THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH, COMMUNITY DEVELOPMENT,
GENDER, ELDERLY AND CHILDREN

STANDARD TREATMENT GUIDELINES AND ESSENTIAL MEDICINES LIST FOR CHILDREN AND ADOLESCENTS

FIRST EDITION
AUGUST 2018

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Standard Treatment Guidelines and Essential Medicines List for Children and Adolescents

First Edition
August 2018

Copies of the *Standard Treatment Guidelines and Essential Medicines List for Children and Adolescents* may be obtained from one of the following entities:

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FOREWORD

Despite the availability of *General Standard Treatment Guidelines and National Essential Medicines List* since 1991, paediatric health issues have not been adequately addressed in Tanzania. As a result, the Ministry of Health, Community Development, Gender, Elderly and Children has prepared this *Standard Treatment Guidelines and Essential Medicines List for Children and Adolescents* for use in all health facilities to improve the care and treatment of children and adolescents. This guideline provides up-to-date information on clinical management to improve the quality of health care services provided in Tanzania.

These guidelines are consistent with the World Health Organization's *Pocket Book of Hospital Care for Children*, existing national treatment guidelines (newborn care, HIV/AIDS, tuberculosis, malaria, integrated management of childhood illnesses, referral care, malnutrition, etc.), and other existing guidelines from referral hospitals in the country.

Regardless of the type of facility, it is expected that *Standard Treatment Guidelines and Essential Medicines List for Children and Adolescents* will be readily available to clinical officers, assistant medical officers, registrars, interns, residents, specialists, doctors, nurses, and pharmaceutical staff. This guide can also be used for pre- and in-service health worker training on proper management of children and adolescents. Similarly, local manufacturers and procurement agents can use this guide's essential medicines list to increase the availability of medicines for children in the country.

Ummy Mwalimu (MP)
Minister for Health, Community Development, Gender, Elderly and Children

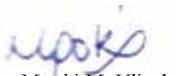
ACKNOWLEDGMENTS

The Ministry of Health, Community Development, Gender, Elderly and Children express its sincere and deep appreciation of its various partners, stakeholders, and individuals who contributed to the development and finalization of this *Standard Treatment Guidelines and Essential Medicines List for Children and Adolescents*.

On behalf of the Ministry of Health, Community Development, Gender, Elderly and Children, I acknowledge the contribution of staff members from the following organizations and programmes: Ministry of Health, Community Development, Gender, Elderly and Children's Department of Preventive Services; Reproductive and Child Health Section; Newborn and Child Health Unit; Pharmaceutical Services Section; National Malaria Control Programme; Immunization and Vaccine Development Programme; World Health Organization; UNICEF; Muhimbili National Hospital; Muhimbili University of Health and Allied Health Sciences; Medical Store Department; Tanzania Food and Nutrition Centre; University Research Company; Helen Keller International; Paediatric Association of Tanzania; Pharmaceutical Council; Mbeya Referral Hospital; Lugalo Military Hospital; Bombo Hospital; Mawenzi Regional Hospital; Mwananyamala Hospital; Tumbi Hospital; Ludewa Hospital; Temeke Hospital; Clinical Officers Training Centre Songea; Kibaha Clinical Officers Training Centre; and Tanga City.

The Ministry of Health, Community Development, Gender, Elderly and Children is grateful to the following organizations for their financial and technical support in developing this guideline: the World Health Organization's Technical Working Group for Better Medicines for Children, United Nations Commission on Life-Saving Commodities, and Jhpiego and consortium partners through the United States Agency for International Development Boresha Afya Project—Lakes and Western Zone.

My deep appreciation goes to the committee of final editors, under the leadership of Dr. John Rwegasha, and members of the National Medicines and Therapeutic Committee, under the leadership of the Chief Medical Officer Prof. Muhammad Bakari Kambi.



Dr. Mpoki M. Ulisubisya
Permanent Secretary

ABBREVIATIONS

ABG	arterial blood gas
ADR	adverse drug reaction
ART	antiretroviral therapy
AWD	acute watery diarrhoea
BUN	blood urea nitrogen
CHD	congenital heart disease
CNS	central nervous system
CRP	C-reactive protein
CSF	cerebrospinal fluid
DIC	disseminated intravascular coagulopathy
EPTB	extrapulmonary tuberculosis
ESR	erythrocyte segmentation rate
ETAT	emergency triage assessment and treatment
FBP	full blood picture
FEV	forced expiratory volume
Hb	haemoglobin
IM	intramuscular
IV	intravenous
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
NGT	nasogastric tube
ORS	oral rehydration solution
PTB	pulmonary tuberculosis
RBG	random blood glucose
RDT	rapid diagnostic test
ReSoMal	rehydration solution for malnutrition
RL	Ringer's lactate
SC	subcutaneously
SCA	sickle cell anaemia
WHO	World Health Organization

HOW TO USE THESE GUIDELINES

It is important to become familiar with the content and layout of this *Standard Treatment Guidelines and Essential Medicines List for Children and Adolescents* in order to use it effectively. This guideline addresses diseases that are common in children in Tanzania. Most chapters are organized as follows: a preamble, diagnostic criteria, investigations, treatment with pharmacological or nonpharmacological agents, and referral care.

The *Standard Treatment Guidelines and Essential Medicines List for Children and Adolescents* strongly encourages health care workers to report adverse drugs reactions (ADRs) in children because fewer medicines are made for and tested specifically on children. The ADR reporting form is in Annex III. The purpose of reporting ADRs is to reduce risks associated with the use of medicines and, ultimately, improve patient care. All health care workers are encouraged to report suspected ADRs when the reaction is potentially serious or clinically significant.

It is important to remember that the treatments recommended in these guidelines are based on the assumption that prescribers are competent in caring for paediatric patients who present at their facilities. Health care workers are encouraged to provide comments that aim to *Standard Treatment Guidelines and Essential Medicines List for Children and Adolescents*—comments will be reviewed for incorporation in the second edition of the guidelines.

RELEVANT PRINCIPLES OF GOOD CLINICAL PRACTICE

1. Hospitals must have basic equipment, medicines, and supplies in stock at all times (see Essential Medicine List for Children and Adolescents).
2. Sick children who present at health facilities must be immediately assessed (triaged) and provided with treatment as soon as possible.
3. Assessment, diagnosis, and illness severity must be thorough, and treatment must be carefully planned. All stages should be accurately documented.
4. The *Standard Treatment Guidelines and Essential Medicines List for Children and Adolescents* provides a minimum standard and safe approach to most, but not all, common problems seen in children. Care needs to be taken to identify and treat children with less common problems (i.e., not just apply the protocols without carefully considering the individual case).
5. Parents or caretakers need to understand the illness and its treatment. They can often then provide invaluable assistance in caring for the child. Being polite to parents considerably improves communication and adherence.
6. The response to treatment needs to be assessed. Severely sick children require reviews every 2 hours for the first 6–12 hours after admission. Such reviews need to be planned between medical and nursing staff members.
7. Correct, supportive care is important for a patient's quick recovery.
8. Laboratory tests should be used appropriately as evidence-based support.
9. Unnecessary use of medicines needs to be avoided. Medicine therapeutic committees should provide lists of appropriate medicines to the facility, particularly antibiotics that are sensitive to local organisms.
10. Dose calculation in children is usually standardized by weight (multiplying the dose per kilogram of body weight to determine the child's dose) and sometimes by body surface area (in square meters). These methods should be used rather than trying to calculate a child's dose on the basis of doses for adults.
11. Appropriate discharge and follow-up plans are important when the child leaves the health facility.
12. Infection control measures, including good handwashing practices and good ward hygiene, improve admission outcomes.

CHAPTER 1. TRIAGE AND EMERGENCY CONDITIONS

Assess a child presenting at the health care facility using the emergency triage assessment and treatment (ETAT) syndromic approach. This approach classifies children in three categories:

- Emergency
- Priority
- Nonurgent

1.1. SUMMARY OF STEPS IN EMERGENCY TRIAGE ASSESSMENT AND TREATMENT

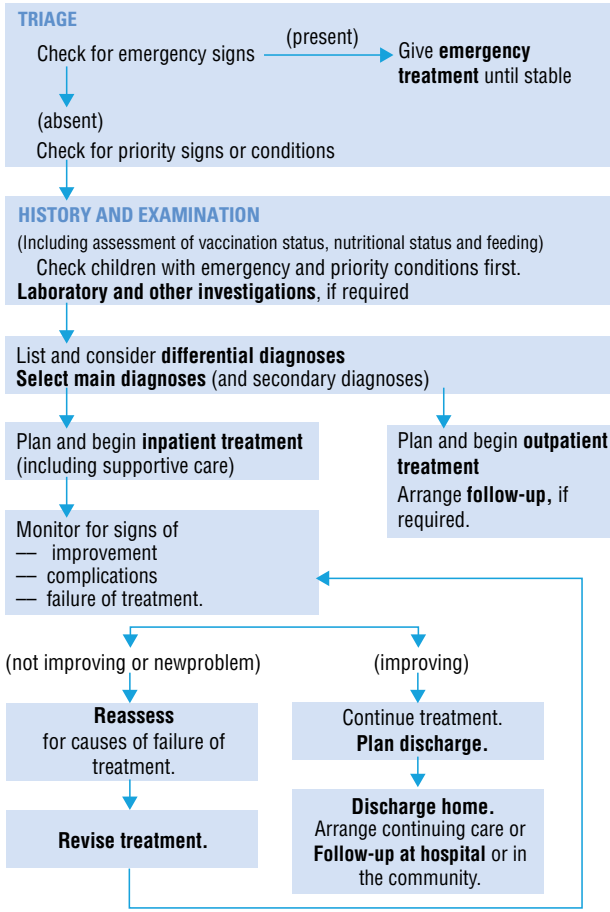
First, perform a proper survey as follows:

Primary survey as shown in Table 1.1.

Secondary survey

- Take comprehensive history and examination.
- Perform specific investigations to confirm the diagnosis.
- Plan and prioritize the specific management.

Figure 1.1. Key elements for management of a sick child



Source: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*.

WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Table 1.1. Emergency triage assessment and treatment

EMERGENCY SIGNS	
Assess using ABCD Concept—Airway, Breathing, Cs (Circulation, Coma, Convulsion), and Dehydration. If any sign positive: Give treatment(s), call for help, and draw blood for emergency investigations (glucose, Hb, malaria rapid diagnostic test, or BS).	
ASSESS	**TREAT**
AIRWAY AND BREATHING □ Obstructed breathing or □ Central cyanosis or □ Severe respiratory distress	1. Do not move neck if cervical spine injury possible, 2. If foreign body aspiration, manage airway in a choking child. 3. If no foreign body aspiration: □ Manage airway. □ Give oxygen. □ Make sure child is warm.
CIRCULATION □ Cold hands with: □ Capillary refill more than 3 seconds, And check for □ Weak and fast pulse □ Severe malnutrition	1. Stop any bleeding. 2. Give oxygen. 3. Make sure child is warm. If no severe malnutrition: □ Insert IV line and begin giving fluids rapidly. If not able to insert peripheral IV, insert an external jugular or intraosseous line. If severe malnutrition and lethargic or unconscious: □ Give IV glucose. □ Insert IV line and give fluids. If severe malnutrition and NOT lethargic or unconscious: □ Give glucose orally or by nasogastric tube. Proceed immediately to full assessment and treatment.
COMA/CONVULSING □ Coma or □ Convulsing (now)	1. Manage airway. 2. If convulsing, give diazepam rectally. 3. Position the unconscious child (if head or neck trauma is suspected, stabilize the neck). 4. Give IV glucose.

SEVERE DEHYDRATION (Only in a child with diarrhoea) plus any two of these: ▫ Lethargy ▫ Sunken eyes ▫ Very slow skin pinch	1. Make sure child is warm. 2. If no severe malnutrition, insert IV line and begin giving fluids rapidly (Diarrhoea Treatment Plan C in hospital). 3. If severe malnutrition: ▫ Do not insert IV. ▫ Proceed immediately to full assessment and treatment.
PRIORITY SIGNS	
PRIORITY SIGNS (3TPR—MOB): These children need prompt assessment and treatment. Tiny baby (< 2 months) Temperature very high Trauma or other urgent surgical condition Pallor (severe) Poisoning (history of) Pain (severe) Respiratory distress Restless, continuously irritable Referral note (urgent) Malnutrition: Visible severe wasting Oedema of both feet Burns (major) NOTE: If a child has trauma or other surgical problems, get surgical help or follow guidelines.	
NONURGENT Proceed with assessment and further treatment according to child's priority.	

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

1.2. MANAGEMENT OF EMERGENCY CONDITIONS

Managing a choking infant

- Lay the infant on your arm or thigh in a head-down position.

Figure 1.2. Heimlich manoeuver in a choking infant

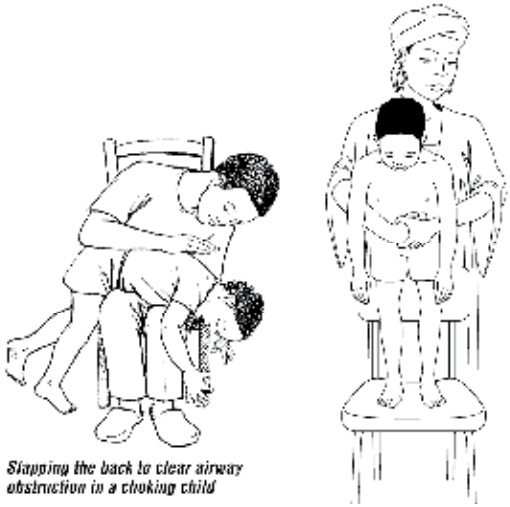
Back slaps ***Chest Thrusts***

Source: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

- Give five blows to the infant's back with heel of the hand.
- If obstruction persists, turn infant over and give five chest thrusts with two fingers, one finger breadth below nipple level in midline (see diagram).
- If obstruction persists, check the infant's mouth for any obstruction which can be removed.
- If necessary, repeat sequence with back slaps.

