administer oxygen if required
- Copious skin irrigation if dermal exposure occurred
- Routine gastric lavage is not recommended, may be considered only in selected cases of recent significant ingestion, when mercury is visible on abdominal imaging and the airway is protected.
- Hemodialysis may be required in severe renal failure
- Surgical/endoscopic removal may be required for retained mercury in the gastrointestinal tract

Pharmacological Management
(Chelation Therapy)

Clinical Scenario	Management
Recent ingestion	**A:** charcoal, activated (PO) may be considered in ingested poisons, though effectiveness in mercury poisoning is limited
Mild–moderate mercury poisoning	**D:** succimer (DMSA) (PO) 10 mg/kg every 8 hours for 5 days, followed by 10 mg/kg every 12 hours for 14 days (maximum 500 mg/dose)
Severe acute inorganic mercury poisoning	**D:** dimercaprol (deep IM) 5 mg/kg stat, then 2.5 mg/kg IM every 12 hours for 10 days

Note: Surgical or endoscopic intervention may be required to remove mercury retained/lodged in the gastrointestinal tract (e.g., intestine or colon), particularly when spontaneous passage fails or ongoing absorption is suspected.

25.3 Prevention of Poisoning

Educate patients and caregivers on do's and don'ts for prevention of poisoning.

Do's

- Keep medicines and poisons in properly labeled containers and out of reach of children
- Use containers with child-resistant caps
- Consult the Material Safety Data Sheet (MSDS) for chemical handling and safety information
- Keep all products in their original containers
- Read medicine labels carefully to avoid medication errors
- Contact the Poison Information Centre for guidance: **0800112031**

Don'ts

- Do not leave containers open
- Do not transfer chemicals or medicines into unlabeled or inappropriate containers
- Do not remove labels from medicine or chemical products
- Do not store tablets in alternative containers such as purses, envelopes, or bags
- Do not refer to medicines as "sweets" or candy
- Do not take medicines in front of children, as they may imitate the behavior

25.4 Alcohol Intoxication

Management of alcohol intoxication see mental health conditions on chapter 23.

25.5 Bites and Stings

Most serious sting-related reactions are caused by insects of the order Hymenoptera, particularly: Bees, Wasps and Ants. Other arthropods/venomous creatures that may also cause bites or stings include: Spiders, Scorpions, Centipedes, Millipedes.

Clinical Presentation

Localized pain at the bite/sting site, Swelling, Redness, Itching. Severe reactions may include: Generalized urticaria, Angioedema, Wheezing, Difficulty breathing, Hypotension, Anaphylaxis.

Non-Pharmacological Management

- Clean the affected area with soap and water to remove contaminants
- If a stinger is present (e.g., bee sting), remove it gently by scraping with a fingernail, card, or gauze
- Avoid using tweezers because they may squeeze additional venom into the wound
- Apply a cold compress/cold pack wrapped in cloth to reduce pain and swelling
- Avoid scratching to prevent skin breakdown and secondary infection

Pharmacological Management

Indication	Management
Pain and inflammation	**A:** ibuprofen (PO) Adults: 400–800 mg every 8 hours for 3 days Children: 10 mg/kg every 8 hours (maximum 400 mg/day) for 3 days
Moderate inflammatory reaction/severe local swelling	**A:** prednisolone (PO) 2 mg/kg/day as a single daily dose (maximum 80 mg/day) for 5 days
Allergic symptoms (first-generation antihistamine)	**A:** chlorpheniramine (PO) • <6 years: 1 mg every 4–6 hours as needed (maximum 6 mg/day) • 6–12 years: 2 mg every 4–6 hours as needed (maximum 12 mg/day) • >12 years/adults: 4 mg every 4–6 hours as needed (maximum 24 mg/day)
Non-sedating antihistamine	**C:** loratadine (PO) • 2–5 years: 5 mg once daily (syrup) • ≥6 years/adults: 10 mg once daily

Note:

- In case of severe Allergic reaction like anaphylaxis, manage according to Chapter 1: Approach To Patients With Emergency Conditions
- For Centipedes Ensure your patient's tetanus vaccination is up to date.

25.5.1 Management of Specific Bites/Stings

25.5.1.1 Bee and Wasps Sting

Bee venom contains multiple toxins including hemolytic enzymes, neurotoxic factors, histamine, and lytic peptides. Wasp venom contains substances such as hyaluronidase and serotonin (5-hydroxytryptamine).

Prevention of Complications After Sting

- Move victim to a safe area to prevent additional stings
- Remove stinger promptly if present (scrape gently using card/gauze/fingernail)
- Wash affected area with soap and water
- Apply cold compress/ice pack wrapped in cloth
- Apply Hydrocortisone 0.5–1% cream, calamine lotion, or baking soda paste for local irritation

Clinical Presentation

Type	Clinical Features
Local reactions	Pain, Itching, Erythema, Swelling, Cellulitis
Systemic reactions	Generalized edema, Fatigue, Nausea/vomiting, Fever, Diarrhea/stool incontinence, Dizziness, Hypotension, Hemolysis, Rhabdomyolysis, Hemoglobinuria/myoglobinuria , Anaphylaxis , Loss of consciousness

Non-Pharmacological Management

- Assess airway, breathing, and circulation
- Remove stingers carefully
- Elevate affected limb
- Clean wound
- Monitor for anaphylaxis

Pharmacological Management

Indication/Condition	Management
Anaphylaxis (first-line)	**A:** epinephrine (IM) 0.5 mg (0.5 mL of 1:1000 solution) into the anterolateral thigh in adults; repeat every 5–15 minutes if needed. Children: 0.01 mg/kg IM (maximum 0.5 mg/dose)
Allergic symptoms / pruritus	**A:** chlorpheniramine (PO) Adults: 4 mg every 4–6 hours (maximum 24 mg/day) Children 2–6 years: 1 mg every 4–6 hours (maximum 6 mg/day) Children 6–12 years: 2 mg every 4–6 hours (maximum 12 mg/day)
OR alternative antihistamine	**A:** promethazine (PO/PR) 6.25–12.5 mg before meals and at bedtime as needed OR 25 mg PO/PR at bedtime OR 25 mg IM/IV stat, may repeat after 2 hours if necessary
OR non-sedating antihistamine	**C:** loratadine (PO) Children 2–5 years: 5 mg once daily Children ≥6 years and adults: 10 mg once daily
Hypotension / shock	**A:** sodium chloride 0.9% (IV) 10–20 mL/kg bolus
Pain / fever	**A:** paracetamol (PO) Adults: 1 g every 8 hours for 48 hours Children: 15 mg/kg every 8 hours for 48 hours
Severe respiratory or cardiovascular reaction	**D:** methylprednisolone (IV) 125 mg stat

Note:

- Patients with multiple stings should be observed for at least 24 hours for delayed systemic toxicity.
- Healthy adults: observe if there are >50 stings, Children: observe if there are >1 sting per kilogram body weight or if there are systemic symptoms/anaphylaxis
- Any patient with: Respiratory distress, Hypotension, Anaphylaxis, Rhabdomyolysis, Hemolysis or Renal impairment should be admitted and closely monitored regardless of the number of stings.

25.5.1.2 Scorpion Sting (Envenoming)

Scorpion stings can cause severe local pain and systemic toxicity. Children are at higher risk of severe envenoming and death compared to adults.

Clinical Presentation

System/Type	Clinical Features
Local effects	Severe pain at sting site , Paresthesia at or near sting site
Neurological / cranial effects	Paresthesia distant from sting site , Blurred vision , Nystagmus / roving eye movements , Tongue fasciculations , Dysphagia , Dysphonia , Restlessness Tremors or involuntary jerking movements ,Tetanus-like muscle rigidity
Autonomic effects	Tachycardia or bradycardia, Hypertension or hypotension , Excess salivation and lacrimation, Urinary and fecal incontinence , Sweating
Severe / systemic effects	Pulmonary edema , Cardiogenic shock , Hyperthermia , Rhabdomyolysis , Multi-organ failure, Death (usually due to cardiogenic shock or pulmonary edema)

Grading of Envenomation

Grade	Clinical Features
Grade I	Local pain ± mild paresthesia at sting site
Grade II	Local pain and paresthesia extending proximal to sting site
Grade III	Cranial nerve involvement (excess salivation, visual disturbance, nystagmus) and/or neuromuscular dysfunction (tremors, muscle spasms, abnormal posturing) ± autonomic dysfunction
Grade IV	Severe systemic toxicity including pulmonary edema, rhabdomyolysis, hyperthermia, cardiogenic shock, and multi-organ failure

Non-Pharmacological Management

- Ensure airway, breathing, and circulation (ABC)
- Provide oxygen therapy
- Keep patient calm to reduce sympathetic stimulation
- Continuous monitoring of: Oxygen saturation, Heart rate, Respiratory rate and Blood pressure.
- Early recognition and management of pulmonary edema or shock

Pharmacological Management

Indication/Condition	Management
Local wound care	Clean sting site with normal saline
Fluid resuscitation	**A:** sodium lactate compound (ringer's lactate)(IV) as required (approx. maintenance or resuscitation fluids; adjust according to clinical status)
Pain and mild systemic symptoms	**A:** paracetamol (PO/IV) Adults: 1 g every 8 hours for 48 hours Children: 15 mg/kg every 8 hours for 48 hours **OR** **A:** ibuprofen Adults: 400–800 mg every 8 hours for 3 days Children: 10 mg/kg every 8 hours (maximum 400 mg/day)
Moderate to severe envenoming (Grade III–IV)	**A:** scorpion antivenom immunoglobulin IV in normal saline 20–50 mL over 30 minutes Initial: 1 vial infused over 10 minutes, observe for response for 60 minutes Repeat remaining vials (up to total 3 vials) at 30-minute intervals if symptoms persist
Anaphylaxis to antivenom or severe systemic allergic risk	**A:** epinephrine (IM) per anaphylaxis protocol
Severe pain (rescue analgesia)	**C:** morphine (IV/IM) titrated according to severity
Local anesthetic for severe localized pain	**A:** lidocaine 1% infiltration at sting site
Severe cardiovascular/respiratory compromise	Prepare for airway support, intubation, and intensive care monitoring

25.5.1.3 Snake Bite

Discussed in details under Notifiable Disease Chapter 4

CHAPTER TWENTY- SIX

RHEUMATOLOGICAL DISORDERS

Rheumatological disorders, also known as rheumatic diseases, comprise a diverse group of conditions that primarily affect the joints, bones, muscles, tendons, ligaments, and connective tissues. Many are driven by autoimmune and inflammatory processes, often leading to multi-organ involvement.

These diseases are usually chronic, may cause long-term disability, and often require multidisciplinary care. Management involves immunosuppressive therapy, including corticosteroids, conventional DMARDs, and biological agents. Accurate diagnosis and thorough assessment are crucial for guiding safe and effective treatment.

Before initiating DMARDs or biologics, it is essential to conduct liver and renal function tests, a chest X-ray, and screen for tuberculosis, HIV, and hepatitis B and C to rule out latent infections and ensure the safety of treatment.

26.1 Inflammatory Arthritis

Inflammatory arthritis refers to a group of diseases characterized by inflammation of the joints, including:

- Rheumatoid Arthritis (RA)
- Psoriatic Arthritis (PsA)
- Axial Spondyloarthritis
- Reactive Arthritis
- Enteropathic Arthritis (associated with IBD)

26.1.1 Rheumatoid Arthritis (RA)

RA is a chronic, systemic autoimmune disease that primarily affects synovial joints, causing symmetrical inflammation, pain, and progressive joint deformity. It often involves the hands and feet, but any synovial joint may be affected. Extra-articular manifestations (such as those affecting the skin, heart, lungs, and eyes) can also occur.

Clinical Presentation

- Symmetrical joint swelling, stiffness, and pain
- Morning stiffness >30 minutes
- Fatigue and general malaise
- Extra-articular signs (e.g., nodules, lung or eye involvement)
- Small and large joint tenderness, swelling, stiffness, pain on motion, deformity, and functional limitation.

Investigations

- CBC: anemia of chronic disease, thrombocytosis, or leukopenia (may occur with Felty's syndrome or DMARD toxicity).
- ESR and CRP: used both for diagnosis and monitoring disease activity and treatment response. Serologic tests: RF: Positive in ~70–80% of RA cases; less specific. Anti-CCP: More specific for RA; indicates a risk of severe erosive disease and extra-articular disease.
- Imaging
  > X-ray (hands, wrists, feet): Shows swelling, osteopenia, joint narrowing, and erosions. Chest X-ray to rule out ILD or TB
  > Ultrasound (US): Detects synovitis, effusion, and erosions earlier than X-ray.
  > CT: Used for suspected atlantoaxial subluxation, preoperative cervical spine planning, or unclear MRI findings.
  > MRI: More sensitive, identifying bone marrow edema and early erosions.

Diagnosis

RA is classified by ACR/EULAR 2010 criteria with a score ≥6/10 based on joints, serology, inflammation markers, and symptom duration.

Treatment consideration

- Assess disease activity using the Disease Activity Score in 28 joints (DAS28), Clinical Disease Activity Index (CDAI), and Simplified Disease Activity Index (SDAI)
- Monitor and adjust treatment every 3 months
- Follow a treat-to-target strategy with tight control
- Aim for low disease activity or remission within 6 months

Non-Pharmacological Management:

- Education
- Physical therapy
- Occupational therapy
- Lifestyle: Smoking cessation, Healthy diet & weight control, Psychosocial support.

Pharmacological Management

1. Disease-modifying anti-rheumatic Drugs (DMARDs)
DMARDs are the cornerstone of RA treatment. They should be started as soon as the diagnosis is made.

a). Conventional Synthetic DMARDs (csDMARDs)
All patients with active rheumatoid arthritis should be initiated on methotrexate as first-line therapy unless there are contraindications or intolerance

S: methotrexate (PO) Start with 10–15 mg/week; increase by 5 mg every 2–4 weeks, depending on the response, up to a maximum of 20-25mg/week.
AND
A: folic acid (PO) 5 mg weekly, taken a day before methotrexate. For severe toxicity, give daily (except on methotrexate day)
OR
S: leflunomide (PO) 10–20 mg 24hourly.
OR
S: hydroxychloroquine (PO) 200–400mg 24hourly, (usually 5 mg/kg/day, max 400 mg/day).
OR
D: sulfasalazine (PO) 500 mg twice daily initially; increase by 500 mg every week to target 2–3 g/day in divided doses maintenance dose 1–1.5 g twice daily.

If the response is inadequate, step-up combination therapy of csDMARDs is advised.

Note:
- Hydroxychloroquine: Annual eye exam after 5 years or earlier if high risk.
- Methotrexate: Split dose or subcutaneous if poorly tolerated.
- Sulfasalazine: Avoid sulfa allergy.
- Triple therapy: Combines methotrexate, sulfasalazine, and hydroxychloroquine; leflunomide may be used as an alternative to methotrexate.
- Methotrexate & leflunomide: Contraindicated in pregnancy and breastfeeding. Avoid leflunomide in women planning pregnancy.

b). Biologic DMARDs (bDMARDs)
In moderate-to-severe RA not controlled by csDMARDs, adding a bDMARD or tsDMARD is preferred.