Managing a choking child (over 1 year of age)

Figure 1.3. Heimlich manoeuver in a choking older child

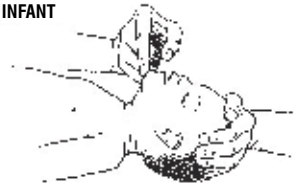


Source: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

- If necessary, repeat the sequence with back slaps again.
- Give five blows to the child's back with heel of hand with child sitting, kneeling, or lying.
- If the obstruction persists, go behind the child and pass your arms around the child's body. Form a fist with one hand immediately below the child's sternum. Place the other hand over the fist and pull upwards into the abdomen (see diagram); repeat this Heimlich manoeuvre five times.
- If obstruction persists, check the child's mouth for any obstruction that can be removed.

Figure 1.4. If no neck trauma is suspected

INFANT



Neutral position to open the airway in an infant

OLDER CHILD

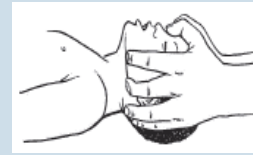
Sniffing position to open the airway in and older child

□ Child conscious:	1 Inspect mouth and remove foreign body if present. 2 Clear secretions from throat. 3 Let child assume position of maximal comfort.
□ Child unconscious:	1 Tilt the head as shown. 2 Inspect the mouth and remove foreign body if present. 3 Clear secretions from throat. 4 Check the airway by looking for chest movements, listening for breathing sounds and feeling for breath.

Figure 1.5. If neck trauma or possible cervical spine injury is suspected

1 Stabilize the neck as shown below.
2 Inspect mouth and remove foreign body if present.
3 Clear secretions from throat.
4 Check the airway by looking for chest movements, listening for breathing sounds and feeling for breath.

Use jaw thrust without head tilt, place the fourth and fifth fingers behind the angle of the jaw and move it upwards so that the bottom of the jaw is thrust forward, at 90˚ to the body. If the child is still not breathing after carrying out the above ventilate with bag and mask.



Figures 1.4. and 1.5. adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.
Sources for images: Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Figure 1.6. Giving oxygen to a sick child

Nasal Prongs

Nasal Catheter

Source for image: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

- Give oxygen through nasal prongs or a nasal catheter.
  - Nasal prongs
    - Place the prongs just inside the nostrils and secure with tape.
  - Nasal catheter
    - Use an 8 FG size tube.
    - Measure the distance from the side of the nostril to the inner eyebrow margin with catheter.
    - Insert the catheter to this depth. Secure with a tape.
- Start oxygen flow at 1–2 L/minute.

Give Ringer's lactate (RL) or normal saline 20 mL/kg as rapidly as possible.

Age/Weight	mL/kg	Volume of RL/Normal Saline Solution 20
2 months	(< 4 kg)	50 mL
2 to < 4 months	(4 to < 6 kg)	100 mL
4 to < 12 months	(6 to < 10 kg)	150 mL
1 to < 3 years	(10 to < 14 kg)	250 mL
3 to < 5 years	(14 < 19 kg)	350 mL
> 5 years	(> 20 kg)	1,000 mL

Note: Ringer's lactate (RL)

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Table 1.2. Reassess the child after appropriate volume has run in

Reassess after first infusion	If no improvement, repeat 20 mL/kg as rapidly as possible.
Reassess after second infusion	If no improvement, repeat 20 mL/kg as rapidly as possible.
Reassess after third infusion	If no improvement, give blood 20 mL/kg over 30 minutes (if shock is not caused by profuse diarrhoea). If profuse, repeat Ringer's lactate or normal saline.
Reassess after fourth infusion	If no improvement, see disease specific treatment guidelines. You should have established a provisional diagnostic by now.

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

After improvement at any stage (pulse slows, faster capillary refill), continue with specific management for the child's condition.

How to give IV fluid therapy for shock in a child with severe malnutrition

Give this treatment only if the child has signs of shock and is lethargic or has lost consciousness. Determine the weight of the child. Give IV fluids 15 mL/kg over 1 hour. Use one of the following solutions (in order of preference) according to availability: - RL with 5% glucose (dextrose) - 0.45% NaCl plus 5% dextrose - Plain RL Weight volume IV fluid give over 1 hour 15 mL/kg
4 kg: 60 mL 6 kg: 90 mL 8 kg: 120 mL 10 kg: 150 mL 12 kg: 180 mL 14 kg: 210 mL 16 kg: 240 mL 18 kg: 270 mL
Measure the pulse and breathing rate at the start and every 5–10 minutes. If there are signs of improvement: Repeat IV 15 mL/kg over 1 hour, then switch to oral or nasogastric rehydration with rehydration solution for malnutrition, 10 mL/kg/h up to 10 hours. Then initiate refeeding with starter F-75. If the child fails to improve after the first 15 mL/kg IV, assume the child has septic shock: Give maintenance IV fluid (4 mL/kg/h) while waiting for blood. When blood is available, transfuse fresh whole blood at 10 mL/kg slowly over 3 hours (use packed red blood cells if in cardiac failure). Then: Initiate feeding with starter F-75. Start antibiotic treatment. (Refer to Chapter 7 for dose and types of antibiotics.) If the child deteriorates during the IV rehydration (breathing increases by five breaths/minute or pulse by 15 beats/minute), stop the infusion because IV fluid can worsen the child's condition.

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Managing a child with convulsions

Give diazepam rectally (10mg/2ml solution)

Table 1.3. Rectal diazepam

Age/Weight	Dose 0.1 mL/kg
2 weeks to 2 months (< 4 kg)*	0.3 mL (1.5 mg)
2 to < 4 months (4 to < 6kg)	0.5 mL (2.5 mg)
4 to < 12 months (6 to < 10kg)	1.0 mL (5 mg)
1 to < 3 years (10 to < 14 kg)	1.25 mL (6.25 mg)
3 to < 5 years (14–19) kg	1.5 mL (7.5 mg)

*Use phenobarbitone (200 mg/mL solution) at a dose of 20 mg/kg to control convulsions in infants < 2 weeks of age:
Weight 2 kg—initial dose, 0.2ml; repeat 0.1 mL after 30 minutes if convulsions continue.

Weight 3 kg—initial dose, 0.3ml; repeat 0.15 mL after 30 minutes if convulsions continue.

If convulsions continue after 10 minutes, give a second dose of diazepam (or give diazepam IV at 0.05 mL/kg = 0.25 mg/kg if IV infusion is running). Do not give more than two doses of diazepam.

If convulsions continue after another 10 minutes, suspect status epilepticus.

Give phenobarbital IM or IV at 15 mg/kg over 15 minutes

or

Give phenytoin IV at 15–18 mg/kg (through a different line from diazepam) over 60 minutes. Ensure a very good IV line, as the drug is caustic and will cause local damage if it extravasates.

If high fever:
Undress the child to reduce the fever.

Do not give any oral medication until the convulsion has been controlled (danger of aspiration).

After convulsions stop and child is able to take orally, give paracetamol or ibuprofen.

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Management of hypoglycaemia

Diagnosis of hypoglycaemia is made when:

- Random blood glucose (RBG) is < 2.5 mmol/L (45 mg/dL) in normal nourished children
  OR
- RBG is < 3 mmol/L (54 mg/dL) in malnourished children

THEN

- Give dextrose 10% IV 5 mL/kg as a bolus.

Table 1.4. Management of hypoglycaemia using 10% glucose solution as bolus

Age (Weight)	Volume of 10% Glucose Solution as Bolus
< 2 months (< 4 kg)	15 mL
2 to < 4 months (4 to < 6 kg)	25 mL
4 to < 12 months (6 to < 10 kg)	40 mL
1 to < 3 years (10–14 kg)	60 mL
3–5 years (< 14 to < 19 kg)	80 mL

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

- Recheck the blood glucose level after 30 minutes; if still low, repeat 10% dextrose IV at 5 mL/kg.
- Feed the child as soon as he/she is conscious.
- If the child is able to feed without danger of aspiration, give:
  - Milk or sugar solution via a nasogastric tube (to make sugar, solution dissolve 4 teaspoons of sugar [20 g] in a 200 mL cup of clean water)
    OR
  - IV fluids containing 5–10% dextrose

Table 1.5. Treatment of severe dehydration after initial management of shock

Give 70 mL/kg of RL solution (or, if not available, normal saline) over 5 hours in infants (aged < 12 months) and over 2.5 hours in children (aged 12 months to 5 years).		
Total volume IV fluid (volume per hour)		
Weight	Age < 12 months Give over 5 hours	Age 12 months to 5 years Give over 2.5 hours
< 4 kg:	200 mL (40 mL/hr)	-
4 to < 6 kg:	350 mL (70 mL/hr)	-
6 to < 10 kg:	550 mL (110 mL/hr)	550 mL (220 mL/hr)
10 to < 14 kg:	850 mL (170 mL/hr)	850 mL (340 mL/hr)
14–19 kg:	1,200 mL (240 mL/hr)	1,200 mL (480 mL/hr)
Reassess the child every 1–2 hours. If the hydration status is not improving, give the IV drip more rapidly. Also give oral rehydration solution (about 5 mL/kg/hour) as soon as the child can drink; this is usually after 3–4 hours (in infants) or 1–2 hours (in children).		
Weight volume of oral rehydration solution per hour		
< 4 kg: 15 mL 4 to < 6 kg: 25 mL 6 to < 10 kg: 40 mL 10 to < 14 kg: 60 mL 14–19 kg: 85 mL		
Reassess after 6 hours (infants) and after 3 hours (children). Classify dehydration. Then choose the appropriate plan (A, B, or C) to continue treatment. If possible, observe the child for at least 6 hours after rehydration to be sure that the mother can maintain hydration by giving the child oral rehydration solution by mouth.		

Note: Ringer's lactate (RL)
Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website.
http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

1.3. MAINTENANCE FLUIDS

Give maintenance fluid to all sick children calculated using Holliday-Segar method, as shown in the table below.

Table 1.6. Maintenance fluid

	Holliday-Segar method	Holliday-Segar estimate
First 10 kg	100 mL/kg/day	4 mL/kg/hr
Second 10 kg	50 mL/kg/day	2 mL/kg/hr
Every kg thereafter	20 mL/kg/day	1 mL/kg/hr

Adapted from: Kliegman RM, Stanton BF, Schor NF, et al. 2016. *Nelson Pediatric Symptom-Based Diagnosis.* 20th ed. Philadelphia, PA: Elsevier.

1.4. CARDIOPULMONARY RESUSCITATION

Cardiopulmonary resuscitation (CPR) is indicated in children with cardiac arrest. For older children, a change to C-A-B (chest compressions, airway, breathing) is currently recommended. For the newborn, the A-B-C (airway, breathing, chest compressions) sequence should be retained.

Table 1.7. Cardiopulmonary resuscitation flow chart

Do a quick assessment basing on AVPU score	
Gently tap the child and ask loudly: "Are you okay?" Call child's name if you know it. A responsive child will answer, move, or moan. **If responsive**	Continue with ABCD (airway, breathing, chest compressions, disability).
If not responding	Quickly CHECK FOR AIRWAY AND BREATHING: Take 10 seconds.
The child is not breathing or only gasping	Start CPR using CAB (chest compressions, airway, breathing) sequence.

Note: alert, voice, pain, unresponsive (AVPU)
Adapted from: Advanced Paediatric Life Support Group. 2016. *Advanced Paediatric Life Support: A Practical Approach to Emergencies.* 6th ed. United Kingdom: John Wiley & Sons, Ltd.

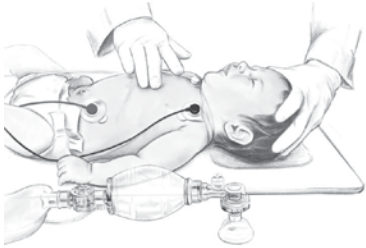
Note: Chest compressions are serial, rhythmic compressions of the chest that cause blood to flow to vital organs (heart, lungs, and brain) in an attempt to keep them viable until advanced life support can be provided.

Standard techniques for CPR

Infants

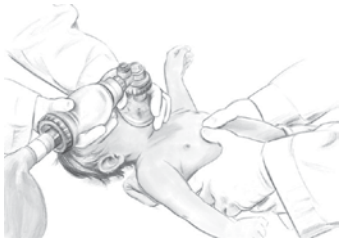
There are two techniques, two-finger and two-thumb encircling. See Figures 1.7. and 1.8.

Figure 1.7. Two-finger technique



Source: Check P, Breathing R. 2009. Part 9: Pediatric basic life support. *Circulation.*

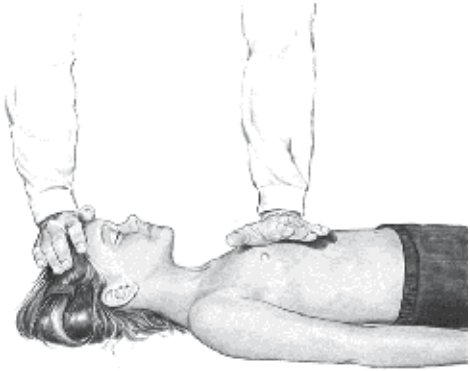
Figure 1.8. Two-thumb technique



Source: Check P, Breathing R. 2009. Part 9: Pediatric basic life support. *Circulation.*

Children aged 1–8 years

Figure 1.9. One-hand compression technique



Source: Check P, Breathing R. 2009. Part 9: Pediatric basic life support. *Circulation.*

For the one-hand compression technique, the heel of one hand is placed over the sternum at the nipple line in children and one finger breath below the nipple line in infants. Push hard and fast.

- Push hard: Compress the chest one-third to one-half of the depth of the chest.
- Push fast: Compress at a rate of 100 compressions per minute.

Ventilation to compression ratios for infant and child CPR:

- One rescuer: 30:2.
- Two rescuers: 15:2.

Allow complete recoil of the chest in order to allow the heart to refill with blood before the next compression.

Minimize interruption of chest compressions; perform uninterrupted CPR in 2-minute intervals before reassessing the patient.

CHAPTER 2. GROWTH, DEVELOPMENT, AND IMMUNIZATION

Growth is an increase in physical size, composition, and distribution of tissues as a result of a combination in an increase in the number (hyperplasia) and size (hypertrophy) of cells.

Development is the increase in complexity of structures and of the functions that take place in the same time period and often in a parallel fashion. Developmental domains include posture and gross motor, vision and fine motor, communication and language, and cognitive function.

2.1. GROWTH MONITORING AND ANTHROPOMETRY

Linear growth (length/height)

Average length is 50 cm at birth.

Table 2.1. Height growth rate during childhood

Age	Rate of Growth (cm/year)
Birth to 1 year	17–26
1–2 years	10–13
2 years to puberty	5–7
Puberty – Girls Puberty – Boys	7–12 8–13

Adapted from: Kliegman RM, Stanton BF, Schor NF, et al. 2016. *Nelson Pediatric Symptom-Based Diagnosis*. 20th ed. Philadelphia, PA: Elsevier.

Weight for age

Table 2.2. Average weight gain during childhood

Item	Weight
Birthweight	2.5–4 kg
Daily weight gain	20–30 g per day for first 6 months*
	15–20 g per day for the rest of the first year
Monthly weight gain in the first year	At least 600 g in the first 6 month
	At least 500 g in the next 6 months
Double birthweight	5–6 months
Triple birthweight	1 year
Quadruple birthweight	2 years
At 1 year	10
At 2 years	12

Adapted from: Kliegman RM, Stanton BF, Schor NF, et al. 2016. *Nelson Pediatric Symptom-Based Diagnosis.* 20th ed. Philadelphia, PA: Elsevier.

Note: Above 2 years of age, estimate weight of the child using this formula: $(2x + 8) \pm 5$ (x)

Where x is the age of the child in years

Head circumference

Table 2.3. Average head circumference: 35 cm at birth

First 3 months	2 cm/month
3–6 months	1 cm/month
6–12 months	0.5 cm/month
1–3 years	0.25 cm/month
4–6 years	1 cm/year

Adapted from: Kliegman RM, Stanton BF, Schor NF, et al. 2016. *Nelson Pediatric Symptom-Based Diagnosis.* 20th ed. Philadelphia, PA: Elsevier.

Mid-upper arm circumference

Table 2.4. Mid-upper arm circumference

6–59 months	≥ 12.5 cm
5–9 years	≥ 14.5 cm
10–14 years	≥ 18.5 cm
15–17 years	≥ 22 cm

Adapted from: Kliegman RM, Stanton BF, Schor NF, et al. 2016. *Nelson Pediatric Symptom-Based Diagnosis.* 20th ed. Philadelphia, PA: Elsevier.

Note: Disease conditions and growth abnormalities related to this chapter are discussed in respective chapters.

2.2. VACCINATION/IMMUNIZATION

Vaccination is a process of introducing biological agents (inactivated or attenuated organisms or their products) into the body to stimulate immune system to protect the body against diseases.

Table 2.5. Vaccine schedule

Age	Vaccine	Type of Vaccine/ State	Disease Prevented Remarks (Dose, Site, and Route)	
Birth	Bacillus Calmette–Guérin	Live attenuated/ Freeze-dried	Tuberculosis	0.05 mL intradermal (Right shoulder)
Birth to 6 weeks	OPV 0* Oral polio vacicne 1 DTP-HepB-Hib 1 (Pentavalent) Live attenuated/ liquid Live attenuated/ liquid Killed bacteria, toxins, and genetically modified vaccines/liquid		Poliomyelitis Diphtheria Tetanus Pertussis Hepatitis B Haemophilus influenza type B infections Pneumonia	2 drops orally 2 drops orally 0.5 mL Intramuscular (Left thigh) 0.5 mL Intramuscular (Right thigh)
	Pneumococcal 1	DNA conjugate		

Age	Vaccine	Type of Vaccine/ State	Disease Prevented Remarks (Dose, Site, and Route)	
	Rota**.1	Live attenuated	Diarrhoeal disease	2 drops orally
10 weeks	Oral polio vaccine 2	Live attenuated/ Liquid	Poliomyelitis	2 drops orally
	Pentavalent 2	Liquid DNA conjugate	As shown above	0.5 mL Intramuscular (Left thigh)
	Pneumococcal 2 Rota 2	Live attenuated Live attenuated	Pneumonia Diarrhoeal disease	0.5 mL Intramuscular (Right thigh) 2 drops orally
14 weeks	Oral polio virus 3 Pentavalent 3 Pneumococcal	Live attenuated/ Liquid Liquid DNA conjugate	Poliomyelitis Diphtheria Tetanus, Pertussis Hepatitis B Haemophilus influenza type B infections Pneumonia	2 drops orally 0.5 mL Intramuscular (Left thigh) 0.5 mL Intramuscular (Right thigh)
	Inactivated polio vaccine	Inactivated	Poliomyelitis	0.5 mL Intramuscular
9 months	Measles-rubella 1	Live attenuated/ Freeze-dried	Measles-rubella 0.5 mL Deep SC or IM (Right thigh)	
18 months	Measles-rubella 2	Live attenuated/ Freeze-dried	Measles-rubella 0.5 mL Deep SC or IM (Right thigh)	

* Do not give after 14 days.
** Do not give after 9 months.
Adapted from: Ministry of Health, Community Development, Gender, Elderly and Children. 2017. *Tanzania Immunization Schedule*.

Note: To prevent neonatal tetanus, women of childbearing age should receive tetanus toxoid vaccine as per national guideline.

Absolute contraindication to immunization

- Acute severe illness at the time of vaccination

- A severe systemic reaction to a previous dose of vaccine (i.e., anaphylaxis, convulsion, or altered level of consciousness within 72 hours of vaccination)
- Live vaccines, such as bacillus Calmette–Guérin, oral polio virus, rotavirus, and measles-rubella, should not be administered to severely immunocompromised children.

2.3. VITAMIN A SUPPLEMENTATION AND DEWORMING

Vitamin A plays an important role in vision, maintenance of epithelial tissues, synthesis of mucous secretion, growth, reproduction, and immunity. Regular deworming for children is necessary for their growth and development.

Vitamin A supplementation and deworming is a public child health intervention.

Table 2.6. Schedule for vitamin A supplementation, dosage, and frequency

Target Group	Vitamin A Supplementation Dose (IU)	
	Dose	Frequency
Nonbreastfed infants from 0–5 months (6th week)	50,000	Once
At the age of 6 complete months	100,000	Once
Children aged 12–59 months	200,000	After every 6 months

Source: Ministry of Health, Community Development, Gender, Elderly and Children. 2017. *Tanzania Immunization Schedule*.

Table 2.7. Routine anthelminthic dosage and frequency

Type of Anthelminths	12–23 Months	24 Months and Above
Mebendazole	1 tablet (500 mg)	1 tablet (500 mg) every 6 months
Albendazole	Not recommended	1 tablet (400 mg) second line

Source: Ministry of Health, Community Development, Gender, Elderly and Children. 2017. *Tanzania Immunization Schedule*.

Note: Disease conditions and growth abnormalities related to this chapter are discussed in respective chapters.

CHAPTER 3. DISEASES OF THE NEWBORN AND YOUNG INFANT

This chapter provides guidance for the management of conditions of babies from birth to 2 months of age.

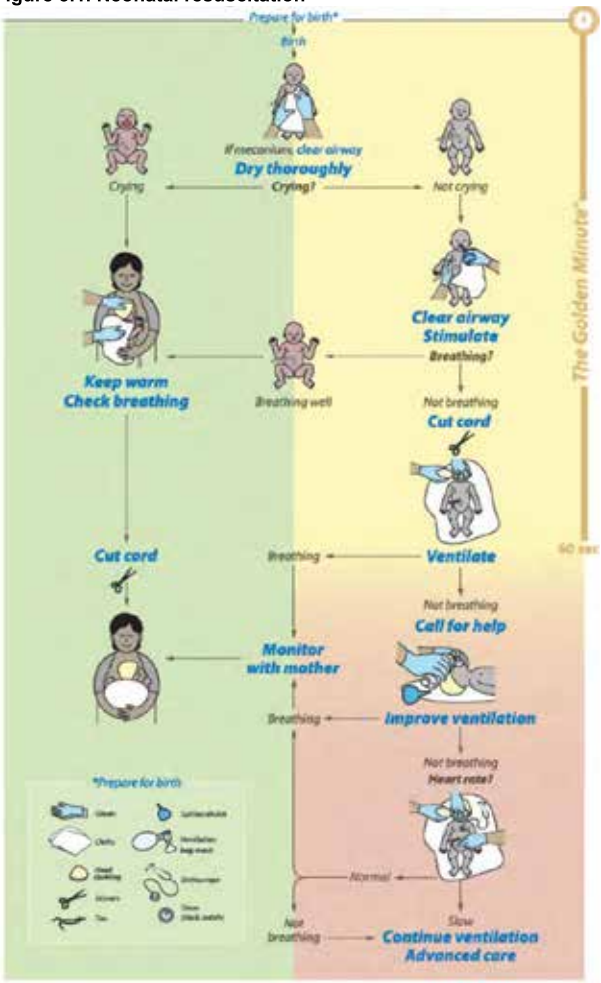
Immediately after delivery, all babies should:

- Be kept warm with the mother and initiated on breastfeeding within the first hour.
- Have tetracycline eye ointment applied to both eyes once.
- Be given oral polio and bacillus Calmette–Guérin vaccines before discharge home.

3.1. NEONATAL RESUSCITATION

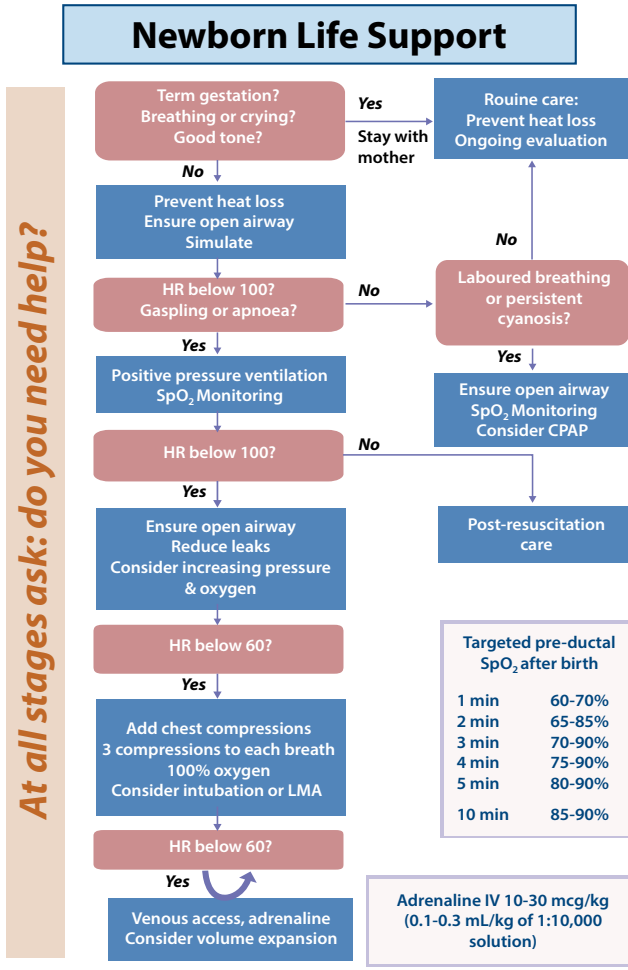
Neonatal resuscitation should follow the A-B-C sequence of CPR. See flow chart below.

Figure 3.1. Neonatal resuscitation



Source: Keenan J, Udaeta E, Lopez M, et al. 2008. Module 7: Delivery and immediate neonatal care. American Academy of Pediatrics website. https://www.aap.org/en-us/Documents/disasters_dpac_PEDsModule7.pdf. Accessed May 14, 2018.

Figure 3.2. Paediatric advanced life support



Source: Kliegman RM, Stanton BF, Schor NF, et al. 2016. *Nelson Pediatric Symptom-Based Diagnosis*. 20th ed. Philadelphia, PA: Elsevier.

3.2. SEVERE ILLNESS IN NEWBORN AND YOUNG INFANTS

Newborns and young infants with severe illness present with signs and symptoms that are not disease specific.

Diagnostic criteria

Sick newborns or young infants with one or more of the following:

- Unable to breastfeed, convulsions, drowsy or unconsciousness, central cyanosis, and movements only when stimulated or no movement at all
- Respiratory rate less than 20 breaths/min or apnoea (cessation of breathing for > 15 seconds)
- Tachypnoea (respiratory rate ≥ 60 breaths/min), grunting, and/or severe chest in-drawing
- Fever (temp ≥ 37.5°C) or hypothermia (temp ≤ 35°C)
- Localizing signs of infection, like skin pustules and umbilical redness or umbilicus draining pus

Investigations

- Full blood count
- C-reactive protein (CRP)
- Serum electrolytes, calcium, and magnesium
- Cerebrospinal fluid (CSF) for biochemistry, microbiology
- Swabs for gram stain and culture
- Chest X-ray
- Renal and liver function tests
- Blood for culture and sensitivity
- Urinalysis and urine culture

Treatment

Nonpharmacological treatment of newborn and young infants with severe illness

- Ensure the airway is patent by suctioning and removing any blockage.
- If apnoeic, ventilate with bag and mask with oxygen (or room air if oxygen not available).
- If high fever, control the environment and undress the child.
- Give oxygen 1.5–2 L/min.

Note: Do not use antipyretic agents, such as paracetamol, for controlling fever in newborns up to the age of 21 days.