S: rituximab (IV) 1000 mg on days 1 and 15; may repeat every 6 months or based on response.
OR
S: adalimumab (SC) 40 mg subcutaneously every other week (may increase to weekly if needed)
OR
S: tocilizumab (IV) 4mg/kg every other 4 weeks may increase to 8mg/kg (Max 800mg/dose)

c). Targeted Synthetic DMARDs (tsDMARDs)
JAK inhibitors are used after the failure of csDMARDs or bDMARDs.
S: tofacitinib (PO) 5 mg12hourly.

2. Glucocorticoids
Used for short-term (< 3 months) control and as bridging therapy.

A: prednisolone (PO) 5–15 mg/day orally (4-6 weeks). Gradually reduce over weeks to months, depending on the response
OR
D: methylprednisolone (IV/IM) 500–1000 mg daily for 1–3 days for severe flares.
OR
S: triamcinolone acetonide: deep IM 10–40 mg monthly or IA in case only 1-2 joints are affected

3. Non-steroidal anti-inflammatory Drugs (NSAIDs)
Used for symptom control only (do not modify disease course).

A: Ibuprofen (PO) 400–800 mg 8 hourly
OR
C: diclofenac (PO) 50mg 8-12hourly
OR
A: piroxicam (PO) 20mg 24hourly
OR
D: meloxicam (PO) 7.5–15 mg 24hourly
OR
S: ketoprofen (PO) 75mg 8 hourly
OR
S: ketoprofen gel 2.5% apply 6 hourly
OR
A: diclofenac gel 1% apply 6 hourly

Note: In patients at high risk of NSAID-related gastrointestinal complications, co-administration of a PPI should be considered to reduce the risk of PUD and UGB

Surgical management
is indicated when medical treatment fails to relieve pain, maintain function, or prevent deformity.

Peripheral joint care:
- Joint replacement
- Synovectomy
- Tendon repair or transfer
- Arthrodesis

Cervical Spine Involvement
- Atlantoaxial subluxation should be routinely monitored in long-standing RA; surgery is indicated in cases of instability with neurological symptoms.
- Basilar invagination (BI) may occur due to ligamentous and bony weakening. Surgical management includes decompression and stabilization via C1–C2 fusion or craniovertebral fusion, depending on severity.

Perioperative and Postoperative Considerations
- Biologics and JAK inhibitors should be temporarily withheld perioperatively based on the risk of infection and the complexity of the procedure.
- Postoperative rehabilitation is crucial for optimizing functional recovery, particularly after joint replacement or tendon procedures.

Special Considerations in RA Treatment
- Subcutaneous Nodules: Use methotrexate for active disease; switch DMARD if nodules worsen
- Heart Failure (HF) (NYHA III/IV): Prefer non-TNF bDMARDs or tsDMARDs over TNF inhibitors if csDMARDs fail or HF develops.
- Pulmonary Disease: MTX is acceptable in mild, stable lung disease or incidental findings.
- Lymphoproliferative Disorder: Rituximab is preferred if there is a history of treated lymphoproliferative disease.
- Hepatitis B:
  > HBsAg-positive: Use rituximab with prophylactic antivirals.
  > Core Ab positive only: Monitor viral load and LFTs.
- NAFLD: MTX is safe if LFTs are normal and no advanced fibrosis
- Cardiovascular disease: Tofacitinib is contraindicated in patients with a history of myocardial infarction, stroke, or HF.

26.1.2 Psoriatic Arthritis (PsA)

PsA is a chronic inflammatory arthritis that is usually seen in patients with psoriasis, although it may predate skin involvement, which can be subtle. It typically presents as seronegative oligoarthritic, with features such as distal joint involvement, arthritis mutilans, or inflammation of joints, spine, entheses, nails, and skin.

Clinical Presentation
- Joints: Asymmetric, DIP, spine, severe deformity (mutilans)
- Dactylitis: Swollen “sausage” digits with PIP synovitis
- Enthesitis: Tender tendon insertions
- Skin/Nails: Psoriasis, nail pitting/onycholysis
- Other: Fatigue, stiffness, joint swelling, and tenderness on exam

Investigations
- ESR, CRP (sometimes normal)
- RF and anti-CCP (usually negative)
- HLA-B27 for those with suspected axial involvement.
- X-rays: First-line; show erosions, new bone, pencil-in-cup, ankylosis, asymmetric sacroiliitis.
- Ultrasound: Shows synovitis, enthesitis, tenosynovitis; Doppler detects active inflammation
- MRI: gold standard test for sacroiliitis and spinal involvement

Diagnosis
PsA is diagnosed using CASPAR criteria, requiring inflammatory joint, spine, or enthesis involvement plus ≥3 points from clinical, lab, or imaging features.

Non-Pharmacological Management
- Weight reduction
- Skin care (avoid trauma)
- Physical therapy
- Stress reduction
- Smoking cessation
- Alcohol reduction

Pharmacological Management

1.Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

- For mild peripheral arthritis, enthesitis, or axial symptoms without poor prognostic factors.
- Relieve symptoms but don't prevent damage.
- Not for monotherapy in moderate-to-severe disease

A: Ibuprofen (PO) 400–800 mg 8 hourly

OR

C: diclofenac (PO) 50 mg orally 8–12 hourly

OR

A: diclofenac gel 1% apply 6 hourly

OR

A: piroxicam (PO) 20 mg 24 hourly

OR

D: meloxicam (PO) 7.5–15 mg 24 hourly

OR

S: ketoprofen (PO) 75mg 8 hourly

OR

S: ketoprofen (PO) 50mg 6 hourly

OR

S: ketoprofen gel 2.5% apply 6 hourly

Note: In patients at high risk of NSAID-related gastrointestinal complications, co-administration of a PPI should be considered to reduce the risk of PUD and UGB

2. Conventional Synthetic DMARDs (csDMARDs)

S: methotrexate (PO) A first-line csDMARDs is especially effective in patients with skin and nail involvement. 15–25 mg once weekly.

AND

A: folic acid (PO) 5mg weekly, taken a day before methotrexate. For severe toxicity, give daily (except on methotrexate day)

OR

D: sulfasalazine: (PO) 500mg 12hourly initially; increase by 500 mg every week to target 2–3 g/day in divided doses

OR

S: leflunomide (PO) 10mg 24 hourly, increase to 20mg 24hourly

3. Biologic DMARDs (bDMARDs)

Used in moderate-to-severe PsA, poor prognosis, or inadequate csDMARDs response.

S: adalimumab (SC) 40mg every 2 weeks.

4. Targeted Synthetic DMARDs (tsDMARDs)

Patients who have failed or are intolerant to bDMARDs.

S: tofacitinib (PO) 5mg 12 hourly

Surgical Treatment

Surgery in PsA is used for severe joint damage or deformity, including synovectomy, joint replacement, Tendon repair or transfer, and Arthrodesis.

Note

- Avoid oral steroids in active psoriasis to prevent flares.
- Start DMARDs or biologics early in the erosive disease stage.
- Monitor with DAPSA, PASI, and HAQ-DI to guide treatment.

26.1.3 Axial Spondyloarthritis

A chronic inflammatory rheumatic disease that primarily affects the sacroiliac joints and spine, leading to pain, stiffness, and progressive fusion of the axial skeleton, resulting in reduced spinal mobility.

It is usually classified as:

1.Non-radiographic axSpA (nr-axSpA): No structural damage seen on X-ray. MRI may show active inflammation of the sacroiliac joints (SIJ)

2.Radiographic axSpA / Ankylosing Spondylitis (AS): Structural damage to SIJ visible on X-ray (per modified New York criteria). Progressive spinal fusion may occur.

Clinical Presentation

- Back pain >3 months, <45 yrs onset, improves with activity, worse at rest
- Night pain, buttock pain
- Spinal stiffness, ↓ decreased mobility
- Peripheral features: arthritis (asymmetric, lower limbs), Enthesitis (heel, Achilles), Dactylitis (sausage digits)
- Uveitis (red, painful eye)
- Associated diseases: Psoriasis, IBD
- Fatigue, weight loss
- Rare: heart (aortic regurgitation), lung (apical fibrosis)

Investigations

Laboratory Tests

- HLA-B27: Positive in ~80–90% of AS cases
- CRP / ESR: May be elevated in active disease
- CBC: May show mild anemia of chronic disease
- RF and anti-CCP: Typically, negative; helps rule out RA

Imaging

- Pelvic X-ray: Sacroiliitis (unilateral or bilateral)
- MRI of sacroiliac joints: Detects early inflammation (bone marrow edema)
- Spine X-ray/MRI: Shows syndesmophytes or vertebral fusion in advanced disease
- Eye exam: If anterior uveitis is suspected
- ECG/Echocardiogram: If cardiac involvement is suspected

Diagnosis

AS is diagnosed based on the ASAS 2009 criteria, which require either the presence of sacroiliitis on imaging, accompanied by at least one clinical feature of spondyloarthritis, or HLA-B27 positivity, accompanied by at least two clinical features.

Non-Pharmacological Management

- Daily spinal extension and mobility exercises
- Structured physical therapy programs
- Postural training to prevent kyphosis
- Smoking cessation (smoking worsens radiographic progression)
- Encourage physical activity, avoid prolonged rest or immobilization

Pharmacological Management

1.Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

First-line therapy: NSAIDs — effective for controlling pain and stiffness; used continuously or on-demand based on symptom severity and response

A: Ibuprofen (PO) 400–800 mg 8 hourly

OR

C: diclofenac (PO) 50 mg 8 hourly /Diclofenac gel 1% apply 6 hourly

OR

A: Piroxicam (PO) 20mg 24 hourly

OR

D: Meloxicam (PO) 7.5–15 mg 24 hourly

OR

S: Ketoprofen (PO) 75 mg 8 hourly

OR

S: Ketoprofen (PO) 50 mg every 6 hourly

OR

S: Ketoprofen gel 2.5% topical, apply to affected area 6 hourly

2. Biologic DMARDs (bDMARDs)

If NSAIDs are insufficient, biological DMARDs are recommended. Conventional DMARDs have no proven efficacy in axial spondyloarthritis and are not routinely recommended.

S: adalimumab (SC) 40 mg SC every two weeks

Surgical Treatment

Indicated for severe deformity, neurologic compromise, or failed medical therapy.

- Corrective osteotomy: For severe kyphosis (e.g., chin-on-chest).
- Spinal fusion/stabilization: For unstable fractures in the fused spine.
- Decompression: For cord or nerve compression (e.g., cauda equina).
- Hip replacement: For advanced hip damage; commonly needed in axSpA

26.1.4 Reactive Arthritis (ReA)

RA is a sterile inflammatory arthritis that occurs 1–4 weeks after an extra-articular infection, most commonly involving the gastrointestinal (e.g., Salmonella, Shigella, Yersinia, Campylobacter) or genitourinary tract (especially Chlamydia trachomatis).

Clinical Presentation

- Arthritis: Asymmetric oligoarthritis (knees, ankles), axial spine, sacroiliitis
- Enthesitis & Dactylitis: Common (heel, Achilles, sausage digits)
- Genitourinary: Urethritis, cervicitis, prostatitis, circinate balanitis
- Eye: Conjunctivitis, uveitis (can threaten vision)
- Skin/Mucosa: Oral ulcers, keratoderma blennorrhagicum, nail dystrophy
- Systemic: Fatigue, fever, weight loss

Investigations

- Inflammatory markers: ESR and CRP may be elevated
- CBC: May show leukocytosis, anemia
- Infection screen: Urine/genital PCR: Chlamydia and Stool culture: GI pathogens
- HLA-B27: Positive in ~50%, linked to severe disease
- Joint aspiration: Sterile inflammatory fluid (rule out sepsis)
- Imaging: X-ray: May show late sacroiliitis or periostitis
- MRI: Detects early sacroiliitis/enthesitis

Diagnosis

Diagnosis is supported by the exclusion of other causes of arthritis (e.g., septic arthritis, crystal arthropathy)

Non-Pharmacological Management

- Rest during acute inflammation
- Physical therapy to maintain joint function and mobility
- Safe sexual practices (e.g., condom use to prevent STI-related recurrence)
- Nutritional support, especially if enteric infection led to weight loss or malabsorption
- Patient education on the self-limiting nature in most cases and possible chronicity in some cases

Pharmacological Management

1.Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

First-line therapy: NSAIDs — effective for controlling pain and stiffness; used continuously or on-demand based on symptom severity and response

A: ibuprofen (PO) 400–800 mg orally 3 times daily

OR

C: diclofenac (PO) 50 mg 8 hourly /Diclofenac gel 1% apply 6hourly

OR

A: piroxicam (PO) 20mg 24hourly

OR

D: meloxicam (PO) 7.5–15mg 24 hourly

OR

S: ketoprofen (PO) 75mg 8 hourly

OR

S: ketoprofen gel 2.5% apply 6hourly

OR

S: dexketoprofen (PO) 25mg 8 hourly

2. Glucocorticoids

A: prednisolone (PO) 5–10 mg 24 hourly, short course for polyarthritis or enthesitis

OR

S: triamcinolone acetonide (deep IM) 10–40 mg monthly for persistent monoarthritis or IA 20-40mg in the affected joint

3. Antibiotic therapy: Indicated only if evidence of ongoing infection, especially Chlamydia

A: doxycycline (PO) 100 mg 12hourly for 7–14 days

4. Conventional Synthetic DMARDs (csDMARDs): for chronic or refractory cases

D: sulfasalazine (PO) 500 mg 12hourly initially; increase by 500 mg every week to target 2–3 g/day in divided doses. Especially for patients with persistent arthritis >3–6 months

OR

S: methotrexate (PO) 15–25mg weekly. May be used if sulfasalazine is ineffective or in patients with extensive peripheral arthritis

AND

A: folic acid (PO) 5mg weekly (except on Methotrexate day)

26.1.5 Enteropathic Arthritis (Associated with IBD)

Enteropathic arthritis is a seronegative spondyloarthritis associated with inflammatory bowel disease (IBD). It can involve both the axial skeleton (spine and sacroiliac joints) and the peripheral joints, and may also present with enthesitis or dactylitis.

Clinical Presentation

- Peripheral arthritis: Asymmetric, large joints, Type 1: <5 joints, flares with IBD, Type 2: >5 joints, not linked to IBD activity
- Axial arthritis: Sacroiliitis, spondylitis,
- Enthesitis (Achilles ' heel), Dactylitis (sausage digits),
- Uveitis and Skin: erythema nodosum, pyoderma gangrenosum
- IBD symptoms: Diarrhea, abdominal pain, bleeding, weight loss

Investigations

- ESR and CRP: Often elevated in both IBD and active arthritis
- Colonoscopy or gastrointestinal imaging (such as MRI/CT enterography or fluoroscopic barium studies) is used to confirm the diagnosis of IBD or to assess disease activity.
- X-ray / MRI: sacroiliac joints for early axial involvement and late changes
- HLA-B27: May be positive, especially in those with axial involvement
- Autoantibodies: RF and anti-CCP negative (to rule out RA)

Diagnosis

There is no specific classification criterion; however, diagnosis is based on the presence of confirmed IBD (Crohn's disease or ulcerative colitis), clinical features of arthritis, and the absence of RF and anti-CCP antibodies.