Table 3.1. Pharmacological treatment of newborns and young infants with severe illness

1. If random blood glucose < 2.2 mmol/L (< 40 mg/dL)	Give 2 mL/kg of 10% dextrose IV. Then give IV infusion according to maintenance fluid while oral feeds are built up.
2. If hypocalcaemic total calcium < 2.2 mmol/L OR ionized calcium < 1.2 mmol/L	Give calcium gluconate 10% 2 mL/kg IV slowly.
3. If convulsing	Give phenobarbitone (IV/IM) 20 mg/kg. If convulsions persist after 30 minutes: Give further doses of phenobarbitone 10 mg/kg to the maximum of 40 mg/kg. Maintenance phenobarbitone 5 mg/kg orally once daily.
4. For infections Give ampicillin 50 mg/kg IV every 12 hours (first week of life), every 8 hours (2–4 weeks of life) AND Gentamicin 3 mg/kg/dose IV (low-birthweight babies), 5 mg/kg/dose (normal birthweight babies), and 7.5 mg/kg/dose (weeks 2–4 of life) once daily for 10 days. Give cloxacillin 50 mg/kg IV every 12 hours (first week of life) and every 8 hours (2–4 weeks of life) with skin pustules or abscesses, as these might be signs of staphylococcus infection.	
If not improving in 72 hours, give ceftriaxone 50 mg/kg IV once daily for 10 days.	
In case of meningitis, if not responding to number 4, give ceftriaxone 100 mg/kg IV once daily for 2 weeks OR Cefotaxime 50 mg/kg IV every 8 hours (full-term babies: first week of life), every 6 hours (full-term babies: 2–4 weeks of life), and every 12 hours (premature babies) for 2 weeks.	
Give vitamin K1 1 mg single dose to all newborns after the first hour of birth (1 mg for birthweight ≥ 1.5 kg and 0.5 mg for birthweight < 1.5 kg).	

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Newborn fluid requirements

Start with 80 mL/kg/day on day one. Increase by 10 mL/kg per day until 150 mL/kg/day.

Table 3.2. Fluids can be given at the following rate

Day 1	80 mL/kg for 24 hours
Day 2	90 mL/kg for 24 hours
Day 3	100 mL/kg for 24 hours
Day 4	110 mL/kg for 24 hours
Day 8	150 mL/kg for 24 hoursalso in subsequent days

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Note: Babies over 2 days old need fluids containing sodium (for example, one-fifth strength of 0.9% normal saline [0.18% NaCl] in 5% glucose or dextrose saline).

Total parenteral nutrition

Total parenteral nutrition is a method of supplying nutrients to the body by an IV route. It is indicated to patients with an impaired or nonfunctional gastrointestinal tract. The main aims are to improve the nutritional status of the patient, attain weight gain and enhance the healing process.

Indications

- Children with low birthweight less than 1,000 g
- Birthweight 1,000–1,500 g and anticipated not to be on significant feeds for 3 or more days
- Birthweight more than 1,500 g and anticipated not to be on significant feeds for 5 or more days
- Surgical conditions in newborns: necrotizing enterocolitis, gastroschisis, omphalocele, tracheoesophageal fistula, intestinal atresia, malrotation, short bowel syndrome and meconium ileus, Hirschsprung's disease, and diaphragmatic hernia

Table 3.3. Parenteral nutrition

Feed Volume (cc/kg)	PN Substrate (CHO/prot/fat) 1	IV+ Po Volume (cc/kg)	Total Parenteral Nutrition Volume (cc/kg)
0–49	12/3.5/3	100–140	100–140
50–74	10/2.5/2	120–140	70–90
75–99	8/2/1.5	130–140	55–65
100–120	8/2/1	130–140	55
120–150	None	NA	None
150–160	None	NA	None

Source: Koletzko B, Goulet O, Hunt J. 2005. ESPGHAN/ESPEN guidelines on paediatric parenteral nutrition. *J Pediatr Gastroenterol Nutr*. 41(suppl 2):S70–75.

3.3. PERINATAL ASPHYXIA (HYPOXIC ISCHAEMIC ENCEPHALOPATHY)

This is a clinical condition that presents with neurological signs during the early newborn period. Caused by inadequate oxygen supply to organs before, during, or immediately after birth, causing ischaemic changes in the brain.

Diagnostic criteria

- Low Apgar score
- Convulsions, apnoea, and/or inability to suck
- Abnormal Thompson hypoxia ischaemic encephalopathy score
- Functional disabilities resulting from hypoxic damage to various organs

Scoring in newborns with hypoxic ischaemic encephalopathy

The assessment should be done daily for the first 7 days of life. The following classification can be made:

- Mild hypoxia ischaemic encephalopathy: 0–10
- Moderate hypoxia ischaemic encephalopathy: 11–14
- Severe hypoxia ischaemic encephalopathy: > 15

Special care should be given to babies with moderate and severe birth asphyxia because the fluid management will be two-thirds of the required fluids per day.

Table 3.4. Thompson hypoxic ischaemic encephalopathy score chart

Sign	Score				Score per day	Remarks
	0	1	2	3		
TONE	Normal	Hyper	Hypo	Flaccid		
LOC	Normal	Hyperalert	Lethargic	Coma		
FITS	None	<3 per day	>2 per day			
POSTURE	Normal	Fisting Cycling	Strong Distal Flexion	Decerebrate		
MORO	Normal	Absent				
GRASP	Normal	Poor	Absent			
SUCK	Normal	Poor	Absent +/- Bites			
RESPIRATION	Normal	Hyperventilation	Apnoea			
FONTANELLE	Normal	Full Not Tense	Tense			

Source: Thompson CM, Puterman AS, Linley LL, Hann FM, et al. 1997. The value of a scoring system for hypoxic ischaemic encephalopathy in predicting neurodevelopmental outcome. *Acta paediatrica*. 86(7):757–61.1.

Investigations

- Full blood picture (FBP)
- Blood for culture and sensitivity
- CRP
- CSF for biochemistry, microbiology
- Urinalysis and urine culture
- Swabs for gram stain and culture
- Chest X-ray
- Serum electrolytes, calcium, and magnesium
- Renal and liver function tests

Treatment

Nonpharmacological treatment

- Adequate resuscitation and ventilation, especially few hours after birth
- Oxygen 1.5–2 L/min
- Restricted fluids and electrolytes until renal function and urine output evaluation are done
- Avoidance of hyperthermia and hypothermia (temperature should be maintained between 36°C and 37°C)
- Commencement of feeding orally only when baby has passed meconium and if not oxygen dependent

Pharmacological treatment

- Give 10% dextrose, two-thirds of the required fluids per day.
- Give phenobarbitone 20 mg/kg in 50mL of 10% dextrose for 1 hour.
- Give ampicillin 50 mg/kg IV every 12 hours (1st week of life) and every 8 hours (2–4 weeks of life), and gentamicin IV 3 mg/kg/dose (low-birthweight babies), 5 mg/kg/dose (normal birthweight babies), and 7.5 mg/kg/dose (weeks 2–4 of life) once daily for 10 days.
- Other specific conditions treat as explained in Table 3.1 above.

Note: If the baby is still floppy or spastic, unresponsive, and cannot suck by the end of first week, this indicates severe brain injury, hence poor prognosis; counsel the family on lifelong supportive care.

3.4. PREMATURITY AND LOW-BIRTHWEIGHT BABIES

These are babies who are born before term pregnancy or are at term pregnancy but with low birthweight. They can be classified as:

- Low birthweight: 2.5 kg to 1.5 kg
- Very low birthweight: 1.5 kg to 1 kg
- Extremely low birthweight < 1 kg

Investigations

- FBP

- Blood for culture and sensitivity
- CRP
- CSF for biochemistry, microbiology
- Urinalysis and urine culture
- Swabs for gram stain and culture
- Chest X-ray
- Serum electrolytes, calcium, and magnesium
- Renal and liver function tests

Treatment

Babies with birthweight between 2.5 kg and 1.5 kg

Start breastfeeding within 1 hour of delivery.

Babies with birthweight < 1.5 kg

If unable to breastfeed:

- Fluid requirement on the first day of life is 80 mL/kg given as:
  - 1 ml of expressed breast milk by nasogastric tube (NGT) (trophic feeds)

    AND
  - The remaining to be given as 10% dextrose IV
- Give breast milk 2–4 mL every 2–3 hours by NGT until suckling reflex present.

  THEN

  Start feeding with cup and spoon or an eyedropper and increase (1–2 mL per feed each day) on a daily basis as tolerated.

  THEN

  Increase the amount of the feeds 150–180 mL/kg/day over the next 2 weeks of life.

  THEN

  Transfer the baby to kangaroo mother care unit when stable.

If able to breastfeed:

- Start breastfeeding within 1 hour of delivery if newborn is able to suck. If unable to breastfeed, give breast milk 2–4 mL every 2–3 hours by NGT until suckling reflex present.

  THEN

- Start feeding with cup and spoon or an eyedropper and increase (1–2 mL per feed each day) on a daily basis as tolerated then
- Increase the amount of feeds to 150–180 mL/kg/ day over the next 2 weeks of life then
- Transfer the baby to kangaroo mother care when stable.

For stable babies, start milk feeds:

- Give 2–4 mL every 2–3 hours by NGT for the first 2 days.

  THEN

  Start feeding with cup and spoon or an eye dropper and increase (1–2 mL per feed each day) on a daily basis as tolerated 3 days.

  THEN

  Increase the amount of the feeds to 150–180 mL/kg/ day over the next 2 weeks of life.

  THEN

  Transfer the baby to kangaroo mother care when stable.

Table 3.5. Oral feeding chart for low-birthweight babies

	< 1.5 kg	1.5–2 kg	
Day 1	2 mL every 2 hours	5 mL every 3 hours	Vitamin K IV
Day 2	3 mL every 2 hours	10 mL every 3 hours	
Day 3	4 mL every 2 hours	15 mL every 3 hours	Vitamin K IV
Day 4	5 mL every 2 hours	20 mL every 3 hours	
Day 5	6 mL every 2 hours	25 mL every 3 hours	

	< 1.5 kg	1.5–2 kg	
Day 6	7 mL every 2 hours	30 mL every 3 hours	
Day 7	8 mL every 2 hours	35 mL every 3 hours	

Source: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Kangaroo mother care functions

- Provide warmth.
- Practice exclusive breastfeeding.
- Give daily supplements when on full enteral feeds:
  - Vitamin D: 400 IU
  - Calcium: 120–140 mg/kg
  - Phosphorus: 60–90 mg/kg
  - Iron (2 mg/day) and folic acid (1.2 mg/day): Should be started at 4 weeks old until 6 months old

Apnoea of prematurity

This is a cessation of breathing for more than 10 seconds in a premature child. Can present with cyanosis and/or bradycardia.

Treatment

Nonpharmacological treatment

- Do tactile stimulation (e.g., gently tap the sole of the foot or rub the back).
- Give high-flow oxygen or continuous positive airway pressure.

Pharmacological treatment

- Give loading dose of aminophylline 6 mg/kg IV over 20 minutes followed by maintenance of 2 mg/kg every 6 hours.

  OR

- Give loading dose of caffeine citrate IV 20 mg stat then 2.5 mg/kg every 12 hours for 24 hours.

Note: Use an apnoea monitor if available; if not available, a pulse oximeter should be used.

Respiratory distress syndrome

This is an acute lung disease present at birth that occurs almost exclusively in preterm babies. Presents immediately after delivery.

Diagnostic criteria

- Tachypnea
- Grunting, intercostal recession
- Cyanosis
- Irregular breathing, then apnoea and/or hypothermia

Investigation

- Arterial blood gas (ABG) analysis
- Chest X-ray (after 4–6 hours)

Treatment

Nonpharmacological treatment

- Give oxygen to keep the saturation between 90–95%.
- Maintain continuous positive airway pressure.
- Keep infant warm.

Pharmacological treatment

- Give IV fluid as shown in Table 3.5.
- Administer early surfactant 4 mL (100 mg/kg) through endotracheal tube within 6 hours of life; repeated dose may be given at 6–12 hour intervals.
- Follow with nasal continuous positive airway pressure.
- If no response to continuous positive airway pressure, will need mechanical ventilation.

Necrotizing enterocolitis

Life-threatening gastrointestinal tract emergences typically occur in the second to third week of life in premature breast milk substitute-fed infants. Characterized by variable damage to intestinal tract from mucosal injury to full thickness necrosis and perforation.

Diagnostic criteria

- Abdominal distension or tenderness
- Bile-stained vomit or bile-stained fluid up the NGT
- Blood in the stools

Investigations

- FBP
- Blood culture and sensitivity
- CRP
- Serum electrolytes
- ABG analysis
- Abdominal X-ray AP and lateral decubitus view

Treatment

Nonpharmacological treatment

- Stop oral feeds and start an IV infusion of dextrose saline.
- Pass an NGT and leave it on free drainage (NGT for decompression).
    - Reintroduce expressed breast milk feeds by NGT when the abdomen is soft and not tender, and the baby is passing normal stools with no blood and not having bilious vomiting. Start feeds slowly and increase slowly by 1–2 mL per feed each day.

Pharmacological treatment

- Give dextrose 10% 80 mL/kg every 24 hours.
- Give dextrose normal saline 90 mL/kg every 24 hours on the second day, then give fluids as shown in Table 3.2.
- Give ampiclox 100 mg/kg IV every 12 hours for 14 days.

- Give gentamicin 5 mg/kg IV once daily for 14 days.
- Give metronidazole 7.5 mg/kg IV every 8 hours for 14 days.

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

3.5. NEONATAL JAUNDICE

This is the yellow discoloration of the sclera, skin, and mucous membrane.

Normal (physiological)

- Skin and eyes are yellow, but none of the signs below.

Pathological (nonphysiological)

- Jaundice started on the first day of life.
- Jaundice lasts longer than 14 days in term, 21 days in preterm infants, or jaundice with fever.
- Jaundice involves palms and soles of the baby.

Investigations

- Serum bilirubin total and direct
- FBP
- Blood group and Rh typing of baby and mother
- Coombs test
- Venereal disease research laboratory test
- G-6-P-D screening
- HIV screening
- Thyroid function tests
- Hepatitis screening and liver function tests
- Abdominal ultrasound

Treatment

- Administer phototherapy or exchange transfusion, depending on severity.
- Treat the underlying cause.