Non-Pharmacological Management

- Physical therapy: Improves mobility and function, especially in axial involvement
- Nutritional support: Address malnutrition or deficiencies associated with IBD
- Management of underlying IBD: Control of intestinal inflammation often improves joint symptoms

Pharmacological Management

1.Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) may ease joint symptoms but can worsen IBD. Use the lowest effective dose briefly. Prefer COX-2 inhibitors for lower GI risk.

D: meloxicam (PO) 7.5–15mg 24hourly (selective at lower dosages)

OR

C: celecoxib (PO) 100-200mg 12 hourly

OR

S: etoricoxib (PO) 30–60 mg 24 hourly

2.DMARDs for Peripheral Arthritis:

D: sulfasalazine (PO) 500 mg 12 hourly initially; increase by 500 mg every week to target 2–3 g/day in divided doses

OR

S: methotrexate (PO)15–25 mg once weekly. Used more in Crohn's disease than ulcerative colitis; helpful if peripheral arthritis coexists

AND

A: folic acid (PO) 5mg weekly (except on methotrexate day)

3. Biologic Therapy (for moderate-to-severe disease or axial involvement):

S: adalimumab (SC) 40mg every two weeks

4. Glucocorticoids

A: prednisolone (PO) 5–10 mg 24 hourly . A short course may help during flares

OR

S: triamcinolone acetonide (deeply IM) 10–40 mg monthly for persistent monoarthritis or IA in case only 1-2 joints are affected.

26.2 Crystal Arthropathies

Crystal arthropathies are caused by the deposition of crystals in joints or periarticular tissues, resulting in inflammation and tissue damage. The most common types include:

- Gout (Monosodium urate crystals)
- Calcium Pyrophosphate Dihydrate Deposition Disease (CPPD)

26.2.1 Gout

A metabolic disease characterized by recurrent attacks of acute arthritis due to monosodium urate (MSU) crystal deposition, typically affecting men and postmenopausal women.

Clinical Presentation

- Acute gout attack: sudden, severe joint pain and swelling, often at night
- Most commonly affects the first metatarsophalangeal (MTP) joint (podagra)
- It can also involve ankles, knees, and elbows
- Monoarthritis (usually one joint at a time) is rarely polyarticular or RA-like in late stages or the elderly.
- Tophaceous deposits (chronic cases)
- Fever may occur in severe cases
- Associated with CKD, obesity, HTN, diabetes, and CVD

Investigations

- Serum uric acid (note: may be normal during acute attacks)
- ESR/CRP (elevated during attacks)
- Renal function (before initiating urate-lowering therapy)
- Ultrasound: crystals, double contour signs
- Joint X-rays (look for erosions and tophi)
- Joint fluid aspiration (gold standard if feasible): needle-shaped crystals with negative birefringent

Diagnosis : The 2015 ACR/EULAR Gout Classification Criteria define gout as present when the total score is ≥8 points, based on clinical, laboratory, and imaging domains.

Non-Pharmacological Management

- Modify your diet by avoiding purine-rich foods (e.g., red meat, organ meats, shellfish), limiting alcohol—especially beer and spirits—and eliminating sugary drinks.
- Encourage hydration by drinking 2–3 liters of water per day.
- Weight loss in overweight/obese patients
- Exercise: low-impact, regular physical activity
- Avoid triggers: Acetylsalicylic acid, thiazide diuretics, excessive alcohol

Pharmacological Management

Acute Gout Attack

1.Non-Steroidal Anti-Inflammatory Drugs (NSAIDs): First-line therapy:

A: ibuprofen (PO) 400–800mg 8 hourly for 3days

OR

C: diclofenac (PO) 50mg orally 12 hourly or 8hourly for 3days

OR

A: diclofenac gel 1% apply 6 hourly

OR

A: piroxicam (PO) 20mg 24 hourly for 5 days

OR

D: meloxicam (PO) 7.5–15 mg 24 hourly

OR

S: ketoprofen (PO) 75 mg 8 hourly

OR

S: ketoprofen (PO) 50 mg every 6 hourly

OR

S: ketoprofen gel 2.5% topical, apply to affected area 6 hourly

2.Anti-inflammatory agents

D: colchicine (PO) 1mg start then 0.5 mg 12hourly (low dose better tolerated)

3. Glucocorticoids

A: prednisolone (PO) 20–40mg/day 24 hourly, taper over 7-10 days

OR

S: triamcinolone acetonide (deeply IM) or IA 10–40mg for monoarticular involvement

Chronic Tophaceous Gout

1. Urate-Lowering Therapy (ULT)
Usually, treatment is started 2–4 weeks after the flare subsides, but in some cases, it can be initiated during the acute attack.

B: allopurinol (PO) Start at 100mg 24 hourly. Titrate every 2–5 weeks by 100 mg to achieve serum urate <6 mg/dL.
OR
S: febuxostat (PO) 40–80mg 24 hourly: alternative in allopurinol intolerance or renal impairment (where available)

2. Prophylaxis During Initiation or Titration of ULT

D: colchicine 0.5mg 12hourly or 24 hourly for 3–6 months

Note:
- Indication to start ULT: ≥2 gout flares per year, Presence of tophi (clinical or imaging evidence).
- Chronic gouty arthritis or radiographic joint damage
- Chronic kidney disease (stage ≥2)
- History of uric acid kidney stones
- Serum urate level >9 mg/dL (≈540 µmol/L)First gout attack in high-risk patients

26.2.2 Calcium Pyrophosphate Dihydrate Deposition Disease (CPPD)
Inflammatory arthritis is caused by the deposition of calcium pyrophosphate crystals in joint cartilage and soft tissues.

Clinical Presentation
- Acute arthritis: Sudden joint pain, swelling, warmth (knees, wrists, shoulders); may mimic gout or infection.
- Chronic form: Resembles OA or RA; stiffness, pain, limited motion (knees, wrists, MCPs, hips, spine)
- Asymptomatic: Chondrocalcinosis on imaging
- Spinal: Crowned dens syndrome (neck pain, stiffness, fever)
- Associated with: Metabolic disorders (e.g., hyperparathyroidism, hemochromatosis)

Investigations
- Synovial fluid: Rhomboid, positively birefringent crystals; inflammatory
- X-ray: Chondrocalcinosis, OA-like changes
- Ultrasound: Crystal deposits; no double contour
- CT/MRI: For spinal involvement (e.g., crowned dens)
- Blood tests: ↑ESR/CRP; check calcium, phosphate, magnesium, iron, PTH for metabolic causes

Non-Pharmacological Management
- Rest the affected joint during flares
- Apply ice packs to reduce swelling
- Initiate physiotherapy post-flare to restore mobility
- Educate patients about the chronic nature of CPPD

Pharmacological Management
Acute Pseudogout Attack

1. Non-Steroidal Anti-Inflammatory Drugs (NSAIDs): First-line therapy:
A: ibuprofen (PO) 400–800mg 8 hourly for 3days.
OR
C: diclofenac (PO) 50mg 12 hourly
OR
A: piroxicam (PO) 20mg 24 hourly for 3-5days
OR
D: meloxicam (PO) 7.5–15mg 24 hourly for 3-5days.
OR
S: ketoprofen 75 mg (PO) every 8 hours
OR
S: ketoprofen 50 mg (PO) every 6 hourly
OR
S: ketoprofen gel 2.5% topical, apply to affected area 6 hourly.

2. Anti-inflammatory agents
D: colchicine (PO) 1mg start then 0.5mg 2–3x/day (low dose better tolerated)

3. Glucocorticoids
A: prednisolone (PO) 20–40 mg 24 hourly, taper over 7-10 days.
OR
S: triamcinolone acetonide (IA) 10–40mg for monoarticular involvement

Prevention
D: colchicine prophylaxis: 0.5 mg 12hourly or 24hourly for patients with frequent attacks
Treat underlying metabolic disorders (e.g., correct magnesium deficiency, treat hypothyroidism)

Note: Urate-lowering therapies used in gout are not effective in CPPD

26.3 Connective Tissue Diseases (CTDs)

CTDs include systemic autoimmune disorders such as:

- Systemic Lupus Erythematosus (SLE)
- Systemic Sclerosis (SSc)
- Sjogren's Syndrome
- Mixed Connective Tissue Disease (MCTD)
- Dermatomyositis/Polymyositis

26.3.1 Systemic Lupus Erythematosus (SLE)

SLE is a chronic autoimmune disease marked by autoantibodies (e.g., ANA, anti-dsDNA), multisystem involvement, and a relapsing-remitting course. It mainly affects women of childbearing age.

Clinical Presentation

Category/System	Clinical Features
Classic presentation	Fever , Joint pain (arthralgia/arthritis), Rash (commonly seen in women of childbearing age)
Pattern of onset	Variable onset , Can affect any age group or gender
General manifestations	Fatigue, Fever , Weight loss, Arthralgia
Musculoskeletal manifestations	Arthritis, Myalgia, Avascular necrosis
Dermatological manifestations	Malar rash, Discoid rash, Photosensitivity
Renal manifestations	Nephritis, Renal failure
Neurological manifestations	Seizures, Psychosis
Respiratory manifestations	Pleurisy, Pleural effusion, Interstitial lung disease (ILD), Pulmonary hypertension
Cardiovascular manifestations	Pericarditis , Myocarditis
Gastrointestinal manifestations	Nausea , Abdominal pain
Hematological manifestations	Anemia, Leukopenia , Thrombocytopenia
Children	More rash, More seizures, More fever
Adults	More joint involvement, More lung involvement
Family history	Positive family history may support suspicion in suggestive cases

Investigations:

- CBC: may show anemia, leukopenia, thrombocytopenia
- ESR/CRP: ESR raised; CRP may be normal unless infection or serositis
- ANA: Screening test (sensitive but not specific)
- Anti-dsDNA, Anti-Sm: Specific for SLE
- Antiphospholipid antibodies at baseline and after 12 months for all high-risk patients
- Anti-Ro/SSA, Anti-La/SSB, Anti-U1 RNP
- Urinalysis, Creatinine: Assess renal involvement
- Complement (C3, C4): Often decreased during active disease
- Renal Biopsy: Recommended for diagnosis/classification of lupus nephritis
- Chest x-ray, ECHO, and abdominal USS for serositis

Non-Pharmacological Management

- Sun protection: Avoid triggers of skin flares
- Patient education: Disease course, treatment adherence
- Vaccination: Especially pneumococcal, influenza
- Routine monitoring: BP, renal, hematologic, CVD risk

Pharmacological Management

Treatment is guided by: Severity of disease, such as SLEDAI-2K, Organ system involvement, Activity vs. damage or Patient comorbidities

1.Baseline Therapy for All Patients

S: hydroxychloroquine 200–400mg 24hourly (usually 5 mg/kg/day, max 400 mg/day).: All SLE patients unless contraindicated

Benefit: Reduces flares, improves survival, lowers thrombotic risk, and improves lipid profile and glucose tolerance

2. Nonsteroidal Anti-inflammatory Drugs Indication: For mild musculoskeletal pain or serositis

C: diclofenac (PO) 50 mg orally 2–3 times daily/Diclofenac gel 1% apply 4 times daily

OR

A: piroxicam (PO) 20mg 24hourly

OR

D: meloxicam (PO) 7.5–15mg 24 hourly

OR

S: ketoprofen 75 mg PO every 8 hours

OR

S: ketoprofen 50 mg PO every 4 hourly

OR

S: ketoprofen gel 2.5% topical, apply to affected area 6 hourly

3. Corticosteroids: Used to control inflammation rapidly, especially in flares.

Steroid type	Dosage formulation	Use
Low dosage	**A:** prednisolone ≤7.5 mg/day	Mild disease (e.g., skin, joint symptoms)
Moderate-dose	**A:** prednisolone 10–30 mg/day	Moderate disease (e.g., serositis, cytopenia)
High-dose / Pulse Therapy	**A:** prednisolone 1–2 mg/kg/day orally, **D:** methylprednisolone 500–1000 mg/day × 3 days	Severe or life-threatening disease (e.g., lupus nephritis, CNS lupus, severe thrombocytopenia or hemolytic anemia, myocarditis, alveolar hemorrhage)

4.Conventional Immunosuppressants: Used as steroid-sparing agents or for organ-threatening disease

Indication	Management
Moderate disease; maintenance of LN	**S:** azathioprine (PO) 1-2 mg/kg/day
Arthritis, skin disease	**S:** methotrexate (PO) 15-25 mg/week
Lupus nephritis (especially class III/IV/V), pneumonitis, vasculitic ulcers, thrombocytopenia, acute hemolytic anemia	**S:** mycophenolate mofetil (PO) Induction: 2-3 g/day; Maintenance: 1-2 g/day
Induction: Severe organ involvement (renal, CNS, cardiac tamponade), then maintain with MMF/Azathioprine	**S:** cyclophosphamide 500-1000 mg/m² monthly × 6

5. Biologic Therapies: Reserved for patients with refractory or severe SLE or those who are intolerant to conventional therapy.
S: rituximab IV 1000 mg × 2 doses, 2 weeks apart (Repeat based on clinical response)

Adjunctive Medications in SLE Management

- Acetylsalicylic acid (low-dose): Used to prevent thrombosis in patients with antiphospholipid antibodies.
- Antihypertensives (ACE inhibitors or ARBs); Indicated in protein uric renal disease to reduce proteinuria and preserve kidney function.
- Statins are prescribed to reduce cardiovascular disease (CVD) risk.
- Calcium/Vitamin D + Bisphosphonates: Recommended for patients on long-term corticosteroid therapy to prevent osteoporosis.
- Antimicrobials (e.g., TMP-SMX): Used for Pneumocystis Jirovecii pneumonia (PJP) prophylaxis in patients receiving high-dose steroids or cyclophosphamide.
- Apply sunscreen with a minimum SPF of 50 before going outside in the sun.

Neonatal lupus (NL)

NL is a passively acquired autoimmune condition in newborns caused by the transplacental transfer of maternal autoantibodies—mainly anti-Ro/SSA and anti-La/SSB, and less commonly anti-U1 RNP—crossing the placenta (usually after 12–16 weeks of gestation); it is not true SLE in the baby.