Phototherapy

Start phototherapy if total bilirubin > BWT x 100 or if bilirubin level is at the level of the nipple.

Note:

- The baby should only stop phototherapy after control level of bilirubin is reduced back to normal and discharge 24 hours after being off phototherapy.
- Babies receiving phototherapy require an increased fluid volume of 10% of daily fluid requirements.

Indications for phototherapy

- Jaundice at the level of xiphoid sternum or more
- Jaundice in preterm babies (< 35 weeks)
- Jaundice on the palms and soles at any age
- Jaundice due to haemolysis

Table 3.6. Indications for phototherapy and exchange transfusion

Age	Phototherapy		Exchange Transfusion	
	≥ 35 weeks gestation	≤ 35weeks gestation	≥ 35 weeks gestation	≤ 35 weeks gestation
Day 1	Any visible jaundice		260 mmol/L (15 mg/dL)	220 mmol/L (10 mg/dL)
Day 2	260 mmol/dL* 15 mg/dL)	170 mmol/L (10 mg/dL)	425 mmol/L (25 mg/dL)	260 mmol/L (15 mg/dL)
Day 3	310 mmol/L (18 mg/dL)	250 mmol/L (15 mg/dL)	425 mmol/L (25 mg/dL)	340 mmol/L (20 mg/dL)

* total bilirubin

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Note: Those with ABO incompatibility and who are anaemic should be transfused with mother's blood group.

3.6. OPHTHALMIA NEONATORUM

This is an acute bacterial infection of the eyes that affects newborn babies during the first 28 days of life. Mainly caused by *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, and *Staphylococcus spp*.

Diagnostic criteria

- Purulent and copious discharge from the eyes
- Massive oedema and redness of eyelids

Investigation

- Eye swab for gram stain, culture, and sensitivity

Treatment

Nonpharmacological treatment

- Frequent and careful cleaning of eyes with normal saline (saline irrigation) by using a clean cloth or gauze

Pharmacological treatment

- Give ceftriaxone 100 mg/kg intramuscular (IM) injection as a single dose if the cause is *Neisseria gonorrhoeae*.
- Give erythromycin orally 12.5 mg/kg every 6 hours if the causative organism is chlamydia for 14 days.
- Give chloramphenicol eye drops every 2 hours OR

  Give tobramycine eye drops hourly when the infection is severe, then every 8 hours for 14 days.

  OR

  Give tetracycline eye ointment hourly for 14 days.

3.7. CONGENITAL SYPHILIS

This is a multisystem infection caused by *Treponema pallidum* and transmitted to the foetus via the placenta. In infected neonates, manifestations of syphilis are classified as early congenital (birth through age 2) and late congenital (after 2 years of age).

Diagnostic criteria

- Anaemia, jaundice, low birthweight
- Red rush, grey patches, blisters, or skin peeling on palms and soles
- Snuffles
- Abdominal distension due to hepatosplenomegaly
- One or more of the above clinical features and positive venereal disease research laboratory or rapid plasma reagin test

Investigations

- Venereal disease research laboratory test
- Rapid plasma reagin test

Treatment

Pharmacological treatment

- Asymptomatic neonates with positive venereal disease research laboratory test
  - Give benzathine penicillin 7.5 mg/kg IM of single dose.
- Symptomatic infants
  - Give benzylpenicillin 50,000 IU (30 mg/kg) IV every 12 hours for the first 7 days of life, then 50,000 IU (30 mg/kg) every 8 hours for 3 days.
- Treat the mother and the partner.

Note: For infant of a mother with tuberculosis:

If the mother has active pulmonary tuberculosis (PTB) and was treated for less than 2 months before birth:

- Reassure the mother that it is safe for her to breastfeed her infant.
- Do not give bacillus Calmette–Guérin vaccine at birth.
- Give prophylactic isoniazid at 10 mg/kg by mouth once daily for 6 months.
- Re-evaluate every 4 weeks.

If findings suggest active TB disease in a newborn:

- Start antituberculosis treatment according to national guideline.
- Give bacillus Calmette–Guérin vaccination 2 weeks after treatment is completed.

If no findings suggestive of an active TB disease in a newborn:

- Give prophylactic isoniazid 10mg/kg by mouth once daily for 6 months.

CHAPTER 4. COUGH OR DIFFICULTY IN BREATHING

Cough and difficulty in breathing are common problems in children. Most episodes of cough are due to common cold. The most common severe illness presenting with cough or difficulty in breathing is pneumonia.

4.1. SEVERE PNEUMONIA

Severe pneumonia is a condition characterized by extensive inflammation of lung parenchyma presenting with signs of respiratory distress.

Diagnostic criteria

Cough or difficulty in breathing, plus at least one of the following:

- Central cyanosis or oxygen saturation < 90% on pulse oximetry
- Inability to breastfeed or drink, or vomiting everything
- Convulsions, lethargy, or unconsciousness
- Grunting, head nodding, lower chest wall in-drawing

Investigations

- Chest X-ray, posterioranterior, and lateral views
- Blood for culture and sensitivity
- FBP
- Erythrocyte segmentation rate (ESR)
- CRP

Treatment

Nonpharmacological

- Give oxygen 2–4 L/min.
- Maintain the airway by gentle suction of any thick secretions.
- Encourage breastfeeding and ensure that the child receives daily maintenance fluids.

Pharmacological

- Give ampicillin 50 mg/kg IV every 6 hours and gentamicin 7.5 mg/kg IV once a day for at least 5 days, then complete treatment at home or at health facility with amoxicillin PO 40 mg/kg every 12 hours, plus gentamicin 7.5 mg/kg IV/IM once daily for a further 5 days.
- If the child does not improve within 48 hours, add cloxacillin 50 mg/kg IV every 6 hours to cover for staphylococcal pneumonia. When the child improves within 48 hours, continue flucloxacillin PO 25 mg/kg every 6 hours for a total course of 3 weeks. Complete a course of ampicillin and gentamicin for 10 days.
- If the child does not improve within 48 hours and staphylococcal pneumonia is not suspected, use ceftriaxone 75 mg/kg IV once daily for 10 days or consider evaluation of other diseases or complications.
- If HIV exposed/infected, add co-trimoxazole IV or orally, 8 mg/kg of trimethoprim, and 40 mg/kg of sulfamethoxazole every 8 hours for 3 weeks for pneumocystis pneumonia.
- If the child has fever (≥ 38.5°C), give paracetamol 15 mg/kg orally.
- If the child has a wheeze, give nebulized salbutamol 2.5 mg (i.e. 0.5 mL of the 5 mg/mL nebulizer solution).

Management of complications of severe pneumonia

If the child has not improved after 2 days, consider the following complications:

Empyema/pleural effusion

Pleural effusion is the collection of fluid within the pleural cavity.

Diagnostic criteria

- The chest is stony dull to percussion over the affected area and a pleural rub may be heard.
- There is a positive pleural tap.
- There is a momogenous opacification with meniscus sign on a chest X-ray.

Investigations

- Chest X-ray
- Pleural fluid analysis: microbiology, biochemistry, and cytology

Treatment

Nonpharmacological

- Drain any significant pleural effusion with under water seal drainage.
- If fever and other signs of illness continue despite adequate chest drainage and antimicrobial therapy, investigate for tuberculosis.

Other complications

These could include pneumothorax, pericardial effusion, lung abscess, bronchiectasis and cor pulmonale.

Note: Refer patients to the next-level health facility if there are inadequate expertise or facilities.

4.2. PNEUMONIA

Pneumonia is the inflammation of the lung parenchyma presenting without signs of respiratory distress.

Diagnostic criteria

- Cough or difficulty in breathing
- Fast breathing

Table 4.1. Fast breathing, according to age

Age	Fast Breathing
< 2 months	≥ 60 breaths per minute
2–12 months	≥ 50 breaths per minute
12 months to 5 years	≥ 40 breaths per minute

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Investigations

No investigations are required.

Treatment

Treat the child as outpatient.

Nonpharmacological

- Encourage breastfeeding, balanced diet, and adequate fluid intake.

Pharmacological

- Give amoxicillin DT 40 mg/kg orally every 12 hours for 5 days.
- For children above 5 years, atypical pneumonia should be considered (e.g., mycoplasma). Give macrolide as a drug of choice. See below:
  - Erythromycin 12.5 mg/kg orally every 6 hours for 5 days
  - Azithromycin 10 mg/kg orally once daily for 5 days

Note:

- Bring the child back after 2 days or earlier if the child becomes sicker or is unable to breastfeed or drink.
- On the second day, if breathing has improved (respiratory rate is within normal range for age), there is less fever (< 37.5°C axillary), and the child is eating better, complete the 5 days of antibiotic treatment.

4.3. COMMON COLD (COUGH OR COLD)

Common cold is a self-limiting viral infection of the upper respiratory tract. Most episodes end within 14 days. Beyond this, consider causes of chronic cough.

Diagnostic criteria

- Cough or nasal discharge or mouth breathing
- Normal respiratory rate
- Fever may or may not be present

Investigations

No investigations are required.

Treatment

Treat the child as an outpatient.

Nonpharmacological

- Soothe the throat and relieve the cough with a safe remedy, such as tea with lemon, lime, or honey.
- Clear secretions from the child using a cloth soaked in water that has been twisted to form a pointed wick.

Pharmacological

- Relieve high fever of ≥ 38.5°C with paracetamol 15 mg/kg.

Note: Do not give any of the following:
- An antibiotic (they are not effective and do not prevent pneumonia)
- Remedies such as cough syrup for children under 5 years of age
- Medicated nose drops

Advise the parent/caretaker to return if the child develops fast or difficult breathing, becomes sicker, or is unable to drink or breastfeed.

4.4. CONDITIONS PRESENTING WITH WHEEZE

Wheeze is a high-pitched whistling sound near the end of each expiration. It is caused by spasmodic narrowing of the distal airways.

Causes of wheezes include bronchiolitis (under 2 years) and asthma (after 2 years).

Bronchiolitis

Bronchiolitis is a lower respiratory infection caused by respiratory syncytial virus and is more common in infants. Secondary bacterial infection may occur. It is most severe in young infants. Episodes of wheeze may occur for months after an attack of bronchiolitis but eventually will stop.

Diagnostic criteria

There are no specific criteria, but use one or more of the following features to make a diagnostic of bronchiolitis:

- First episode of wheeze in a child aged < 2 years old
- Hyperinflation of chest, prolonged expiration
- Reduced air entry if very severe
- Poor or no response to a rapid-acting bronchodilator
- Increased resonance to percussion
- Rhonchi and/or crackles on auscultation of the chest may be present

Investigation

- Chest X-ray
- FBP
- CRP
- Blood culture and sensitivity
- Serum electrolytes to exclude other diagnostic

Treatment

Treat as an outpatient unless the child has signs of respiratory distress.

Nonpharmacological

- Give oxygen 1–2 L/min if there are signs of severe respiratory distress.
- Encourage breastfeeding, balanced diet, and adequate fluid intake.

Pharmacological

- Give paracetamol 15 mg/kg if the temperature is above 38.5□ C.

Note: If the child fails to respond to oxygen therapy or the child's condition worsens suddenly, obtain a chest X-ray and other lab investigations to rule out other complications.

Bronchial asthma

Asthma is a chronic inflammatory condition with reversible airway obstruction. Symptoms usually start after 2 years of age but may present earlier.

Diagnostic criteria

- Paroxysmal respiratory distress
- Recurrent cough
- Wheeze
- Chest tightness
- Forced expiratory volume 1 of less than 80%
- Good response to treatment with a bronchodilator

Investigation

- FPB
- ABG analysis
- Chest X-ray: often normal, therefore not routinely required
- Spirometry

Treatment

Nonpharmacological

- Give oxygen 2–4 L/min.

Pharmacological

- Severe asthma
- Admit to hospital:
  - Give nebulized salbutamol 5 mg (i.e., 0.5 mL of the 5 mg/mL nebulizer solution) PLUS budesonide 0.25 mg once daily.
  - Repeat intermittently every 4–6 hours until the child is stable.
  - Step down to metered dose inhalation for stable children.
  - Introduce two puffs (200 mcg) into the spacer chamber every 6–8 hours for 2–4 weeks AND budesonide metered dose inhalation: 100,200 mcg/dose (puff), starting dose 100–200 mg every 12 hours.

For persistent asthma, give salmeterol 50 mg every 12 hours and fluticasone metered dose inhalation: 50 mcg/puff, 125 mcg/puff, 250 mcg/puff, starting dose 50–250 mg every 12 hours can be used.

Note:
- Mild asthma: Use salbutamol metered dose inhalation 400 mg as needed.
- Intermittent asthma: Use salbutamol/budesonide every 12 hours.
- Chronic, persistent asthma: Use salmeterol/fluticasone every 12 hours.

4.5. TUBERCULOSIS

TB is a chronic infectious disease caused mainly by *Mycobacterium tuberculosis*. It is classified into two clinical types:

- PTB: Affects the lungs and is the most common.
- Extrapulmonary tuberculosis (EPTB): Common form of EPTB in children includes:
  - TB lymphadenopathy
  - Disseminated/miliary TB
  - TB effusions (pleural, pericardial, and peritoneal)
  - Spinal TB
  - TB meningitis

Diagnostic criteria

- Cough for more than 2 weeks
- Unexplained fever for more than 2 weeks
- Contact with an adult or older children with smear-positive PTB
- Excessive night sweats
- Failure to gain weight or weight loss (use growth charts)
- Infections not responding to conventional antibiotics

Note: Use TB scoring chart for diagnostic (Annex VI).

Investigations

- Sputum or gastric aspirate for Ziehl–Neelsen stain
- Chest X-ray
- Mantoux test
- Genexpert
- FBP
- ESR
- Sputum for acid-fast bacilli culture and sensitivity when indicate (e.g., treatment failure/relapse)

Treatment

Nonpharmacological treatment

- Encourage breastfeeding, balanced diet, and adequate fluid intake.

Pharmacological treatment

- Currently, the recommended regimen is short-course chemotherapy by directly observed treatment throughout the duration of treatment, as shown in Table 4.2 below.

Table 4.2. TB chemotherapy

	Intensive Phase (First 2 Months)		Continuation Phase (Last 4 Months)
Weight (kg)	**RHZ (paediatric) 75/50/150 mg**	**Ethambutol 100 mg**	**RH (paediatric) 75/50 mg**
< 4 kg	For children less than 4 kg, consult a physician or district or regional TB and leprosy coordinator.		
4–7.9 kg	1 tablet	1 tablet	1 tablet
8–11.9 kg	2 tablets	2 tablets	2 tablets
12–15.9 kg	3 tablets	3 tablets	3 tablets
16–24.9 kg	4 tablets	4 tablets	4 tablets
> 25 kg	Use the adult doses for TB management.		

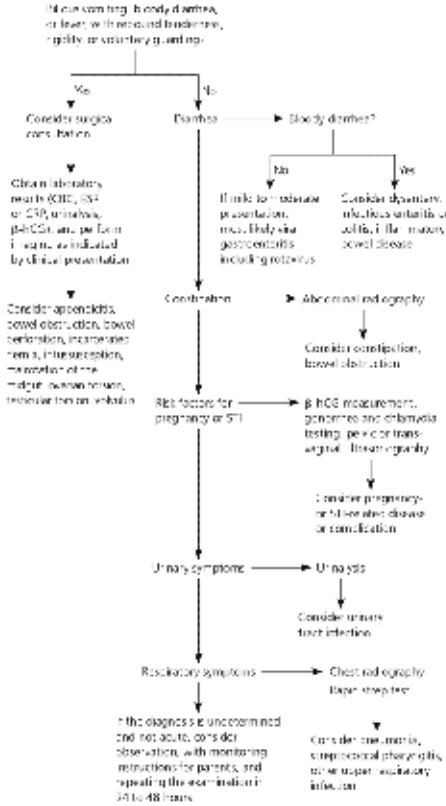
Adapted from: Ministry of Health, Community Development, Gender, Elderly and Children. 2016. *National TB and Leprosy Guideline*.

Note: In treatment failure cases, consider multidrug-resistant/extensively drug-resistant TB, then refer to the next-level facility with adequate expertise and facility.

CHAPTER 5. GASTROINTESTINAL DISORDERS

There are diverse group of gastrointestinal diseases mostly presenting with abdominal pain. For the purpose of this guideline, we shall discuss the general approach for the child presenting with abdominal pain. Specific conditions will be discussed separately.

5.1. APPROACH FOR A CHILD WITH ABDOMINAL PAIN



Source: Kliegman RM, Stanton BF, Schor NF, et al. 2016. Nelson Pediatric Symptom-Based Diagnosis. 20th ed. Philadelphia, PA: Elsevier.

5.2. DIARRHOEAL DISEASES

These are conditions affecting the gastrointestinal tract that present with diarrhoea. Diarrhoea is defined as passage of watery or loose stools, at least three times in a period of 24 hours. It can be acute, persistent, or chronic in nature and Is usually associated with fluids and electrolyte depletion.

Acute watery diarrhoea

This is diarrhoea that lasts less than 14 days. Based on the degree of dehydration, there are three categories:

- Acute watery diarrhoea with no signs of dehydration
- Acute watery diarrhoea with some dehydration
- Acute watery diarrhoea with severe dehydration

First, check for emergency signs (the ABCD), and then check for signs of dehydration.

Table 5.1. Assessment of dehydration

	A	B	C
General condition	Well, alert	Restless, irritable	Lethargic or unconsciousness
Eyes	Normal	Sunken	Sunken
Thirst	Drinks normally	Drinks eagerly	Drinks poorly or not able to drink
Skin pinch	Goes back quickly	Goes back slowly	Goes back very slowly
Decide	If the patient has less than two of the signs above, NO SIGNS OF DEHYDRATION	If the patient has two or more of the signs above, SOME DEHYDRATION	If the patient has two or more of the signs above, SEVERE DEHYDRATION
Treat	Treatment Plan A	Treatment Plan B	Treatment Plan C

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Note: Lethargy means the mental state is dull and the child cannot be fully awakened; the child may appear to be drifting into unconsciousness.

For assessment of dehydration in severe acute malnutrition, refer to Chapter 7.

Acute watery diarrhoea with no signs of dehydration

Diagnostic criteria

- Diarrhoea and no signs of dehydration

Investigations

- No specific investigation

Treatment

- Treatment Plan A

Table 5.2. Diarrhoea Treatment Plan A

Rule 1: Give fluids to prevent dehydration.	Give oral rehydration solution 5-10 mls/kg per motion. Children under 2 years of age: 50–100 mL of fluid Children 2–5 years of age: 100–200 mL If oral rehydration solution is not available, give plain water, *madafu* (coconut water), or unsweetened, fresh fruit juice.
Rule 2: Give zinc sulfate orally.	Children under 6 months: Give zinc sulfate 10 mg orally once a day for 10 days. Children 6 months and above: Give zinc sulfate 20 mg orally once a day for 10 days.
Rule 3: Feed the child to prevent malnutrition.	Encourage breastfeeding. Ensure adequate fluid and calorie intake.
Rule 4: The mother should take her child back to the health facility if the child:	Becomes sicker, passes many watery stools, has blood in stool, has repeated vomiting, becomes very thirsty, is eating or drinking poorly, develops fever, or the child does not get better in 3 days.

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Acute watery diarrhoea with some dehydration

Diagnostic criteria

- Diarrhoea and at least two signs in column B above

Investigations

- Serum electrolytes

Treatment Plan B

- Administer oral rehydration therapy for children with some dehydration.
- Give low osmolar ORS and zinc supplementation to children with some dehydration in a health facility (Treatment Plan B), as described in Table 5.3.

Table 5.3. Diarrhoea Treatment Plan B

Give recommended amount of oral hydration solution (ORS) in clinic over a 4-hour period.				
☐ **Determine amount of ORS in clinic over a 4-hour period.**				
Age*	Up to 4 months	4–12 months	12 months–2 years	2–5 years
Weight	< 6 kg	6 to < 10 kg	10 to < 12 kg	12 to < 19 kg
Vol in mL	200–400	400–700	700–900	900–1,400
** Use the child's age only when you do not know the weight. Amount of ORS required in mL can be calculated as 75 mL/kg.*				
- If the child wants more ORS than shown, give more.				
☐ **Show the mother how to give ORS.**				
- Give frequent small sips from a cup.				
- If the child vomits, wait 10 minutes. Then continue, but more slowly.				
- Continue breastfeeding whenever the child asks.				
☐ **After 4 hours:**				
- Reassess the child and classify the child for dehydration.				
- Select the appropriate plan to continue treatment.				
☐ **If the mother must leave before completing treatment:**				
- Show her how to prepare ORS at home.				
- Show her how much ORS to give to finish 4-hour treatment at home.				

-	Give her enough ORS packets to complete rehydration. Also give her two packets as recommended in Plan A.
☐	**Explain the four rules of home treatment:**
	1. Give extra fluid.
	2. Give zinc supplements.
	3. Continue feeding.
	4. Know when to return.

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Note: Oedematous (puffy) eyelids are a sign of overhydration. If this occurs, stop giving ORS, but give breast milk or plain water and food.

Do not give a diuretic.

Acute watery diarrhoea with severe dehydration

Diagnostic criteria

- Diarrhoea and at least two signs in column C above

Investigations

- Serum electrolytes
- Serum creatinine
- Blood urea nitrogen
- FBP

Treatment Plan C

Give IV rehydration therapy to children with severe dehydration.
Follow the chart in Table 5.4.

Table 5.4. Diarrhoea Treatment Plan C

Treat severe dehydration quickly.		
START HERE		
Can you give (IV) fluid Immediately? →	YES	Start IV fluid immediately. If the child can drink, give ORS (oral rehydration solution) by mouth. Give 100 mL/kg RL or normal saline solution divided as follows:
		AGE First give 30 mL/kg, then give 70 mL/kg. For infants under 12 months, give 30 mL/kg in 1 hour, then 70 mL/kg in 5 hours. For children over 12 months, give 30 mL/kg in 30 minutes, then 70 mL/kg in 2.5 hours.
		Infants < 12 months 1 hour* 5 hours
NO		Children > 12 months 30 minutes* 2.5 hours
		*Repeat once if radial pulse is still very weak or not detectable.
		Reassess the child every 15–30 minutes. If hydration status is not improving, give the IV drip more rapidly.
		Also give ORS (about 5 mL/kg/hour) as soon as the child can drink: usually after 3–4 hours (infants) or 1–2 hours (children).
		Reassess an infant after 6 hours and a child after 3 hours. Classify dehydration. Then choose the appropriate plan (A, B, or C) to continue treatment.
Is IV treatment available nearby (within 30 minutes?)	YES	Refer URGENTLY to hospital for IV treatment.
NO →		If the child can drink, provide the mother with ORS and show her how to give frequent sips during the trip.
Are you trained to use nasogastric tube for rehydration?	YES	Start rehydration by tube (or mouth) with ORS: Give 20 mL/kg/hour for 6 hours (total of 120 mL/kg).
NO →		Reassess the child every 1–2 hours.
Can the child drink?		If there is repeated is vomiting or increasing abnormal distension, give fluids more slowly.
NO →		If hydration status is not improving after 3 hours, send the child for IV therapy.
Refer URGENTLY to hospital for IV or nasogastric tube treatment		After 6 hours, reassess the child. Classify dehydration. Then choose the appropriate plan (A, B, or C) to continue treatment.

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Note: If possible, observe the child for at least 6 hours after rehydration to be sure the mother can maintain hydration by giving the child ORS by mouth.

Treatment of complications of acute watery diarrhoea hypernatremia (serum Na > 150 mmol/L)

- Give ORS 75 mL/kg slowly over a period of 24 hours.

Hyponatraemia (serum Na+ < 130 mmol/L)

- For mild/moderate (Na 120–130 mmol/L), give ORS according to Treatment Plan A or B, depending on the level of dehydration.
- For severe hyponatraemia (Na < 120 mmol/L), give 3% NaCl 4 mL/kg IV bolus over 15 minutes.

Hypokalaemia (serum K+ < 3 mmol/L)

- Mild/moderate (serum K+ 2.5–3 mmol/L): Give potassium (potassium chloride—slow K) 1–4 mmol/kg by mouth daily.
- Severe hypokalaemia (serum K + < 2.5 mmol/L): Give 7.5% potassium chloride 0.2–0.4 mmol/kg/hr (1 mL = 1 mmol) diluted 25–50 times in RL to run for 3 hours. Give food rich in potassium (ripe banana, *madafu* [green coconut water], tomatoes, etc.) during diarrhoea and after it has stopped.

Note: Severe hypokalaemia should be managed where serum electrolytes can be monitored closely as overdose can cause sudden cardiac arrest. Before giving IV potassium, ensure that the child is passing urine; never give bolus or flush.
1 tablet of slow K has 600 mg = 8 mmol

Persistent diarrhoea

This is diarrhoea lasting 14 days or longer without remission in between. When there are signs of some or severe dehydration, it is classified as severe persistent diarrhoea.

Diagnostic criteria

- Diarrhoea for 14 days or more
- No remission in between

Investigations

- Stool analysis
- Stool culture and sensitivity
- Stool pH and reducing substances
- Serum electrolytes (Na, K, Cl, Ca)
- Serum creatinine, blood urea nitrogen (BUN)

Treatment

Nonpharmacological treatment

- Encourage breastfeeding.
- For infants under 6 months old, give diet one for 7 days. If no improvement (high purging rate, reappearance of dehydration), give diet two.
- When child improves, return to appropriate diet.

Diet one: starch-based, reduced milk (low lactose)
It contains at least 70 Cal/100 g, with 10% of calories as protein, but lactose should not be more than 3.7 g/kg body weight/day.

Table 5.5. Full-fat diet

Full-fat dried milk	11 g or (whole, liquid milk 85 mL)
Rice	15 g
Vegetable oil	3.5 g
Sugar	3 g
Water to make 200 mL	
With this diet, 130 mL/kg provides 110 Cal/kg.	

Adapted from World Health Organization (WHO). 2013. *Pocket Book of Hospital Care for Children*. 2nd ed. Geneva: WHO.

Diet two: milk-free (lactose-free) diet and cereal (starch)
It contains 70 cal/100 mL, with at least 10% of calories as protein (egg or chicken).

Table 5.6. Lactose-free diet

Whole egg	64 g
Rice	30 g
Vegetable oil	4 g
Glucose	3 g
Water to make 200 mL With this diet, 145 mL/kg provides 110 cal/kg. If grinded chicken (12 g) is used in place of an egg, the diet provides 70 cal/100 g.	

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Pharmacological treatment

- Treat dehydration/electrolyte imbalance, if present, as above.
- Give folic acid 5 mg by mouth once daily for 14 days.
- Give zinc sulfate.
  - For children under 6 months, give 10 mg by mouth once a day for 10 days.
  - For children 6 months and older, give 20 mg by mouth once a day for 10 days.
- Give multivitamin: 1 tablet once daily for 14 days.

Note: Refer children with severe malnutrition and persistent diarrhoea not responding to treatment—and infants under 6 months—to next-level facility with adequate expertise and facility.

5.3. DYSENTERY

This is diarrhoea presenting with blood in stool.

Diagnostic criteria

- Diarrhoea
- Visible blood in stool

Investigations

- FBP
- Stool analysis
- Stool culture and sensitivity
- Serum electrolyte
- Serum creatinine and BUN

Treatment

Pharmacological treatment

- Give ciprofloxacin 15 mg/kg by mouth every 12 hours for 3 days.
- If no response after 3 days, give ceftriaxone 80 mg/kg IV once per day for 5 days.

Note:

- Ciprofloxacin is safe to use in children.
- Blood stool in young infants (under 2 months) may not be due to dysentery; therefore, they should be referred/admitted for further evaluation.
- Intussusceptions may mimic dysentery.

5.4. VIRAL HEPATITIS

Hepatitis is the inflammation of liver cells. The five groups of viral hepatitis of public health importance are A, B, C, D, and E.