Most commonly seen in mothers with: SLE, Sjögren's syndrome, Undifferentiated connective tissue disease. Sometimes the mother is asymptomatic but antibody-positive

Domain	Details
Clinical Presentation	• Skin rash – annular/periorbital rash, usually resolves by 6–8 months • Photosensitivity • Congenital heart block – usually complete and may be permanent • Hepatitis • Cytopenias (usually self-limiting)
Investigations	• ECG – assess for congenital heart block • Complete blood count (CBC) • Liver function tests (LFTs) • Anti-Ro/SSA antibody test • Anti-La/SSB antibody test
Management	• Skin rash → Sun protection • Mild topical corticosteroids for rash • Congenital heart block → Pacemaker insertion if severe/symptomatic • Future pregnancy prevention → Hydroxychloroquine + fetal echocardiography between 16–26 weeks' gestation

26.3.2 Systemic Sclerosis (SSc)

Systemic sclerosis (scleroderma) is a chronic autoimmune disease marked by skin and organ fibrosis, vasculopathy, and autoimmunity. It causes tissue thickening and can affect the skin, lungs, kidneys, and heart.

Clinical Presentation

- Skin: Skin thickening (sclerodactyly), Raynaud's phenomenon, digital ulcers, pitting, telangiectasia, calcinosis, tight mask-like face, and skin pigment changes
- Vascular: Raynaud's, nailfold capillary changes, and pulmonary hypertension (limited type)
- Musculoskeletal: Joint pain/stiffness, muscle weaknesses and tendon rubs
- Gastrointestinal: Reflux, dysphagia, bloating, Small intestine bacterial overgrowth (SIBO), malabsorption, weight loss, and faecal incontinence
- Lung: ILD (diffuse type) and pulmonary hypertension (limited type)
- Renal: Scleroderma renal crisis (hypertension, AKI)
- Cardiac: Pericarditis, arrhythmias, and myocardial fibrosis

Investigations:

- ANA, anti-centromere, anti-Scl-70, Anti-RNA polymerase III
- Serum creatinine and urinalysis, blood pressure
- Chest X-ray, HRCT for ILD
- Echocardiogram for pulmonary hypertension

Diagnosis

SS is classified using the ACR/EULAR 2013 criteria, where a total score of ≥9, based on weighted clinical, vascular, serological, and organ involvement features, is required for diagnosis.

Non-Pharmacological Management

- Avoid cold to prevent Raynaud's—keep hands and feet warm.
- Use moisturizers to maintain skin hydration and to avoid cracking.
- Physiotherapy helps preserve joint mobility and counteract skin tightening, especially in the hands

Pharmacological Management

1. Raynaud's phenomenon prevention

A: nifedipine: (PO) 20–120mg 24hourly (extended-release formulation)

2. Gastroesophageal reflux (GERD)

A: omeprazole (PO) 20–40mg 24 hourly

OR

C: pantoprazole (PO) 40 mg 24 hourly

OR

S: esomeprazole (PO) 20–40mg 24 hourly

3. Interstitial lung disease (ILD)

S: cyclophosphamide: 500–1000mg/m² every 4 weeks (intravenous infusion)

OR

S: mycophenolate Mofetil (PO) 1g–1.5 g 12hourly

Pulmonology consultation is advised

4. Renal crisis (emergency)

C: enalapril (PO) 5–40mg 24 hourly (divided doses)

OR

C: lisinopril (PO) 5–40mg 24hourly. Nephrology consultation is advised

5. Skin and Joint involvement

S: methotrexate (PO) 15–25 mg weekly

OR

S: azathioprine (PO) 1–2 mg/kg 24hourly

26.3.3 Sjögren's Syndrome

Sjögren's syndrome is a chronic autoimmune disease characterized by dry eyes (xeropthalmia) and dry mouth (xerostomia), resulting from lymphocytic destruction of the salivary and lacrimal glands. It may occur as a primary condition (primary Sjögren's syndrome) or in association with other autoimmune diseases such as RA and SLE, viral infections such as HIV and Epstein–Barr virus, and primary biliary cirrhosis (secondary Sjögren's syndrome).

Clinical Presentation

- Dry eyes (gritty, red)
- keratoconjunctivitis sicca
- Dry mouth (swallowing difficulty, dental decay/caries, tongue fissure)
- Salivary gland swelling (esp. parotid)

Extra glandular manifestations

- Fatigue, arthralgias, myalgia, Raynaud's Phenomena
- Skin: Dryness, purpura
- Lungs: Cough, ILD
- Kidneys: Tubular acidosis
- Nerves: Neuropathy
- Blood: Anemia, leukopenia
- B cell Lymphoma (MALT lymphoma)

Investigations:

- ANA: Often elevated in autoimmune diseases; not specific.
- Anti-Ro/SSA and Anti-La/SSB: Key markers; Anti-Ro/SSA is most common.
- Schirmer's test: Confirms dry eyes by measuring tear production.
- Salivary gland biopsy: Confirms the disease biopsy shows lymphocytic infiltration

Diagnosis

SS is classified by ACR/EULAR 2016 criteria when the total score is ≥4 in a symptomatic patient without exclusion criteria

Non-Pharmacological Management

- Artificial tears/saliva: Relieve dry eyes and mouth.
- Dental hygiene, including brushing, flossing, and regular dental check-ups, helps prevent decay and infection.
- Hydration: Frequent fluid intake; sugar-free gum stimulates saliva
- Avoid: Tobacco, cannabis, caffeine, Cola drink

Pharmacological Management

1. Dry Mouth

D: pilocarpine (PO) 5 mg, 8 hourly for dry mouth.

2. Fatigue or arthralgia

S: hydroxychloroquine (PO) 200–400mg 24 hourly

3. Systemic involvement, such as Vasculitis or other systemic manifestations

A: prednisolone (PO) 0.5-1 mg/kg/ 24hourly

OR

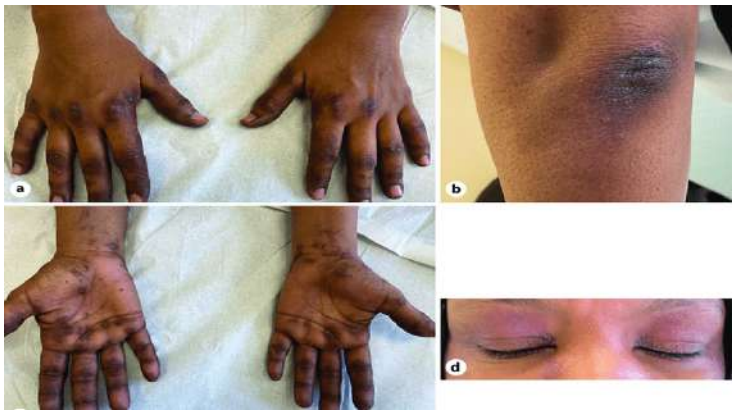
S: methotrexate: 10–25mg weekly

OR

S: azathioprine: 1.5–2.5 mg/kg/day

26.3.4 Dermatomyositis / Polymyositis

Dermatomyositis (DM) and polymyositis (PM) are inflammatory myopathies causing proximal muscle weakness. DM is marked by distinctive skin rashes (e.g., Gottron's papules, heliotrope rash), whereas PM lacks skin involvement. Both may lead to significant functional impairment.



Gottron's papules are red or violet, flat-topped, scaly lesions that appear symmetrically over joint extensor surfaces—typically the knuckles, elbows, knees, and ankles

A heliotrope rash is a distinctive reddish-purple or lilac discoloration of the upper eyelids and periorbital region, often associated with DM, an autoimmune inflammatory myopathy.



Clinical Presentation

- Proximal muscle weakness: Symmetric, gradual onset
- Skin signs (DM only): Heliotrope rash, Gottron's papules, photosensitive rash
- Systemic: Fatigue, fever, weight loss
- Lungs: ILD, cough, dyspnea
- Joints: Arthralgia, non-erosive arthritis
- Myalgia
- Raynaud's phenomenon
- Dysphagia: Esophageal weakness
- ↑ Malignancy risk i.e Colon, lung, breast and ovarian cancers (mainly in DM)

Investigations

- CK: Elevated in active disease.
- AST and ALT: Mildly raised from muscle injury.
- ANA: Often positive, but non-specific.
- Myositis-specific antibodies: Anti-Jo-1 (ILD), Anti-Mi-2 (good prognosis), Anti-SRP, Anti-PL-7.
- EMG: Shows myopathic changes.
- Muscle biopsy: Confirms inflammation.
- Chest CT imaging: for ILD
- Malignancy screening: Essential in DM—age- and gender-appropriate cancer screening is advised.

Diagnosis

DM and PM are classified using the 2017 EULAR/ACR criteria with a score of ≥6.7 (with biopsy) or ≥8.7 (without biopsy) in patients without exclusion criteria.

Non-Pharmacological Management

Physiotherapy: Essential for managing weakness, preventing atrophy, and improving strength and flexibility.

Pharmacological Management

1. High-dose Corticosteroids: First-line treatment.
A: prednisone (PO) Starting at 0.5–1 mg/kg/day, tapering as the patient improves.

2. Immunosuppressants: Used as adjunctive therapy or steroid-sparing strategies.

S: methotrexate (PO) 10–25 mg weekly
OR
S: azathioprine (PO) 1.5–2.5 mg/kg 24 hourly
OR
S: hydroxychloroquine (PO) 200–400mg 24hourly. Used for skin involvement in DM
OR
S: cyclophosphamide (IV) 500–1000 mg/m² every 4 weeks

Immunoglobulin Intravenous (IGIV): For severe or refractory cases, it is often used in life-threatening DM or PM or with significant skin involvement.

3. Biologics
S: rituximab (IV) 1000mg × 2 doses, 2 weeks apart (Repeat based on clinical response. For refractory cases or overlap syndromes (e.g., lupus).

Treatment Considerations:

- Monitor muscle strength, creatine kinase, or CK, and skin rash to guide treatment.
- Long-term: Use physiotherapy and monitor for complications like ILD and malignancy.

26.3.5 Mixed Connective Tissue Disease (MCTD)

MCTD is an overlap syndrome with features of SLE, systemic sclerosis, and polymyositis. It is defined by high titers of anti-U1 RNP antibodies, distinguishing it from other CTDs.

Clinical Presentation

- SLE: Malar rash, photosensitivity, oral ulcers.
- SSc: Skin thickening, Raynaud's.
- Polymyositis: Muscle weakness, ↑CK.
- Raynaud's: Common and may be an early feature.

Investigations

- ANA (Antinuclear Antibody): Positive in most cases.
- Anti-U1 RNP: High titer confirms the diagnosis.
- CBC: To assess for anemia, thrombocytopenia, or leukopenia.
- Creatine Kinase (CK): Elevated in cases with muscle involvement (polymyositis).
- ESR/CRP: To assess inflammation levels.
- Anti-DNA antibodies may be present, especially if SLE features are prominent.
- Echocardiogram: Assesses pericarditis or pulmonary hypertension.
- PFTs: Evaluate interstitial lung disease or pulmonary hypertension.
- Urinalysis: Screens for renal involvement, including lupus nephritis.

Diagnosis: MCTD is diagnosed clinically, based on overlapping features of multiple CTDs and high anti-U1 RNP antibody levels.

Non-Pharmacological Management

- Educate on flare triggers and early symptom recognition.
- Emphasize sun protection, especially in patients with SLE features.
- Encourage regular follow-ups to monitor disease activity and complications.

Pharmacological Management

The management of MCTD involves a combination of corticosteroids, disease-modifying antirheumatic drugs (DMARDs), and targeted therapies aimed at alleviating symptoms.

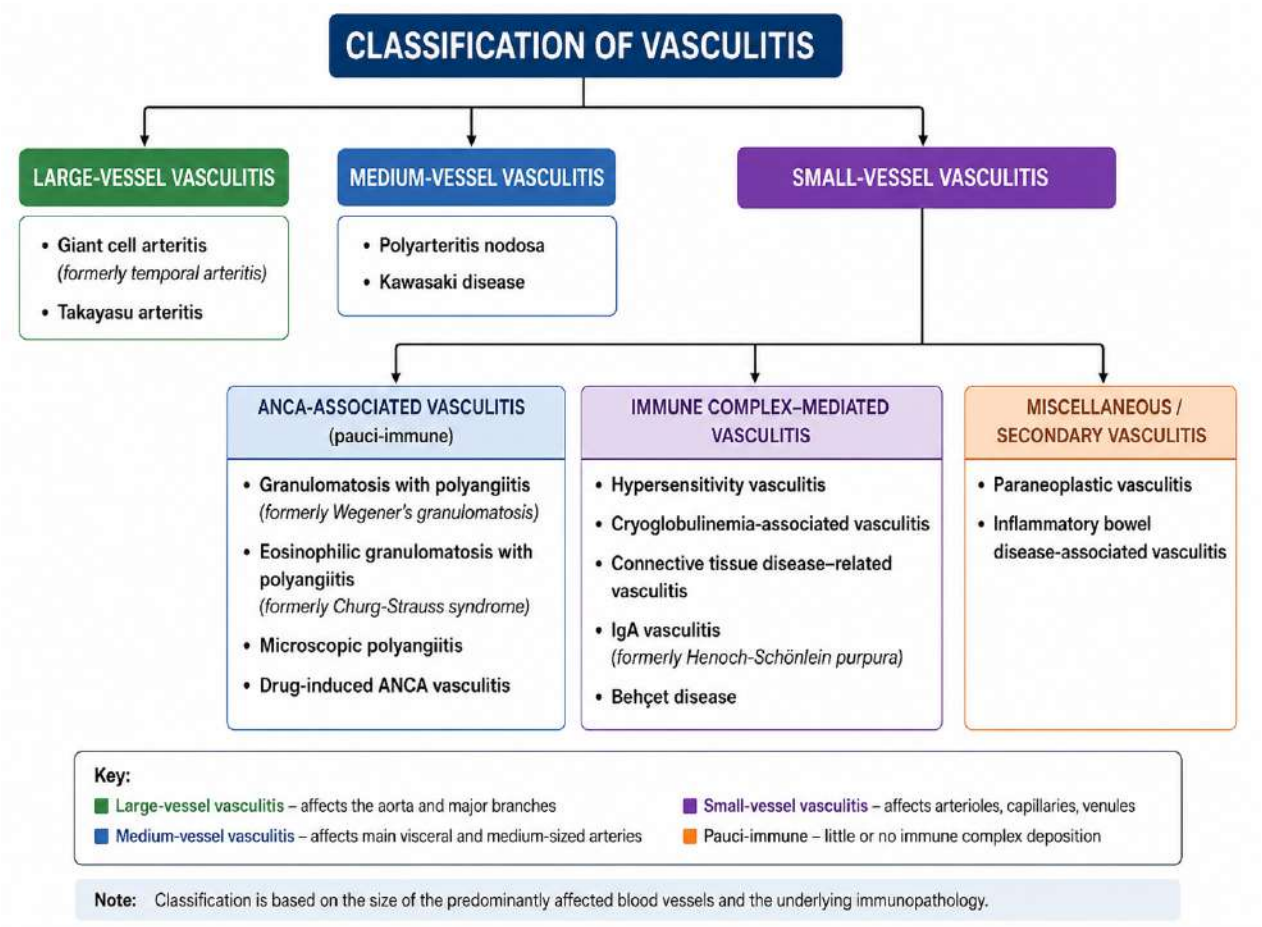
1.High-dose Corticosteroids: First-line treatment.
A: prednisone: Starting at 0.5–1 mg/kg/day, tapering as the patient improves.