Hepatitis A

Hepatitis A is an RNA virus transmitted by faecal-oral route, usually by consumption of contaminated seafood or water.

Diagnostic criteria

- Fever, jaundice, and diarrhoea
- PLUS serological evidence of hepatitis A infection

Investigations

- Serology for hepatitis A
  - Immunoglobulin M
  - Immunoglobulin G
- FBP
- Liver function tests (bilirubin, alanine aminotransferase, aspartate aminotransferase, prothrombin time, partial thromboplastin time, international normalized ratio)

Treatment

Nonpharmacological treatment

- Encourage breastfeeding.
- Ensure adequate fluid and calorie intake.

Pharmacological treatment

- No antiviral treatment is required.
- Cautiously give paracetamol 10 mg/kg by mouth every 8 hours if temperature is above 38.5ºC.

Hepatitis B

Hepatitis B is a DNA virus, transmitted through parenteral, sexual, and vertical transmission and through the sharing of contaminated needles and sharps. It is acute when it lasts less than 6 months and chronic when it persists more than 6 months.

Diagnostic criteria

- Fever
- Jaundice
- PLUS serological evidence of hepatitis B infection

Investigations

- HBsAg
- Hepatitis B virus DNA polymerase chain reaction

- FBP
- Liver function tests (bilirubin, alanine aminotransferase, aspartate aminotransferase, prothrombin time, partial thromboplastin time, international normalized ratio, serum albumin)
- Abdominal ultrasound

Treatment

Nonpharmacological treatment

- Encourage breastfeeding.
- Ensure adequate fluid and calorie intake.
- Ensure a low-fat diet.
- Encourage bed rest.

Pharmacological treatment

Give Peg-IFN-2α 180 mcg/1.73 m^2 subcutaneously (SC) once a week for 48 weeks for children aged 1 year and above.

Give entecavir once a day as shown below for children aged 2 years and above:

- 10–11 kg: 0.15 mg (3 mL)
- >11–14 kg: 0.2 mg (4 mL)
- >14–17 kg: 0.25 mg (5 mL)
- >17–20 kg: 0.3 mg (6 mL)
- >20–23 kg: 0.35 mg (7 mL)
- >23–26 kg: 0.4 mg (8 mL)
- >26–30 kg: 0.45 mg (9 mL)
- >30 kg: 0.5 mg (10 mL oral solution or one 0.5 mg tablet)

Give tenofovir for children 12 years old and older, ≥35 kg: 300 mg by mouth once daily.

Treatment is indicated to few eligible patients.

Note:

- Refer children with serological evidence of hepatitis B infection to the next-level facility with adequate expertise and facility.
- Immunization is recommended for all infants, young children, and adolescents who have not been vaccinated; babies born to hepatitis B virus-positive mothers, including a dose at birth; the sexual partner(s) of the hepatitis B virus-positive mother; and other children in the family.

Hepatitis C

Hepatitis C is an RNA virus; transmission mode is mainly parenteral but also happens through contaminated needles and sharps.

Diagnostic criteria

- Fever
- Jaundice
- PLUS serological evidence of hepatitis C infection

Investigation

- Hepatitis C virus antibody
- Hepatitis C virus RNA polymerase chain reaction

Treatment

Pharmacological treatment

- Pegylated interferon 2α 180 mcg/1.73 m^2 SC once a week with ribavirin 15 mg/kg daily every 12 hours for 48 weeks

Note: Refer children with serological evidence of hepatitis C infection to the next-level facility with adequate expertise and facility.

5.5. SCHISTOSOMIASIS

Schistosomiasis is a parasitic disease affecting the urinary and gastrointestinal tract systems caused by blood flukes (trematodes) of the genus *Schistosoma*. Common species found in Tanzania are *S. haematobium*, which is responsible for

urogenital schistosomiasis, and *S. mansoni*, which is responsible for intestinal schistosomiasis.

Diagnostic criteria

S. mansoni

- Abdominal pain and frequent blood-stained stool
- Evidence of *S. mansoni* ova in stool

S. haematobium

- Painless terminal haematuria
- PLUS evidence of *S. haematobium* ova in urine

Investigations

- Stool analysis for *S. mansoni* ova
- Urine analysis for *S. haematobium* ova

Treatment

Pharmacological treatment

- Give a single dose of praziquantel 40 mg/kg by mouth for children over 4 years.

5.6. AMOEBIASIS

Amoebiasis is an inflammatory condition of the colon caused by the protozoa *E. histolytica*. Extra intestinal manifestation includes liver abscess (most common), pleura pulmonary, and cardiac and cerebral dissemination. *E. histolytica* is transmitted through the faecal-oral route.

Diagnostic Criteria

- Abdominal pain, bloody diarrhoea, and fever spanning several weeks duration
- PLUS evidence of *E. histolytica* ova on stool microscopy

Treatment

Pharmacological treatment

- Give metronidazole 7.5 mg/kg by mouth every 8 hours for 10 days.
  OR

  Give tinidazole 60 mg/kg by mouth once a day for 3 days.
  OR

  Give secnidazole 30 mg/kg by mouth stat.

5.7. GIARDIASIS

Giardiasis is an infestation of the small intestine, caused by the flagellate protozoa *Giardia lamblia* (or *G. intestinalis*).

Diagnostic criteria

- Watery diarrhoea with flatulence
- PLUS stool microscopic evidence of *G. lamblia*

Investigation

- Stool analysis for *Giardia lamblia*

Treatment

- Give metronidazole 7.5 mg/kg by mouth every 8 hours for 5 days. OR

  Give tinidazole 60 mg/kg by mouth once a day for 3 days.
  OR

  Give secnidazole 30 mg/kg by mouth stat.

5.8. ASCARIASIS

Ascariasis is an intestinal infestation caused by *Ascaris lumbricoides*.

Diagnostic criteria

- Fever, chronic nonproductive cough, dyspnoea, and wheezing
- PLUS stool microscopic evidence of *Ascaris lumbricoides* ova

Investigation

- Stool analysis for *Ascaris lumbricoides* ova

Treatment

Pharmacological treatment

- Give a single dose of albendazole 200 mg (children under 2 years old) and 400 mg by mouth for older children.
  OR

  Give mebendazole 500 mg by mouth as a single dose (children over 1 year old).

5.9. ANCYLOSTOMIASIS (HOOKWORM DISEASE)

This is an infestation of the small intestine caused by *Ancylostoma duodenale* or *Necator americanus*.

Diagnostic criteria

- Iron deficiency anaemia
- PLUS stool microscopic evidence of *Ancylostoma duodenale* or *Necator americanus*

Investigation

- Stool analysis for *Ancylostoma duodenale* or *Necator americanus* ova

Treatment

Pharmacological treatment

- Give albendazole 200 mg single dose (children under 2 years old) or 400 mg by mouth for older children.
  OR

  Give mebendazole 500 mg by mouth as a single dose (children over 1 year old).

Note: Give ferrous sulfate (3–6 mg/kg of elemental iron) once daily for 3 months.

5.10. CUTANEOUS LARVA MIGRANS

This is a skin disease caused by nematode parasites of the hookworm family, *Ancylostoma caninum* and *Ancylostoma braziliense*.

Diagnostic criteria

Figure 5.1. Creeping eruption on the skin

Source: Diseases Doctor

- Cutaneous larva migrants

Investigation

- No specific investigation

Treatment

Pharmacological treatment

- Give thiabendazole 50 mg/kg by mouth every 12 hours for 2 days. OR

  Give albendazole 200 mg single dose (children under 2 years old) or 400 mg by mouth for older children. Repeat after 1 week.
- PLUS apply topical 10% thiabendazole paste twice daily for 5 days.

5.11. CESTODIASIS

This is an intestinal parasitic infestation caused by a tapeworm of the class cestoda. Two subtype are known *Taenia saginata* (beef tapeworm) and *Taenia solium* (pork tapeworm). When ingested through eating raw or undercooked beef, the tapeform leads to evagination of the scolex, which attaches to the small intestine. Pork tapeworm can infect the brain and cause neurological manifestation (cystercecosis). However, most cases of cestodiasis are asymptomatic.

Diagnostic criteria

- Appearance of proglottides or segments in the stool
- PLUS evidence of stool microscopic ova (*Taenia saginata*) or evidence of brain imaging of cystercecosis (*Taenia solium*)

Investigations

- Stool analysis for ova and parasites
- Brain CT and MRI scan

Treatment

Pharmacological treatment

- Niclosamide by mouth:
  - Children under 6 years old: 2 g as a single dose after a light breakfast, followed by a purgative (e.g., bisacodyl 5 mg stat) after 2 hours
  - Children 2–6 years old: 1 g as a single dose after a light breakfast, followed by a purgative (e.g., bisacodyl 5 mg stat) after 2 hours

5.12. PEPTIC ULCER DISEASE AND GASTRITIS

This refers to ulceration or mucosal breakdown involving the lower oesophagus, stomach, and duodenum. They have in common the involvement of acid pepsin in the pathogenesis, leading to disruption of mucosal integrity and active inflammation.

The common types of peptic ulcer disease include stomach and duodenal ulcers. Gastritis may involve the entire stomach (e.g., pangastritis) or a region of the stomach (e.g., antral gastritis).

Diagnostic criteria

- Burning epigastric pain, preprandial or postprandial
- PLUS endoscopic evidence of mucosal ulceration

Investigations

- FBP
- Screening for *H. pylori*
- Oesophageal gastro duodenoscopy

Treatment

Pharmacological treatment

- Give omeprazole 1 mg/kg by mouth once daily for 6 weeks.
  OR
  Give esomeprazole 10 mg by mouth once daily for 6 weeks.

For eradication of *H. pylori*, triple therapy is indicated:

- Give omeprazole 1 mg/kg by mouth once daily for 14 days.
- Give metronidazole 7.5 mg/kg by mouth every 12 hours for 14 days.
- Give clarithromycin 7.5 mg/kg by mouth every 12 hours for 14 days, then continue either omeprazole 1 mg/kg by mouth once daily for 4 weeks or esomeprazole 10 mg by mouth once daily for 4 weeks.

Note: Refer children with haematemesis and melaena to next-level facility with adequate expertise and facilities.

5.13. GASTRO-OESOPHAGEAL REFLUX DISEASE

This is a disorder resulting from gastric acid and other gastric contents into the oesophagus due to incompetent barriers at the gastro-oesophageal junction, thereby leading to inflammation of the oesophagus.

Diagnostic criteria

- Heartburn and regurgitation
- WITH endoscopic evidence of mucosal inflammation

Investigations

- Oesophageal gastroduodenoscopy
- Contrast barium swallow
- The 24-hour oesophageal pH

Treatment

- Give omeprazole 1 mg/kg by mouth once daily for 8 weeks.
  OR
  Give esomeprazole 10 mg by mouth once daily for 8 weeks.

CHAPTER 6. FEVER

Fever is defined as axillary or rectal temperature above 37.5°C. This chapter gives guidelines for management of common conditions presenting with fever in children.

6.1. MALARIA

Malaria is a parasitic infection caused by *Plasmodium falciparum* and can present as uncomplicated or severe malaria.

Severe malaria

Severe malaria presents with signs of severe illness and/or evidence of organ dysfunction.

Diagnostic criteria

- A positive rapid diagnostic test or a positive blood slide for malaria parasites AND
- One or more of the following features:

  Prostration, inability to drink or breastfeed, vomiting everything, respiratory distress, behavioural changes, lethargy, coma, convulsion, hypoglycaemia, metabolic acidosis, shock, severe pallor, jaundice, dark-coloured urine

Note: It is important to consider meningitis and septicaemia in a child presenting with altered consciousness or convulsions.

Investigations

- Malaria rapid diagnostic test and blood slide for malarial parasite smear
- RBG
- FBP
- Lumbar puncture to exclude meningitis
- Blood culture and sensitivity

Treatment

Nonpharmacological treatment

- Encourage breastfeeding.
- Ensure adequate fluid and calorie intake.
- Give IV fluids if oral intake is not possible.

Pharmacological treatment

1. Artesunate

Give artesunate: 3 mg/kg for children < 20 kg and 2.4 mg/kg for children > 20 kg IV or IM at 0 hour, 12 hours, and 24 hours. Thereafter, complete treatment by giving a complete course of oral artemether-lumefantrine or dihydr artemisinin-piperaquine.

NOTE: Injectable artesunate has two-step dilutions.

Step 1: The powder for injections should be diluted with 1 mL of 5% sodium bicarbonate and shaken vigorously 2–3 minutes till the solution becomes clear.

Step 2: For IV infusion (3–4 minutes), add 5 mL of 5% dextrose or normal saline to obtain artesunate concentration of 10 mg/mL. For IM injection, add 2 mL of 5% dextrose or normal saline to obtain artesunate concentration of 20 mg/mL.

2. Quinine

Quinine is indicated in infants under 5 kg or when artesunate is not available.

Give quinine 10 mg/kg diluted in 5–10 mL/kg body weight of 5% dextrose to run for 4 hours.

If the patient has to receive a blood transfusion, IV fluid for severe dehydration, correction of electrolyte imbalance, or failed IV or intraosseous access, give the first dose of quinine by IM.

Administration of quinine by IM:

- Dose is 10 mg of quinine/kg (maximum 600 mg/dose).

- Quinine should be diluted to a concentration of 60 mg/mL for IM injection and given on the anterolateral aspect of the thigh in two divided doses on each thigh.

Dilution: Dilute four times in water for injection to a concentration of 60mg/mL. This dilution will minimize the risk of sterile abscess formation.

Note: In neonates, give quinine and antibiotics to cover for septicaemia (refer to Chapter 3).

3. Artemether

Give artemether when artesunate is not available in the following dose: 3.2 mg/kg loading dose IM, then 1.6 mg/kg at 24 hours and 48 hours.

If patient can tolerate oral medication after 24 hours, provide a full treatment course of artemether-lumefantrine. Initiate the first dose of artemether-lumefantrine 8 hours after the last injection.