2. Immunosuppressants: Used as adjunctive therapy or in steroid-sparing strategies.
S: methotrexate (PO) 10–25 mg weekly
OR
S: azathioprine: 1.5–2.5 mg/kg/day
OR
S: hydroxychloroquine (PO) 200–400mg 24hourly. Used for SLE involvement
OR
S: cyclophosphamide (IV) 500–1000 mg/m² every 4 weeks

26.4 Managing Systemic Vasculitis

Vasculitis is a group of disorders characterized by inflammation of blood vessels, resulting in damage to the vessel and organ involvement. It is classified by vessel size (large, medium, small) or by mechanism (e.g., immune complex–mediated, ANCA-associated)

Figure 26.1 Classification of Vasculitis



26.4.1 Large Vessel Vasculitis (LVV)

Large vessel vasculitis involves inflammation of the larger arteries, typically those with elastic tissue, such as the aorta and its major branches. The primary conditions under this category are Giant Cell Arteritis (GCA) and Takayasu Arteritis (TAK).

Table 26.1 Large Vessel Vasculitis Comparison

Feature	Giant Cell Arteritis (GCA)	Takayasu Arteritis (TAK)
Age of onset	>50 years	Young adults (usually <40 years), more common in females
Vessels involved	Temporal artery , ophthalmic artery ,posterior ciliary artery, carotid/vertebral branches, aorta (especially thoracic)	Aorta, subclavian artery, carotid artery AND renal arteries, vertebral arteries, pulmonary arteries
Key clinical features	New-onset headache, jaw claudication , visual loss (amaurosis fugax/blindness), scalp tenderness , stroke-like symptoms	Limb claudication, absent/diminished pulses ("pulseless disease"), BP discrepancy, syncope/dizziness, hypertension (renal artery stenosis) AND carotidynia
Diagnosis	Temporal artery biopsy, ultrasound , elevated ESR/CRP	CT/MR angiography , conventional angiography AND elevated ESR/CRP
Pharmacological management	**A:** prednisone (PO) 1–2 mg/kg/day (high dose induction) THEN taper after 4–6 weeks **AND** **S:** methotrexate (PO) 15–25 mg weekly **OR** **S:** tocilizumab (IV) 8 mg/kg every 4 weeks (steroid-sparing / refractory disease)	**A:** prednisone (PO) 1–2 mg/kg/day (high dose induction) THEN taper after 4–6 weeks **AND** **S:** methotrexate (PO) 15–25 mg weekly (maintenance) **OR** **S:** azathioprine (PO) 2 mg/kg/day (maintenance after remission)
Prognosis	Good if treated early BUT risk of irreversible blindness	Variable depending on extent of vascular stenosis and organ ischemia

26.4.2 Medium Vessel Vasculitis

Medium-vessel vasculitis involves inflammation of medium-sized arteries, leading to vascular damage, stenosis, and aneurysms. The two main types of medium vessel vasculitides are Polyarteritis Nodosa (PAN) and Kawasaki Disease.

Table 26.2: Medium Vessel Vasculitis Comparison

Feature	Polyarteritis Nodosa (PAN)	Kawasaki Disease (KD)
Age of onset	Adults (commonly 40–60 years)	Children <5 years
Vessels involved	Renal AND mesenteric, hepatic, coronary, peripheral nerves, muscle, testicular arteries	Coronary, brachial, femoral, axillary, iliac, cerebral arteries
Key clinical features	Fever, malaise , myalgia , weight loss , hypertension, renal infarction , abdominal pain, neuropathy, livedo reticularis, skin ulcers, testicular pain	High fever (>5 days), conjunctivitis , mucous membrane changes (strawberry tongue), polymorphous rash, extremity changes (erythema/peeling), cervical lymphadenopathy
Diagnosis	Angiography (microaneurysms) , biopsy AND raised ESR/CRP, Hepatitis B association	Clinical criteria, echocardiography (coronary artery aneurysms)
Pharmacological management	**A:** prednisolone(PO) 1–2 mg/kg/day (high dose induction) THEN taper after 4–6 weeks **AND** **S:** cyclophosphamide (PO) 1–2 mg/kg/day OR IV pulse therapy for severe disease ± Plasma exchange (severe/organ-threatening disease)	**S:** immunoglobulin Intravenous (IGIV)2g/kg once (single infusion) **AND** **A:** acetylsalicylic acid) → High dose 80–100 mg/kg/day during acute febrile phase, THEN Low dose 3–5 mg/kg/day PO for antiplatelet effect **AND** **S:** prednisolone (PO) 2 mg/kg/day (for IVIG-resistant cases or high-risk patients)
Prognosis	Variable; risk of relapse and progressive organ damage if untreated	Excellent with early treatment BUT risk of coronary artery aneurysms

26.4.3 Small Vessel Vasculitis (SVV)

Small vessel vasculitis affects arterioles, venules, and capillaries. It includes ANCA-associated and immune complex–mediated types.

Table 26.3: Small Vessel Vasculitis – Clinical Features and Management

Condition	Clinical Features	Pharmacological Management
Granulomatosis with Polyangiitis (GPA)	Upper + lower respiratory disease AND renal involvement AND c-ANCA (PR3) positive	**A:** prednisolone (PO) 1 mg/kg/day (max 60–80 mg/day) **AND** **S:** cyclophosphamide (PO) 2 mg/kg/day OR 0.5–1 g/m² IV every 2–4 weeks **OR** **S:** rituximab (IV) 375 mg/m² weekly × 4 weeks ± plasma exchange (severe disease e.g. pulmonary hemorrhage/RPGN)
Microscopic Polyangiitis (MPA)	Pulmonary capillaritis AND RPGN AND p-ANCA (MPO) positive	**A:** prednisolone (PO) 1 mg/kg/day **AND** **S:** cyclophosphamide (PO) 2 mg/kg/day OR 0.5–1 g/m² IV every 2–4 weeks **OR** **S:** rituximab 375 (IV) mg/m² weekly × 4 weeks ± plasma exchange
Eosinophilic Granulomatosis with Polyangiitis (EGPA)	Asthma AND eosinophilia AND neuropathy ± renal disease	**A:** prednisolone (PO) 1 mg/kg/day (initial high dose, then taper) **AND** **S:** cyclophosphamide (PO) 2 mg/kg/day OR IV 0.5–1 g/m² every 2–4 weeks **OR** **S:** rituximab (IV) 375 mg/m² weekly × 4 (for severe disease)
IgA Vasculitis (Henoch–Schönlein Purpura)	Palpable purpura AND abdominal pain AND arthralgia AND IgA deposition	**A:** prednisolone (PO)1–2 mg/kg/day (max 60 mg/day) for severe GI or renal disease ± Methylprednisolone (IV) 500–1000 mg daily × 3 days (severe nephritis) ± immunosuppressive therapy if refractory
Cryoglobulinemic Vasculitis	Purpura AND neuropathy AND renal disease AND low complement	**A:** prednisolone (PO) 1 mg/kg/day **AND** **S:** rituximab (IV) 375 mg/m² weekly × 4 OR 1 g IV day 1 and 15 ± Cyclophosphamide (PO) 2 mg/kg/day or 0.5–1 g/m² IV ± plasma exchange (life-threatening disease)
Anti-GBM Disease (Goodpasture's)	RPGN AND pulmonary hemorrhage AND anti-GBM antibodies	**D:** methylprednisolone (IV) 500–1000 mg daily × 3 days **THEN** **A:** prednisolone (PO) 1 mg/kg/day **AND** **S:** cyclophosphamide (PO) 2 mg/kg/day OR IV 0.5–1 g/m² every 2–3 weeks **AND** **S:** Plasma exchange 1–1.5 plasma volume daily or alternate days for 10–14 sessions
Hypocomplementemic Urticarial Vasculitis (HUV)	Urticarial rash AND low complement AND nephritis	**A:** prednisolone (PO) 0.5–1 mg/kg/day **AND** **S:** methotrexate PO/SC 15–25 mg once weekly OR Cyclophosphamide PO/IV 2 mg/kg/day pulse 0.5–1 g/m² monthly

26.5 Hypermobility and Associated Connective Tissue Disorders

Hypermobility refers to excessive joint movement beyond the normal range, often associated with connective tissue disorders such as Joint Hypermobility Syndrome (JHS) and Ehlers-Danlos Syndrome (EDS). Symptoms include joint pain, instability, dislocations, and soft tissue injury. Co-existing neurodivergent features are common. Management focuses on symptom control, functional improvement, and the prevention of complications. The Beighton Score is commonly used for assessing joint hypermobility

Table 26.4: Classification of Hypermobility and Connective Tissue Disorders

Condition	Genetic Cause / Mechanism	Key Clinical Features
Joint Hypermobility Syndrome (JHS)	Usually multifactorial / unknown genetic basis	Generalized joint hypermobility, joint pain, instability, mild skin hyper elasticity, easy bruising
Classical Ehlers–Danlos Syndrome (cEDS)	Mutation in COL5A1 or COL5A2	Hyperextensible skin, atrophic scarring, joint hypermobility, easy bruising, chronic pain
Hypermobile Ehlers–Danlos Syndrome (hEDS)	Genetic cause not clearly identified	Generalized joint hypermobility, chronic musculoskeletal pain, joint instability, mild skin hyperextensibility
Vascular Ehlers–Danlos Syndrome (vEDS)	Mutation in COL3A1	Arterial rupture, organ rupture, thin translucent skin, easy bruising, aortic dissection risk
Kyphoscoliotic EDS (kEDS)	Mutation in PLOD1	Severe hypotonia, progressive scoliosis ,Joint hypermobility, ocular fragility , muscle weakness
Arthrochalasia EDS (aEDS)	Mutation in COL1A1 or COL1A2	Congenital hip dislocation, severe joint hypermobility, recurrent dislocations, skin hyperextensibility
Marfan Syndrome	Mutation in FBN1 (fibrillin-1)	Tall stature, arachnodactyly, lens dislocation AND aortic root dilation, joint hypermobility
Osteogenesis Imperfecta (OI)	Mutation in COL1A1 or COL1A2	Bone fragility, recurrent fractures, blue sclera, hearing loss, joint hypermobility

Non-Pharmacological Management

- Physical Therapy: Strengthen supporting muscles, improve coordination and posture; use bracing or orthotics if needed.
- Patient Education: Teach proper posture, body mechanics, and balanced exercise to prevent joint strain.
- Occupational Therapy: Adapt daily activities and ergonomics to reduce joint stress

Pharmacological Management

1. Nonsteroidal Anti-inflammatory Drugs) For musculoskeletal pain
A: ibuprofen (PO) 400 - 800mg 8 hourly for 3days
OR
C: diclofenac (PO) 50mg 8 - 12 hourly
OR
D: meloxicam (PO) 7.5 - 15mg 24 hourly

2. Muscle relaxant
S: baclofen (PO) 10mg 8 hourly titrate to a maximum of 40 -80mg per day

3. Joint Supplements:
S: glucosamine (PO)1500mg + chondroitin 800-1200mg once or in divided dosage.

4.Surgical Management Orthopedic Interventions: Joint replacement for advanced degeneration; ligament repair or stabilization for severe instability or deformities

26.6 Juvenile Idiopathic Arthritis (JIA)

Juvenile Idiopathic Arthritis (JIA) refers to a group of inflammatory joint disorders that begin before the age of 16 and last for more than 6 weeks. It is characterized by chronic inflammation of the synovium, which can lead to joint destruction, deformity, and functional impairment. The cause of JIA is not fully understood, but it involves genetic and environmental factors that trigger an autoimmune response in genetically predisposed children.

Diagnosis and classification of JIA
Clinical assessment: Joint swelling, pain, and stiffness lasting over 6 weeks.

Table 26.5: Juvenile Idiopathic Arthritis (JIA) – Classification

Type of JIA	Key Features	Age of Onset	Prognosis
Oligoarticular JIA	Affects <5 joints (usually large joints such as knees, ankles, elbows) , uveitis is common (especially ANA-positive cases)	Usually <6 years	Generally good prognosis, but risk of chronic uveitis
Polyarticular JIA	Affects ≥5 joints (small + large) , may be RF-negative or RF-positive (RF-positive resembles adult RA)	Usually >6 years	Higher risk of joint destruction and deformity

Type of JIA	Key Features	Age of Onset	Prognosis
Systemic JIA (Still's disease)	Spiking high fever, evanescent salmon-pink rash, lymphadenopathy, hepatosplenomegaly , severe systemic inflammation	Any age (often early childhood)	Variable; risk of macrophage activation syndrome (MAS) (↑ ferritin) and severe morbidity
Enthesitis-related JIA (ERA)	Enthesitis (tendon/ligament insertion inflammation), sacroiliac/spine involvement AND HLA-B27 association	Usually adolescent males	May progress to ankylosing spondylitis-like disease
Psoriatic JIA	Arthritis, psoriasis or family history, dactylitis , nail pitting	Usually >6 years	Generally good response, but some develop chronic arthritis

Investigations

- CRP, ESR: Elevated in active disease.
- RF: Negative in most cases, except RF-positive polyarticular JIA.
- Anti-CCP: Negative in JIA, positive in adult RA.
- ANA: Positive in oligoarticular JIA, especially those at risk for uveitis.
- Ferritin: over 1,000 in systemic JIA with MAS
- HLA-B27: Associated with enthesitis-related JIA and axial involvement.
- Imaging: X-rays, ultrasound, or MRI to assess joint damage.

Management

Treatment focuses on controlling inflammation, relieving symptoms, and preventing joint damage.

Non-Pharmacological Management

- Physical Therapy: Strengthening, proprioception, posture, bracing/orthotics.
- Patient Education: Joint protection, posture, ergonomics, balanced exercise.
- Occupational Therapy: Task modification and assistive devices to reduce joint strain.

Pharmacological Management

1. Non-Steroidal Anti-Inflammatory Drugs (NSAIDs

A: ibuprofen (PO) 400 - 800mg 24 hourly
OR
C: diclofenac (PO) 50mg 8-12hourly
OR
D: meloxicam (PO) 7.5–15mg 24hourly

Consider: Proton pump inhibitor (PPI) co-therapy for GI protection if used long-term.

2. Conventional Synthetic DMARDs (csDMARDs)
S: methotrexate (PO) 15–25mg once weekly. For polyarticular and systemic JIA
AND
A: folic acid (PO) 5mg weekly (except on MTX day)
OR
D: sulfasalazine (PO) 500mg 12hourly initially; increase by 500 mg every week to target 2–3 g/day for polyarticular JIA

3. Biologic DMARDs (bDMARDs)
Used in moderate-to-severe PsA, poor prognosis, or inadequate csDMARD response.
S: adalimumab (SC) 40mg every two weeks for moderate to severe cases

4. Glucocorticoids
A: prednisolone (PO) 10–40 mg/day, taper over 7-10 days. Prednisone for acute flare-ups or severe systemic features.

Surgical Management

Orthopedic surgery, including joint replacement, may be needed for deformities, contractures, instability, or severe joint destruction unresponsive to conservative treatment.

26.7 Antiphospholipid Syndrome (APS)

APS is an autoimmune disorder characterized by persistent antiphospholipid antibodies (aPL), leading to increased risk of thrombosis (arterial, venous, or microvascular) and pregnancy-related complications such as recurrent miscarriage, preterm birth, and preeclampsia. It may occur as a primary condition or secondary to other autoimmune diseases, particularly SLE and, less commonly, RA.

Clinical Presentation

- Thrombosis: Venous (e.g., DVT, PE), Arterial (e.g., stroke, MI), and small vessel (organ ischemia) Obstetric: Recurrent miscarriage (<10 weeks), Fetal loss (≥10 weeks,) and Preterm birth (<34 weeks) due to placental issues
- Hematologic: Thrombocytopenia and Hemolytic anemia (rare)
- Neurologic: Stroke, TIA, Seizures, and cognitive issues
- Skin: Livedo reticularis, Ulcers, and gangrene
- Cardiac: Valve thickening or vegetations
- Renal: Hypertension and APS nephropathy

Investigations

- aPL (require positive results on two occasions, ≥12 weeks apart):
- Lupus anticoagulant (LA)
- Anticardiolipin antibodies (aCL) – IgG or IgM, medium to high titer
- Anti-β2 glycoprotein I antibodies – IgG or IgM, high titer

Additional Tests (if indicated):

- Coagulation studies: May show prolonged aPTT (due to LA)
- CBC: Thrombocytopenia
- Renal function tests: If renal involvement is suspected
- Imaging: To confirm thrombotic events (e.g., Doppler US, CT angiography)
- Obstetric evaluation: Fetal monitoring, uterine artery Doppler in pregnancy

Diagnosis:

APS is defined by the revised Sapporo (2006) criteria, which include one clinical criterion (thrombosis or pregnancy loss) and one laboratory criterion (positive aPL antibodies ≥12 weeks apart).

Non Pharmacological Management

- Education: Understand risks and follow-up needs
- Lifestyle: No smoking, stay active, hydrate
- Avoid Triggers: Immobility, estrogen, surgery without cover
- Pregnancy: Plan, monitor closely
- Monitoring: Regular labs, mental health support if needed

Pharmacological Management

Category	Clinical Situation	Pharmacological Management
Primary prevention	High-risk asymptomatic antiphospholipid antibody (aPL) positive OR SLE without prior thrombosis OR obstetric APS without thrombosis (non-pregnant)	**A:** acetylsalicylic acid 75 mg (PO) 24 hourly
Secondary prevention (first-line)	Previous thrombotic event (arterial or venous APS)	**C:** warfarin 5 mg (PO) 24 hourly (adjust dose to maintain INR 2.0–3.0)
Alternative / bridging therapy	High-risk situations (pregnancy, surgery)	**D:** low molecular weight heparin SC 1 mg/kg 12 hourly
Alternative anticoagulant (selected cases only)	Triple aPL positivity OR intolerance to warfarin OR poor INR control despite adherence	**S:** rivaroxaban (PO) 15–20 mg 24 hourly (not first-line in APS)
Long-term prevention	History of thrombosis	Lifelong anticoagulation **C:** warfarin 5mg (PO) 24 hourly **AND/OR** **A:** acetylsalicylic (PO) acid 75 -100 mg 24 hourly Low-dose: for persistent aPL without thrombosis

Table 26.6: Antiphospholipid Syndrome – Pregnancy and Non-Thrombotic Manifestations

Clinical Scenario	Management
Pregnancy in APS – anticoagulation	**A:** acetylsalicylic acid (75–100 mg) PO 24 hourly (Low-dose) **AND** **D:** Low molecular weight heparin , weight-based dosing e.g., 1 mg/kg SC every 12 hours
High-risk pregnancy (recurrent pregnancy loss / severe obstetric APS)	Continue LMWH throughout pregnancy and postpartum period
Fetal monitoring	Regular ultrasound for fetal growth, placental function, and early detection of complications
Neuropsychiatric APS	Anticoagulation therapy tailored to clinical scenario (warfarin or LMWH depending on risk stratification and setting)
Skin manifestations (e.g., livedo reticularis)	No specific systemic therapy required AND topical corticosteroids if symptomatic AND sun protection measures

26.8 Fibromyalgia

Fibromyalgia is a chronic pain syndrome characterized by widespread musculoskeletal pain lasting ≥3 months, associated with fatigue, sleep disturbance, and cognitive dysfunction.
It is a disorder of central pain processing (central sensitization) rather than peripheral inflammation.

Diagnosis
The 2016 Revised ACR Fibromyalgia Diagnostic Criteria assist in diagnosing fibromyalgia. Tender point examination is no longer required; diagnosis is based on the Widespread Pain Index (WPI) and Symptom Severity Score (SSS) with symptoms present for at least 3 months.

Investigations
Laboratory testing should be limited to excluding alternative diagnoses when clinically indicated.

- ESR and CRP
- CK levels
- Thyroid function testing
- Vitamin D testing may be considered in selected patients.
- Autoimmune serology should not be ordered routinely unless clinical suspicion exists.

Management
Fibromyalgia management should be multimodal and individualized, prioritizing non-pharmacological therapy first, with medications added for persistent moderate to severe symptoms.

Non pharmacological management

- Patients should receive structured education about the condition.
- Regular graded aerobic exercise and Strength training is strongly recommended.
- Cognitive Behavioral Therapy (CBT).
- Encourage sleep hygiene measures.
- Stress reduction strategies.

Pharmacological Management
S: duloxetine (PO) 30mg-60mg 24 hourly
OR
A: amitriptyline (PO) 25mg 24 hourly

CHAPTER TWENTY- SEVEN

APPROACH TO COMMON NEONATAL CONDITIONS

Common neonatal conditions are a major cause of illness and death in the first 28 days of life. Early recognition and prompt management are essential to improve survival and prevent complications.

Assessment begins with rapid identification of emergency signs including respiratory distress, apnoea, shock, convulsions, severe bleeding, hypothermia, poor feeding, and altered consciousness. Immediate management should follow the principles of airway, breathing, circulation, correction of hypoglycemia, and thermal protection.

A focused history should include maternal risk factors, antenatal and intrapartum events, gestational age, birth weight, feeding history, and any history of delayed cry or resuscitation. Physical examination should assess vital signs, respiratory status, hydration, jaundice, signs of infection, congenital abnormalities, and neurological status.

Investigations are guided by clinical findings and may include blood glucose, full blood count, C-reactive protein, blood culture, serum bilirubin, electrolytes, and relevant imaging.

Management involves supportive care (warmth, oxygen, fluids, nutrition, and glucose correction) and specific treatment for conditions such as neonatal sepsis, neonatal jaundice, respiratory distress syndrome, birth asphyxia, and neonatal seizures.

Continuous monitoring and follow-up are essential for early detection of complications and improved outcomes.

27.1: Emergency Signs Assessment and Immediate Management in Neonates

Table 27.1 Emergency Signs Assessment and Immediate Management in Neonates

Emergency Sign	Clinical Features	Immediate Management
Severe Respiratory Distress	• Grunting • Chest wall indrawing • Fast breathing (>60 breaths/minute) • Respiratory rate <30 breaths/minute (respiratory depression) • Gasping • Central cyanosis • Apnoea	• Place newborn on a warm surface under good light • Position airway in neutral position to maintain patency • Resuscitate using bag and mask ventilation if breathing is inadequate • Provide appropriate respiratory support to maintain SpO_2 90–94%
Bleeding	May be visible (external) OR non-visible (internal)bleeding	• Identify source of bleeding immediately • Stop visible bleeding: → Umbilical stump: re-clamp/re-tie → Wound/cut site: apply sterile gauze compression **:** Phytomenadione (Vitamin K_1) 2 mg IV stat (continue for 3 days if bleeding persists) • Send blood for grouping, cross-match, and coagulation profile • Assess need for blood transfusion
Shock	• Pallor • Cold extremities • Weak, rapid pulse • Severe lethargy/unconsciousness • Capillary refill time >3 seconds	• Follow ABC resuscitation principles • Administer oxygen • Keep neonate warm • Establish IV access (intraosseous access if IV unavailable) • Send investigations: FBP, CRP, blood group, cross-match **A:** sodium chloride 0.9 % (IV)10–20 mL/kg **OR** **A:** sodium lactate (Ringer's lactate) (IV)10–20 mL/kg over 15–20 minutes If RBG <2.6 mmol/L: **B:** dextrose 10% IV 2 mL/kg stat If obvious bleeding: **D:** packed red blood cells (PRBCs) 20 mL/kg transfusion
Convulsions (active seizure)	May be subtle: • Autonomic changes • Apnoea • Bradycardia • Abnormal movements	• Protect airway and prevent aspiration • Check random blood glucose (RBG) If RBG <2.6 mmol/L OR unable to measure: **B:** dextrose 10% IV 2 mL/kg stat **AND** **A:** phenobarbitone (IV/IM) 20 mg/kg slowly over 20 minutes

27.2 Perinatal Asphyxia

Perinatal asphyxia is failure to initiate and sustain breathing after delivery and/or APGAR score of <7 in the 5th minute.

Clinical Presentation

- CNS – seizures, abnormal posture, decreased tone, impaired primitive reflexes, bulging fontanelle, irritability or loss of consciousness
- CVS – shock/hypotension, myocardial dysfunction, arrhythmia
- RS – respiratory distress, pulmonary haemorrhage, pulmonary oedema, apnoea
- Renal – oliguria/anuria, renal failure, haematuria (acute tubular necrosis, renal vein thrombosis)
- GI – paralytic ileus, bloody stools, necrotizing enterocolitis (NEC)
- Hepatic – impaired coagulation of blood
- Haematology – thrombocytopenia, DIC
- Metabolic – acidosis, hypoglycaemia, hypocalcaemia, hypomagnesemia

Investigations

- Blood Gas Analysis (where available)
- Day 1 of life - FBP and blood culture 6 hours from birth.
- Day 2 of life
  > Check for renal function
  > CRP to decide on whether to stop antibiotics or not. Stop antibiotics if CRP is < 10 mg/dL.
- Serum Glucose, Calcium, Magnesium and Phosphate
- Perform a lumbar puncture in neonates with seizures, and CRP >20 mg/dL.
- LFTs (in those with jaundice) and cardiac enzymes (in those with hypotension/ tachycardia) may be done.
- Imaging: Cranial ultrasound between days 1 and 3, at day 7 and at day 14 of life; MRI for brain injury severity, prognostication and exclude the HIE mimics.
- Amplitude-integrated electroencephalography (aEEG): Assessing seizure activity, brain function and response to therapy.
- Other investigations depending on the presentation and system affected

Non-Pharmacological Management

Intervention Area	Management
Airway & Breathing	Ensure patent airway and provide ventilation support if required
Oxygen therapy	Give oxygen and maintain SpO_2 90–94% (use lowest effective concentration)
Circulation	Ensure good perfusion and provide circulatory support if needed
Temperature control	Maintain normal body temperature (prevent hypothermia/hyperthermia)
Glucose monitoring	Check and correct hypoglycemia immediately
Fluid management	Give 2/3 maintenance IV fluids on days 1–3, then adjust based on urine output and condition
Nutrition	Start trophic feeds from day 2 and advance gradually as tolerated
Infection control	Start IV antibiotics in moderate–severe cases or if sepsis suspected
Monitoring	Monitor neurological status, urine output, vital signs, and seizure activity

Pharmacological Management

Indication	Management
First-line seizure control	**A:** phenobarbitone (IV) 20 mg/kg slow loading dose over 20 minutes (or IM if no IV access)
If seizures persist (within 30 minutes)	Repeat Phenobarbitone 10 mg/kg IV/IM
Maximum loading dose	Up to 50 mg/kg within 24 hours
Maintenance therapy	**A**: phenobarbitone 5 mg/kg/day IV/PO, started 12–24 hours after last loading dose

Note:

- Stabilize first (airway, breathing, circulation, glucose)
- Phenobarbitone is first-line anticonvulsant, Avoid diazepam in neonates.
- Always treat underlying cause (e.g., infection, hypoxia, metabolic disturbance)
- Maintain strict monitoring of neurological and systemic status

27.3 Neonatal Sepsis

This is a serious systemic condition of infectious origin occurring in the first month of life. Neonatal sepsis is classified as early-onset or late onset.

Early-onset neonatal sepsis
It is diagnosed in the first 3 days and caused by pathogens in the mother's genital tract.

27.2 Risk factors and clinical indicators for early-onset neonatal sepsis

Category	Red Flags (High Risk – urgent admission & evaluation)	Non–Red Flags (Warning signs – close observation & assessment)
Risk factors (maternal / perinatal)	> Suspected or confirmed infection in twin (multiple pregnancy) > Previous baby with Group B Streptococcal (GBS) infection > Maternal GBS colonization or bacteriuria > Unexplained preterm birth <37 weeks > Prolonged rupture of membranes >18 hours > Pre-labour rupture of membranes >24 hours > Intrapartum fever >38°C > Clinical diagnosis of chorioamnionitis	
Clinical indicators (neonatal presentation)	> Need for cardiopulmonary resuscitation (at birth) > Apnoea > Seizures > Signs of shock > Requirement for mechanical ventilation > Respiratory distress beginning after 4 hours of age (suggests pathology rather than transition)	> Altered behaviour or responsiveness > Hypotonia (floppiness) > Refusal/poor feeding > Vomiting, high gastric aspirates, abdominal distension > Abnormal heart rate (tachycardia or bradycardia) > Signs of respiratory distress (mild/moderate) > Central cyanosis or low oxygen saturation > Jaundice within 24 hours of birth > Temperature <36°C or >38°C (not environmental cause) > Unexplained bleeding > Abnormal blood glucose (hypoglycemia or hyperglycemia)

Note:
Red flags → immediate admission, full sepsis work-up, and urgent management
Non–red flags → close monitoring, reassessment, and early intervention if progression occurs

Neonate ≤ 3days to be investigated for sepsis and started on antibiotics:

- Those with any red flag risk factor or clinical indicator
- Those with 2 or more none red flag risk factor or clinical indicator

Investigations
For early onset neonatal sepsis

- Full Blood picture (FBP)
- Blood culture and sensitivity
- C-reactive protein (CRP)
- Random blood glucose (RBG)
- Lumbar puncture (in case of CNS signs)
- Chest X-ray (in case of respiratory signs)

Pharmacological Management

Management of early-onset neonatal sepsis
Start antibiotics immediately (do not wait for results)
A: ampicillin (IV) 50 mg/kg 12 hourly for 5 – 7 days
AND
A: gentamicin (IV) 5 mg/kg (3mg/kg for LBW neonates) 24hourly for 5 – 7 days

- Provide other supportive care as indicated by the neonate's condition
- Close monitoring of vitals - respiratory rate, temp, SPO2, heart rate, RBG, BP and urine output

Late-onset neonatal sepsis
Late-onset sepsis is diagnosed after 3 days of age and is horizontally acquired from the environment and the people handling the neonate.

Table 27.3 Clinical indicators of possible late-onset neonatal sepsis

System/Category	Clinical Signs (Warning signs)	Severe Clinical Signs (Emergency signs)
CNS	• Parent/caregiver concern of behavioral change • Appears ill to healthcare provider (lethargy) • Weak, high-pitched or continuous cry • Seizures • Inactive or reduced responsiveness • Bulging fontanelle	• Reduced movement • Convulsions (ongoing or recurrent) • Not waking or not staying awake when aroused
Respiratory	• Fast breathing ≥60 breaths/min • Grunting • Oxygen saturation <90% in room air or increased oxygen requirement	• Severe chest indrawing • Apnoea • Fast breathing >60 breaths/min (persistent/worsening) • Increasing oxygen requirement
Circulation	• Persistent heart rate >160 bpm or <100 bpm (unexplained) • Capillary refill time >3 seconds (sternum)	• Capillary refill time >3 seconds (marked/prolonged)
Skin	• Mottled or ashen appearance • Central cyanosis • Non-blanching rash • Sclerema	• Central cyanosis (severe/persistent) • Sclerema
Other	• Temperature >38°C or <36°C (non-environmental cause) • Poor feeding • Abdominal distension • Unexplained bleeding	• Not feeding at all • Unexplained bleeding (significant/persistent)

Investigations

As described for early-onset sepsis Plus:

- Lumbar puncture if there is no contraindication
- Urinalysis and culture
- Electrolytes
- Consider ABG (some babies have inborn error of metabolism and mistaken for sepsis)

Pharmacological Management

Late-onset neonatal sepsis:

- All neonates with signs suggestive of sepsis need to be admitted for close observation
- After taking samples for investigation commence antibiotics immediately

B: ampicillin + cloxacillin (FDC) (IV) 100 mg/kg 12hourly for 5 – 7 days

AND

A: gentamicin (IV) 5mg/kg 24hourly for 5 – 7day

Note:

- Monitor vitals continuously for neonates with severe clinical signs
- Repeat septic markers (CRP) after 48hours of antibiotics
- For treatment guidance regularly review the clinical condition and investigation results of the neonate

When to consider changing antibiotics to the next line for neonate with sepsis

- If there is deterioration
- If no clinical improvement after 48 hours of treatment
- If culture results indicate resistance to current antibiotics

Note:

1st line antibiotics are:

- ampicillin + gentamicin (early onset sepsis)
- ampicillin + cloxacillin(FDC) + gentamicin (late onset sepsis)

2nd line antibiotics
cefotaxime or ceftriaxone or ciprofloxacin)

27.4 Care of a low-birth-weight Neonate

Low Birth Weight neonates (LBW) are at higher risk of early growth retardation, infections, developmental delay, impaired respiration, difficulty in feeding, poor body temperature regulation and death. The smaller the neonate, the higher the risk.

Table 27.4: Classification of Low-birth weight in neonates

Category	Birth Weight
Extremely Low Birth Weight (ELBW)	<1000 g
Very Low Birth Weight (VLBW)	1000 g – <1500 g
Low Birth Weight (LBW)	1500 g – ≤2500 g

Non-Pharmacological Management

Area	Management
1. Thermal Control	• Maintain neonatal temperature 36.5°C – 37.5°C • Maintain room temperature 25°C – 28°C • Use radiant warmers with servo control mode • Ensure correct placement of temperature probe (right side, ~3 cm below right costal margin) • If probe failure → use manual mode and monitor axillary temperature every 15–30 minutes • In cold environments use heaters; in hot environments use air conditioning • Rewarm hypothermic neonates slowly (0.5°C/hour) to avoid complications • Promote skin-to-skin contact (Kangaroo Mother Care)
2. Feeding and Fluid Management	• Start with Minimal Enteral Feeding (MEF / trophic feeds) when appropriate • Gradually advance feeds based on tolerance • Monitor feeding tolerance and abdominal distension • Use enteral feeding whenever possible before IV nutrition
3. Monitoring and Support	• Monitor temperature, weight, and feeding tolerance • Observe for signs of infection (treat only if indicated) • Monitor for respiratory distress and hypoglycemia

Note: Non-pharmacological care is the cornerstone of LBW management, especially thermal regulation, feeding support, and close monitoring.

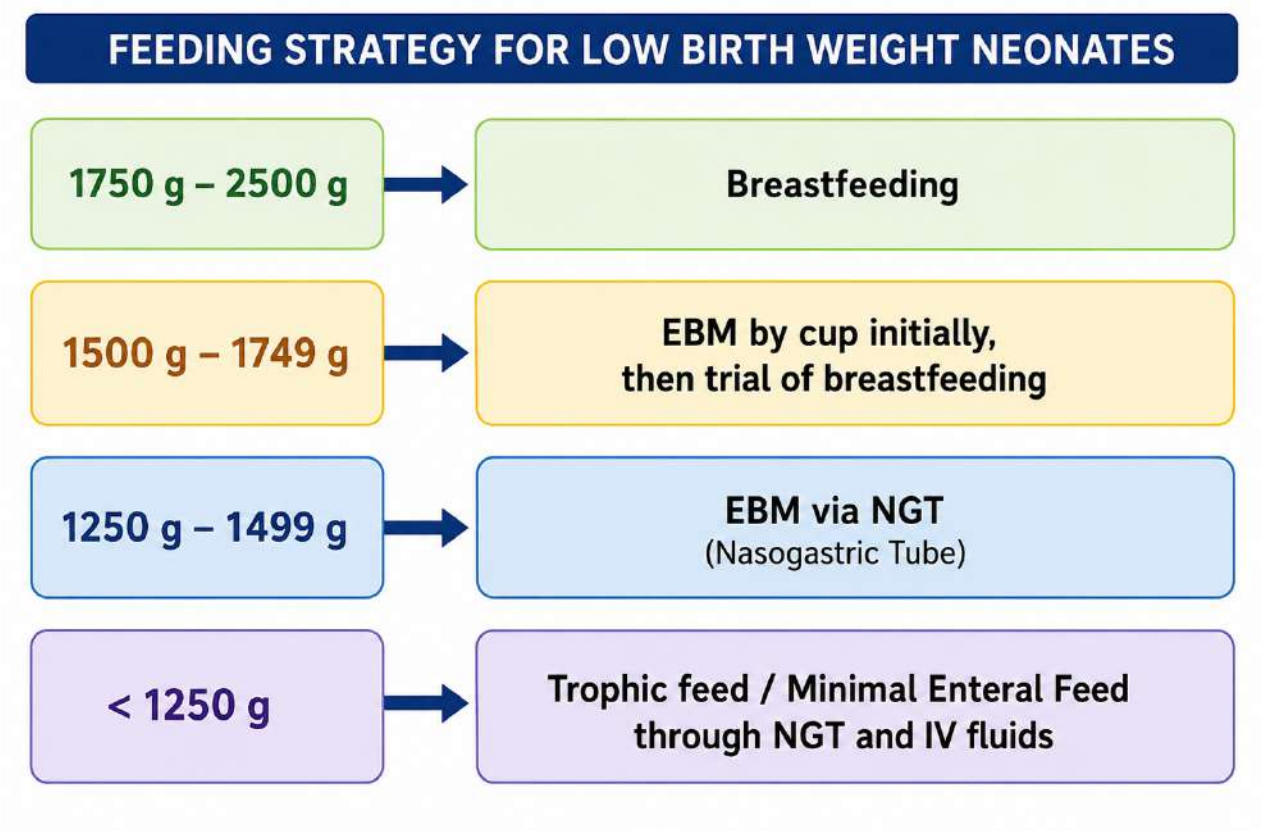
Pharmacological Management

Therapeutic Area	Indication	Management
1. Antibiotic therapy (empirical)	LBW neonates with sepsis risk criteria or suspected infection	**A:** ampicillin 50 mg/kg (IV) every 12 hours (may be adjusted to every 8 hours in severe cases depending on protocol) **AND** **A:** gentamicin 5 mg/kg IV once daily (24-hourly) for 5–7 days, guided by clinical response and culture results
2. Total Parenteral Nutrition (TPN)	Neonates unable to tolerate or receive adequate enteral feeding	**D:** Neonatal/paediatric Total Parenteral Nutrition (TPN)
3. TPN indications	Gastrointestinal failure or inability to feed enterally	• Gastrointestinal anomalies (gastroschisis, congenital diaphragmatic hernia, esophageal/intestinal atresia) • NPO neonates with no expected enteral feeds within 72 hours • Short bowel syndrome
4. Early TPN initiation criteria	Risk-based early nutritional support	• <28 weeks (<1000 g): if no adequate feeds within 24 hours • 28–32 weeks (1000–1500 g): if no adequate feeds within 3 days • >32 weeks (>1500 g): if no adequate feeds within 5 days

Note:

- Ampicillin + Gentamicin remains first-line empirical therapy for suspected neonatal sepsis
- Duration is typically 5–7 days, adjusted by clinical and microbiological response
- TPN is indicated when enteral feeding is not possible or significantly delayed
- Early nutrition improves survival and growth outcomes in LBW neonates

Figure 27.1: Feeding modality/options in the first few days of life



Calculate the total fluid intake (TFI) using birth weight then minus the amount of milk required for that day (if it exceeds trophic feed), and give the remaining amount as IV fluids over 24 hours.

Table 27.5: Total fluid requirement according to Birth weight and postnatal age

Day of Life	Weight < 1 kg	Weight 1 – < 1.5 kg	Weight ≥ 1.5 kg
Day 1	100 mL/kg/day	80 mL/kg/day	60 mL/kg/day
Day 2	120 mL/kg/day	100 mL/kg/day	80 mL/kg/day
Day 3	140 mL/kg/day	120 mL/kg/day	100 mL/kg/day
Day 4	160 mL/kg/day	140 mL/kg/day	120 mL/kg/day
Day 5	160–180 mL/kg/day	160 mL/kg/day	140 mL/kg/day
Day ≥6	160–180 mL/kg/day	160–180 mL/kg/day	150–160 mL/kg/day

Things to consider when giving IV fluids

- Type of fluid in the first 48 hours of life is Dextrose 10%
- After 48 hours of life:
  > 4/5 (80%) of total volume will be dextrose 10% the remaining 1/5 (20%) iv sodium chloride or sodium lactate
  > IV fluids should be given as a continuous infusion for 24 hours NOT bolus (preferably use an infusion pump if available).
  > Consider to stop IV fluid if neonate can take 2/3rd of total fluid required enterally and maintains normal RBG.

Apnoea of Prematurity

Apnoea of Prematurity is defined as a pause in breathing ≥20 seconds, or a shorter pause associated with bradycardia, cyanosis, or oxygen desaturation in preterm neonates due to immature respiratory control.

Caffeine citrate should be given to all preterm neonates until reaching 34 weeks GA or 1.5 kg, and if there have been no apnoeic episodes after CPAP discontinuation for at least 5 days.

B: caffeine citrate (IV/PO) – loading dose 20 mg/kg stat, then maintenance 5 – 10 mg/kg/day

Complications of LBW

Table 27.6: Complications of Low -Birth Weight Broadly categorized into short-term (neonatal period) and long-term (beyond the neonatal period).

Short-term complications (Neonatal period)	Long-term complications (Beyond neonatal period)
Hypothermia and hyperthermia	Developmental delay
Hypoglycaemia and hyperglycaemia	Anaemia of prematurity
Respiratory distress syndrome	Retinopathy of prematurity
Apnoea of prematurity	Bronchopulmonary dysplasia (BPD)
Infections	—
Hyperbilirubinaemia (jaundice)	—
Vitamin K deficiency bleeding	—
Patent ductus arteriosus (PDA)	—
Intraventricular haemorrhage (IVH)	—

27.5 Respiratory Distress Syndrome (RDS)

Respiratory Distress Syndrome (RDS) is caused by deficiency of pulmonary surfactant in immature lungs, commonly affecting preterm neonates born at <34 weeks' gestational age.

Clinical Presentation

- Tachypnea (respiratory rate >60 breaths/minute)
- Chest wall indrawing
- Intercostal retractions
- Grunting
- Apnoea (in severe cases)
- Diminished breath sounds
- Cyanosis

Investigations/Monitoring

- Oxygen saturation monitoring (pulse oximetry)
- Random blood glucose (RBG)
- Temperature monitoring
- Blood gas analysis (where available)
- Chest X-ray (where available, if diagnosis is uncertain)

Table 27.7: Management of Respiratory Distress Syndrome (RDS)

Management Category	Intervention	Details/Criteria
Non-Pharmacological Management	1.Continuous Positive Airway Pressure (CPAP)	Initiate CPAP with: • FiO_2: 30% • PEEP: 6 cmH_2O Adjust FiO_2 and PEEP according to severity of respiratory distress and oxygen saturation.
	2.Thermal care	Maintain normal body temperature through: • Kangaroo Mother Care (intermittent skin-to-skin contact where appropriate) • Radiant warmer/incubator if indicated
	3.Nutrition and fluid support	• Start enteral feeding if stable • If unable to feed, initiate IV fluids as per neonatal fluid guidelines
	4.Monitoring	Monitor: • Temperature • Blood glucose • Respiratory status • Oxygen saturation
Pharmacological Management	**D:** Surfactant	Administer if ALL of the following are present: • Silverman Andersen Score (SAS) ≥7 • FiO_2 requirement ≥40% • PEEP requirement ≥7 cmH_2O to maintain oxygen saturation ≥90% **D:** Beractant 100 mg/kg (4 mL/kg) intratracheally as a single dose via endotracheal tube; may repeat every 6 hours if required to a maximum of 4 doses **OR** **D:** Poractant alfa 200 mg/kg intratracheally as an initial dose via endotracheal tube, followed by 100 mg/kg intratracheally after 12 hours if required; maximum 3 doses

Post-administration care: Continue CPAP after surfactant administration where appropriate and monitor oxygen saturation, respiratory effort, and need for repeat dosing.

Note:
Surfactant administration should only be performed at Level D facility (Regional Referral Hospital) and above by trained healthcare providers.

Advanced Respiratory Support	Mechanical ventilation	Consider mechanical ventilation if: Severe respiratory distress: • SAS ≥7 • Requires FiO_2 ≥50% • Requires PEEP ≥8 cmH_2O • Persistent oxygen saturation <90% after second dose of surfactant OR Recurrent apnoea: More than two episodes within 24 hours

Table 27.8: Neonatal Referral Care

Component	Intervention/Action	Details
Indications for Referral	Refer promptly to a higher-level facility when:	• Advanced respiratory support is unavailable • Surfactant therapy is required but unavailable • Mechanical ventilation is required • Severe prematurity/low birth weight requiring specialized care
Referral by Birth Weight	Appropriate referral facility	• Health Centre: Neonates ≥1.8 kg • District Hospital and above: Sick neonates and/or neonates <1.8 kg
1. Assessment and Identification	Initial assessment	• Take thorough history • Perform physical examination • Assess vital signs • Conduct relevant investigations
	Determine need for referral	Based on: • Severity of illness • Available facility resources
2. Stabilization Before Referral	Airway/Breathing	• Ensure airway is patent • Provide oxygen if required • Initiate CPAP where indicated
	Circulation/Fluids	• Start IV fluids if dehydrated or in shock • For gastroschisis: provide rehydration fluids as per neonatal fluid guidelines • Insert NGT for decompression where indicated
	Glucose management	• Check blood glucose • Correct hypoglycaemia: **B:** dextrose 10% IV if hypoglycaemic • Maintain glucose through breastfeeding, NGT feeding, or IV fluids as appropriate
	Medications	Administer indicated medications before referral such as: • Antibiotics • Anticonvulsants • Other condition-specific treatment
	Temperature control	Keep neonate warm during stabilization
	Timing	Ensure referral is done without unnecessary delay
3. Communication	Parent/guardian communication	Explain: • Neonate's condition • Need for referral • Referral process
	Receiving facility communication	Communicate: • Diagnosis • Current condition • Treatment given • Estimated arrival time
4. Documentation	Required documents	• Completed referral form • Medical records • Investigation results • Imaging reports (if available)
5. Transport Arrangements	Mode of transport	• Ambulance • Specialized neonatal transport • M-mama transport system (where available)
	Transport readiness	Ensure availability of: • Necessary equipment • Required supplies • Qualified personnel

Component	Intervention/Action	Details
6. Management During Transfer	Ongoing supportive care	• Maintain thermoregulation • Keep airway patent • Monitor pulse rate, respiratory rate, and oxygen saturation
	Continue treatment	Continue feeding, IV fluids, and medications as indicated
	Condition-specific care	• Portable CPAP for RDS • Plastic bowel covering for gastroschisis
7. Handover at Receiving Facility	Transfer of care	• Provide verbal handover • Transfer referral documents • Ensure signed referral documentation is returned
8. Follow-Up	Post-referral care	• Obtain feedback from receiving facility • Ensure continuity of care after discharge • Facilitate down-referral when appropriate

CONTRIBUTORS

A. National Medicines and Therapeutic Committee (NMTC) Members

SN	Name	Membership / Designation
1	Dr. Grace E. Magembe	Chief Medical Officer and Chairperson, NMTC
2	Pharm. Daudi Msasi	Director, Pharmaceutical Services Unit – MoH and Secretary, NMTC
3	Prof. Kaushik Ramaiya	Physician Endocrinologist – Representative, Private-Owned Health Facilities
4	Dr. Delilah Kimambo	Cardiologist, Executive Director, Muhimbili National Hospital
5	Dr. David Mwenesano	Gastroenterologist – Director of Medical and Technical Services, National Health Insurance Fund (Member)
6	Dr. John Meda	Cardiologist, Benjamin Mkapa Zonal Referral Hospital
7	Dr. Alex Magesa	Hematologist – Director of Diagnostic Services, MoH
8	Dr. Best Magoma	Regional Medical Officers' Representative
9	Dr. Calorine Damian	Assistant Director, Regional Referral Hospitals
10	Dr. Paul Chaote	Assistant Director, Health, Social Services and Nutrition – PMO-RALG
11	Dr. Damas Andrea	Neuropsychiatrist – Mirembe National Mental Health Hospital
12	Dr. Daniel Nkungu	Gynecologist – Medical Officer In-Charge, Morogoro Regional Referral Hospital
13	Dr. Peter Kitenyi	General Surgeon – Kabanga Regional Hospital
14	Dr. Sr. Salome Antony	Physician – Kahama Municipal Hospital
15	Dr. Yona Mwalwisi	Pharmacist – Director of Human and Veterinary Medicines, TMDA
16	Dr. Jacqueline Urio	Pediatrician – Mount Meru Hospital
17	Dr. Pauline Chale	Physician – Muhimbili National Hospital
18	Ms. Neema Joshua	Assistant Director, Nutrition Services
19	Pharm. Samiri Saitoti	Clinical Pharmacologist, University of Dodoma (Member)
20	Pharm. Joseph Mwasambili	Assistant Directorate of Pharmacy Practice and Enforcement, Pharmacy Council Tanzania
21	Pharm. Davance Mwasomola	Clinical Pharmacist, Mbeya Zonal Referral Hospital
22	Pharm. Doris Ezekiel	Pharmacist and Supply Chain Specialist – Medical Stores Department
23	Pharm. Marco Salingu	Principal Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)
24	Pharm. Beno Ndonde	Senior Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)
25	Pharm. Cosmas Mogasa	Principal Pharmacist, National Health Insurance Fund (Secretariat)
26	Pharm. Emiliana Francis	Senior Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)
27	Pharm. Aneth Wilbroad	Principal Pharmacist , Pharmaceutical Services Unit – MoH (Secretariat)
28	Pharm. Noel Mhadu	Senior Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)
29	Pharm. Tito Mazengo	Senior Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)
30	Pharm. Joyce Chuwa	Senior Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)
31	Pharm. Abdi Abdallah	Senior Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)
32	Pharm. Erick Muhikambele	Senior Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)
33	Pharm Sylvester Maige	Principal Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)
34	Felister Rugalabamu	Senior Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)

SN	Name	Membership / Designation
35	Deborah Loina	Principal Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)
36	Daria Mwinuka	Senior Pharmacist, Pharmaceutical Services Unit – MoH (Secretariat)
37	Pharm. Rehema Sanka	Pharmacist, Mirembe National Mental Health Hospital
38	Josephine Materu	Budget Officer, Pharmaceutical Services Unit – MoH (Secretariat)

B. Lead Reviewers

SN	Lead Reviewers	Chapters
1	Dr. Patrick Shao, Emergence Medicine Specialist- Muhimbili National Hospital	Chapter One: Approach To Patients With Emergency Conditions
2	Dr.Bernard Kenemo, Anesthesiologist- Bugando Medical Centre	Chapter Two: Anaesthesia
3	Dr. Stella Malangahe, Haematologist- Benjamin Mkapa Hospital	Chapter Three: Haematology And Blood Transfusion
4	Dr. Rogath Kishimba , Epidemiologist – Ministry of Health (DPS)	Chapter Four: Notifiable Diseases
5	Dr. Abdallah Lusasi, Public Health Specialist, Ministry of Health (MoH-NMCP)	Chapter Five: Malaria
6	Dr. James Kamuga, Pediatrician, Program Officer, Care Treatment and Support -Pediatric HIV and Viral Hepatitis (MoH- NaSHCOP)	Chapter Six: HIV And AIDS
7	Dr. Allan Tarimo, Public Health Specialist, Head of Care and Prevention Unit (MoH-NTLP)	Chapter Seven: Tuberculosis And Leprosy
8	Prof. Mugisha C. Mazoko, Neurosurgeon – Aga khan Medical Centre.	Chapter Eight: Nervous System Disease Conditions
9	Dr. Othman Kiloloma, Neurosurgeon - Muhimbili Orthopedics Institute	
10	Prof. Eric A. Aris, Neurologist, Management and Development for Health (MDH)	
11	Dr. Mwanaada A. Kilima, Pulmonologist and Critical Care, Muhimbili National Hospital	Chapter Nine - Respiratory Disease Conditions
12	Dr. Amunga Meda (Gastroenterologist) - Muhimbili National Hospital	Chapter Ten- Gastrointestinal Disease Conditions
13	Dr. Patrick J. Kushoka, Obstetrician & Gynecologist, Dodoma Christian Medical Centre	Chapter Eleven- Obstetrics, Gynecology And Contraception.
14	Dr. Deonatus B. Mafuru, Physician- Murgwanza District Designated Hospital	Chapter Twelve - Sexually Transmitted Infections
15	Dr. Peter J. Chapa, Dermatologist – Dodoma Regional Referral Hospital	Chapter Thirteen- Skin Diseases And Allergic Reactions
16	Dr. Frank Sandi, Ophthalmologist – University of Dodoma, College of Health and Applied Sciences	Chapter Fourteen- Eye Diseases And Conditions
17	Dr. Denis R. Katundu, ENT Specialist & Otolaryngologist – Kilimanjaro Christian Medical Centre	Chapter Fifteen- Ear, Nose, And Throat Diseases
18	Dr. Silas S. Sembiko, Restorative Dentistry – Tandahimba District Council Hospital	Chapter Sixteen- Oral And Dental Conditions
19	Dr. Arnold A. Mtenga, Oral & Maxillofacial Specialist- Muhimbili National Hospital	
20	Dr. Joel Z. Ng'wiza, Orthopedic Surgeon- Muhimbili Orthopedic Institute	Chapter Seventeen - Musculoskeletal Disorders
		Chapter Eighteen- Trauma & Injuries
21	Dr. Hanifa Mbithe, Physician Endocrinologist – Aga khan Medical Centre	Chapter Nineteen: Metabolic and Endocrine Disease Conditions
22	Dr. Henry A. Mayala, Consultant Preventive and Clinical Cardiologist, Jakaya Kikwete Cardiac Institute	Chapter Twenty: Cardiovascular Disease Conditions

SN	Lead Reviewers	Chapters
23	Dr. Remigius Rugakingira, Urologist - Benjamin Mkapa Hospital	Chapter Twenty One: Kidney and Urological Disorders
24	Dr. Jacqueline Shoo, Nephrologist - Muhimbili National Hospital	
25	Dr. Jerry Ndumbalo (Oncologist) - Ocean Road Cancer Institute	Chapter Twenty Two: Malignant Disease Conditions
26	Dr. Enock Changarawe (Psychiatrist) - Mirembe National Mental Health Hospital	Chapter Twenty Three: Mental Health Conditions
27	Ms. Grace R. Moshi, Nutritionist – (MoH- DPS)	Chapter Twenty Four: Nutrition Disorders
28	Mr. Yohana Goshashy, Chemist, Head National Poison Control Centre – GCLA	Chapter Twenty Five: Poisoning
29	Ms. Magdalena J. Mtenga, Chemist, Manager Central Zone – GCLA	
30	Dr. Gervas Nyaisonga, Physician, Rheumatologist – Mbeya Regional Referral Hospital	Chapter Twenty Six: Rheumatological Disorders
31	Dr. Jacqueline K. Suba, Pediatrician – Nkinga Regional Hospital	Chapter Twenty Seven: Approach to Common Neonatal Conditions
32	Dr. Haika K. Maliki, Neonatologist – Lugalo Military Hospital	
33	Dr. Ngwilo Mwakyusa, Radiologist – Mbeya Regional Referral Hospital	Cross Cutting in Various Chapters
34	Dr. Alex Msoka, General Surgeon, MAT-President Elect – Jakaya Kikwete Cardiac Institute	Cross Cutting in Various Chapters

C: Assistant Reviewers – Clinical Pharmacist, Pharmaco-economist & Health economists

No.	Name	Institution
1	Pharm. Leonard Buganda, Clinical Pharmacist	Jakaya Kikwete Cardiac Institute (JKCI)
2	Pharm. Andrea Kiberenge, Clinical Pharmacist	Muhimbili National Hospital (MNH)
3	Pharm. Samson Misinzo, Clinical Pharmacist	Muhimbili National Hospital (MNH)
4	Pharm. Julieth Kaaya, Clinical Pharmacist	Muhimbili Orthopaedic Institute (MOI)
5	Pharm. Moses Masuki, Clinical Pharmacist	Kongwa District Hospital
6	Pharm. Denis Mbepera, Principal Pharmacist , Pharmaco-economist	Ministry of Health (MoH)
7	Pharm. Mercyline Ntengo, Pharmaco-economist	Jakaya Kikwete Cardiac Institute (JKCI)
8	Pharm. Nelson F. Njau, Health Economist	Muhimbili National Hospital (MNH)
9	Pharm. Jason Maro, Pharmaco-economist	Medical Store Department (MSD)
10	Dr. Salum Mruma, Health Economist	National Health Insurance Fund (NHIF)
11	Dr. Othman Haji,Health Economist	National Health Insurance Fund (NHIF)
12	Dr. Fatma Kassim, Health Economist	National Health Insurance Fund (NHIF)

D: Other Contributors

SN	Name	Institution
1	Prof. Amani T. Mori, Senior Researcher, Pharmaco-economist,	University of Bergen
2	Dr. Alphoncina Kagaigai, Health Economist	Muhimbili University of Health and Allied Sciences
3	Reshma Dharamus, Pharmacist	Tanzania Medicine and Medical Device Authority (TMDA)
4	Pharm. Jirabi Masige, Pharmacist	Ministry of Health – DCS
5	Joachim Chacha, Laboratory Scientist	Ministry of Health – DDS

SN	Name	Institution
6	Dr. John Gwakisa, Epidemiologist	Ministry of Health – DPS
7	Anna Josephat, Pharmacist	Ministry of Health – NTDCP
8	Pharm. Swald Amir, Pharmacist	Medical Store Department
9	Pharm. Akiza Kamuzora, Pharmacist	Ugavi Bora Afya Bora (UBAB)
10	Pharm. Beritha Kyabula, Pharmacist	Ugavi Bora Afya Bora (UBAB)

E: Stakeholders participated in the process by providing input through a survey.

1. Muhimbili National Hospital
2. Muhimbili Orthopedics Institute
3. Jakaya Kikwete Cardiac Institute
4. Kibong'oto Infectious Diseases Hospital
5. Mbeya Zonal Referral Hospital
6. Chato Zonal Referral Hospital
7. Bugando Medical Centre
8. Benjamin Mkapa Hospital
9. Kilimanjaro Christian Medical University College
10. Ocean Road Cancer Institute
11. Manyara Regional Referral Hospital
12. Simiyu Regional Referral Hospital
13. Bukoba Regional Referral Hospital
14. Songwe Regional Referral Hospital
15. Mbeya Regional Referral Hospital
16. Morogoro Regional Referral Hospital
17. Iringa Regional Referral Hospital
18. Mawenzi Regional Referral Hospital
19. Katavi Regional Referral Hospital
20. Temeke Regional Referral Hospital
21. Ligula Regional Referral Hospital
22. Sekou Toure Regional Referral Hospital
23. Sali International Hospital
24. Sokoine Region Referral Hospital
25. Tosamaganga Hospital
26. Namtumbo District Hospital
27. Nzega District Hospital
28. Mkumbi Health Center
29. Namabengo Health Centre
30. Kindimba Chini Health Center
31. Namtumbo Health Center
32. Santilya Health Centre
33. Lundumato Dispensary
34. Lungwa Dispensary
35. Mico Ilala Kipunguni B Dispensary
36. St John´s University of Tanzania
37. Catholic University of Health and Allied Sciences
38. Health Quality Assurance Unit–MoH
39. Directorate of Curative Services (DCS)- MoH
40. National Tuberculosis and Leprosy Programme (NTLP)
41. Clinton Health Access Initiative (CHAI)
42. Kabanga Collage of Health and Allied Sciences
43. Medical Stores Department (MSD)
44. Tanzania Medicines and Medical Devices Authority (TMDA)
45. Tanzania Food and Nutrition Centre (TFNC)
46. Pediatric Association of Tanzania (PAT)
47. National Malaria Control Program (NMCP)