Uncomplicated malaria

Uncomplicated malaria is malaria without severe signs or evidence of organ dysfunction.

Diagnostic criteria

- Fever
- Positive malaria rapid diagnostic test or positive blood slide for malaria (blood sample for malarial parasite smear)

Investigations

- Malaria rapid diagnostic test and/or blood slide for malaria parasites

Treatment

Nonpharmacological treatment

- Encourage breastfeeding.
- Ensure adequate fluid and calorie intake.

Pharmacological treatment

- Give artemether-lumefantrine.

  Artemether-lumefantrine (strength 20/120 mg) is given based on predefined weight bands, as shown in Table 6.1.

Table 6.1. Artemether-lumefantrine regimen

Weight (kg)	Dose	First	Second	Third	Fourth	Fifth	Sixth	Colour
	Hours	0	8	24	36	48	60	
	Age	Tablets	Tablets	Tablets	Tablets	Tablets	Tablets	
5 up to 15	3 months up to 3 years	1	1	1	1	1	1	Yellow
15 up to 25	3 years up to 8 years	2	2	2	2	2	2	Blue
25 up to 35	8 years to 12 years	3	3	3	3	3	3	Red
35 and above	12 years and above	4	4	4	4	4	4	Green

Adapted from: Ministry of Health, Community Development, Gender, Elderly and Children. 2016. *Malaria National Treatment Guidelines*.

Note:

- If there is no improvement or child's condition worsens within 2 days, re-evaluate or refer the child for further management.
- In case of nonresponse to treatment with artemether-lumefantrine, give dihydroartemisinin-piperaquine. The recommended dose is 4 mg/kg of dihydroartemisinin and 18 mg/kg of piperaquine once a day for 3 days.

6.2. MENINGITIS

This is an infection of the central nervous system (CNS) mainly involving the meninges.

Diagnostic criteria

Children under 2 months

- Fever or history of fever or low temperature (< 35.5^{O}C) with any of the following:
  - Irritability
  - Unable to breastfeed
  - Vomiting everything
  - High-pitched cry
  - Convulsions
  - Lethargy/unconscious
  - Apnoeic attacks
  - Stiff neck
  - Bulging fontanelle

Children 2 months and older

- Fever or history of fever and any of the following:
  - Altered level of consciousness
  - Convulsions
  - Bulging of fontanelle and stiff neck
  - Headache
  - Irritability
  - Confusion
  - Projectile vomiting

Investigations

- CSF for microbiology, biochemistry, and cytology
- Blood culture
- Urine culture
- FBP
- Renal function test

- CRP
- RBG
- Serum electrolytes
- For newborns, consider septic screen (ear swab, cord swab, skin lesion swab)

Treatment

Pharmacological treatment

Infants under 3 months

- Give ampicillin 50 mg/kg/dose IV every 6 hours and gentamicin 7.5 mg/kg once daily for 14 days (for treatment of newborns, refer to Chapter 3).

  OR

  Give ceftriaxone 50 mg/kg every 12 hours or 100 mg/kg once daily for 14 days.

3 months to under 18 years old

- Give ceftriaxone 100 mg/kg IV once daily for 14 days.
  OR

  Give chloramphenicol 25 mg/kg IV every 6 hours and ampicillin 50 mg/kg every 6 hours for 14 days.

6.3. SEPTICAEMIA

This is a severe bloodstream infection associated with toxaemia manifesting with target organ dysfunction.

Diagnostic criteria

Fever or hypothermia with:

- General danger signs
- Signs of septic shock
- Target organ dysfunction (disseminated intravascular coagulopathy, acute kidney injury, encephalopathy, hepatic dysfunction)

Investigations

Perform septic screen, including but not limited to:

- Blood for culture and sensitivity
- Urinalysis
- Urine culture
- FBP
- Renal function tests
- Liver function tests
- CRP

Treatments

Nonpharmacological treatment

- Encourage breastfeeding.
- Ensure adequate fluid and calorie intake.
- Give oxygen 1–2 L/min.

Pharmacological treatment

- Give ampicillin 50 mg/kg IV every 6 hours and gentamicin 7.5 mg/kg IV once a day for 10 days.
- Give cloxacillin 50 mg/kg IV every 6 hours if staphylococcal infection is suspected (e.g., presence of impetigo or abscess).
- Give paracetamol 15 mg/kg by mouth if high fever (temperature ≥ 38.5°C).

Note: If no improvement, give specific antibiotics depending on culture and sensitivity pattern.

6.4. TYPHOID FEVER

This is a systemic disease resulting from infection by *Salmonella typhi* and *S. paratyphi*, serotypes A and B, respectively. Infection is acquired through ingestion of contaminated food and water.

Diagnostic criteria

- Headache

- Paradoxycal haemodynamic state
- Roth spots in the periumbilical area
- Increasing O titters

Investigations

- Widal test
- Indirect fluorescent Vi antibody
- ELISA immunoglobulin M and G
- Blood and stool cultures

Treatment

Nonpharmacological treatment

- Encourage feeding and breastfeed if child is still breastfeeding.
- If patient has dehydration, manage accordingly.

Pharmacological treatment

- Give ciprofloxacin 15 mg/kg by mouth every 12 hours for 10 days.
  OR

  Give azithromycin 10 mg/kg by mouth once a day for 7 days.
  OR

  Give cefixime 10 mg/kg IV or IM every 12 hours for 14 days.
  PLUS
- Give paracetamol 15 mg/kg by mouth every 8 hours for 5 days.

Note: Ciprofloxacin is safe to use in children.

6.6. SEPTIC ARTHRITIS AND OSTEOMYELITIS

This is an infection of joints and bones usually caused by the haematogenous spread of bacteria, by an adjacent focus of infection, or penetrating injuries. It can be acute or chronic.

Diagnostic criteria

- Unable to move the affected limb or joint or bear weight on the affected leg and is febrile
- Swelling, tenderness, and warmth over the joint or bone
- Periostial bone reaction may be seen
- If chronic osteomyelitis:
  - Discharging sinuses may be present.
  - X-ray of bone shows sequestrum.

Investigations

- FBP
- Blood for culture and sensitivity
- If septic arthritis aspirate fluid for microbiology, cytology and biochemistry
- CRP and ESR

Note: X-rays may not be helpful in early stages of the disease.

Treatment

Nonpharmacological treatment

- Encourage breastfeeding.
- Ensure adequate fluid and calorie intake.
- Rest the affected limb.

Pharmacological treatment

For children 3 years old or younger

- Give ampicillin 50 mg/kg IV every 6 hours for 3 days. Once temperature returns to normal, give amoxicillin 40 mg/kg by mouth every 12 hours for 3 weeks for septic arthritis and 5 weeks for osteomyelitis.
- If no response to above, give cefotaxime 50 mg/kg IV every 8 hours. Once temperature returns to normal, give oral cefixime 4 mg/kg every 12 hours for 3 weeks for septic arthritis and 5 weeks for osteomyelitis.
- Give paracetamol 15 mg/kg by mouth for pain and high fever.

For children under 3 years old

- Give cloxacillin 50 mg/kg IV every 6 hours or chloramphenicol 25 mg/kg IV every 6 hours until temperature returns to normal, then give flucloxacillin 25 mg/kg by mouth every 6 hours for 3 weeks for septic arthritis and 5 weeks for osteomyelitis.
- If no responses to above, give cefotaxime 50 mg/kg IV every 8 hours until temperature returns to normal, then give cefixime 4 mg/kg by mouth every 12 hours for 3 weeks for septic arthritis and 5 weeks for osteomyelitis.
- Give paracetamol 15 mg/kg by mouth for pain and high fever.

CHAPTER 7. ACUTE MALNUTRITION

Acute malnutrition (wasting) is a rapid decline of weight, though height remains unchanged. It is a reflection of inadequate dietary intake or acute infection. It is classified as severe acute or moderate acute malnutrition according to the degree of wasting and the presence or absence of oedema.

7.1. SEVERE ACUTE MALNUTRITION

This is defined as oedema of both feet and visible severe wasting.

Diagnostic criteria

- Visible severe wasting
- Oedema of both feet
- Weight for length/height < -3SD
- Mid-upper arm circumference < 11.5 cm

Investigations

- RBG
- Blood sample for malarial parasite smear
- Septic screening: urine culture, blood culture, swab cultures
- FBP
- HIV screening
- Chest X-ray

Treatment of Severe Acute Malnutrition

The management of severe malnutrition involves 10 steps in three phases: stabilization, transition, and rehabilitation.

Stabilization

This is the initial phase in the management of severe acute malnutrition when acute complications and metabolic derangements are addressed.

Treat/prevent hypoglycaemia

- Give 50 mL 10% glucose by mouth or NGT if unable to feed, or 50mL of sugar water (1 rounded teaspoon sugar in 3 tablespoons of water).
- Give 10% glucose 5 mL/kg IV bolus if RBG <3 mmol/L or 54 mg/dL followed by 10% glucose or sugar water 50 mL by NGT for unconscious, lethargic, or convulsing child.
- Give F-75 a half-hour after giving glucose. Feed every 2 hours. Give one-quarter of the every-2-hour amount of F-75 every half-hour during the first 2 hours to an unconscious child.

Treat/prevent hypothermia (axillary temperature < 35ºC or rectal temperature < 35.5ºC)

- Change wet clothes and beddings promptly.
- Cover the child, including the head and feet, with a warm blanket and place a heater (not pointing directly at the child) or lamp nearby.
- Keep room temperature at 28–32°C.

Note: Do not use hot water bottles to warm the child.

Treat/prevent dehydration

Assume dehydration if there is a recent history of diarrhoea and/or vomiting.

- Give ReSoMal 5 mL/kg every 30 minutes for 2 hours, then 10 mL/kg every hour, alternating hourly with F-75, for the next 4–10 hours.
- If ReSoMal is unavailable, give one-half strength ORS.
- Give zinc 20 mg (children 6 months or older) or 10 mg (children less than 6 months) by mouth once a day for 10 days.
- Continue breastfeeding throughout treatment.

Note:

- Do not give IV fluids to severely malnourished children, except those in shock.

Do not give ReSoMal in case of profuse watery diarrhoea (e.g., cholera); instead, give ORS without changing the amount and frequency.

Prevention of dehydration

Give ReSoMal after every watery stool as follows:

- For children under 2 years old, give 50–100 mL after each watery stool.
- For children over 2 years old, give 100–200 mL after each watery stool.

Correct electrolyte imbalance

- Give extra potassium 3 mmol/kg daily.
- Give extra magnesium 0.4 mmol/kg daily.
- When rehydrating, give ReSoMal.
- Prepare food without salt.

Note: Commercially prepared F-75/F-100 contains micronutrients; they do not require extra micronutrient supplements.

Treatment of infections

- Give ampicillin 50 mg/kg IV every 6 hours for 2 days, then amoxicillin DT 40 mg/kg by mouth every 12 hours for 5 days.
  AND

  Give gentamicin 7.5 mg/kg IV once daily for 7 days.

Micronutrients supplementation

- Give folic acid 5 mg on day 1, then 1 mg daily for 3 months.
- Give iron 3 mg/kg once a day for 3 months during rehabilitation.

Note: Commercially prepared F-75/F-100/ready-to-use therapeutic food contains micronutrients; they do not require extra micronutrient supplements.

Dietary management

- Give F-75 11 mL/kg every 2 hours (12 feeds/day).
  OR

  For stable children, give F-75 16 mL/kg every 3 hours (8 feeds/day).
- If a child has severe oedema, give F-75 8.5 mL/kg every 2 hours.
  OR
  For stable children, give F-75 12.5mL/kg every 3 hours.

Note: Do not give food other than F-75 and breast milk.

Transition phase

This is a short period between the stabilization and rehabilitation phase to assess if the child can tolerate F-100.

Criteria to move from stabilization phase to transition phase

- Appetite has improved.
- Lost of has a minimal oedema.
- Medical complications treatment has commenced and patient has improved.
- IV fluids and NGT feeding completed.
- Child can take food orally.

Dietary management

- Replace F-75 feeds with the same amount of F-100 for the first 2 days.
- On the third day, increase amount of F-100 given by 10 mL in each successive feed as long as child finishes feeds.

Rehabilitation phase

This phase is associated with full recovery and rapid catch-up of lost weight. In this phase, use either F-100 or ready-to-use therapeutic food.

Dietary management

- Give 25 mL/kg of F-100 every 3 hours.

Ready-to-use therapeutic food

- Do appetite test.
- If passed, give 200 Cal/kg per day of ready-to-use therapeutic food.
- Encourage drinking water after eating ready-to-use therapeutic food.
- Give additional foods if demanded as long as full amount of prescribed ready-to-use therapeutic food has been consumed.

Table 7.1. Ready-to-use therapeutic food volumes for children during the rehabilitation phase in inpatient treatment and care and during over the counter

Weight (kg)	Ready-to-Use Therapeutic Food Paste		Ready-to-Use Therapeutic Food Sachets*	
	Per day (g)	Per week (g)	Per day (sachets)	Per week (sachets)
3.0–3.4	105	750	1.25	8
3.5–3.9	130	900	1.5	11
4.0–5.4	200	1,400	2	14
5.5–6.9	230	1,600	2.5	18
7.0–8.4	260	1,800	3	21
8.5–9.4	320	2,300	3.5	25
9.5–10.4	370	2,600	4	28
10.5–14.9	400	2,800	4.5	32
15.0–19.9	450	3,200	5	35
20.0–29.9	550	3,900	6	40
30.0–39.9	650	4,500	7	50
40.0–60.0	740	5,100	8	55

*The calculation based on ready-to-use therapeutic food sachets of 92 g that provides 500 Cal.

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Sensory stimulation and emotional support

Provide:

- Tender, loving care
- A cheerful, stimulating environment
- Structured play therapy for 15–30 minutes a day
- Physical activity as soon as the child is well
- Support for maternal involvement

Preparation for discharge and follow-up

Discharge only if all of the following criteria are met:

- No medical complication
- Passed appetite test
- No oedema

Follow-up

- Monitor weight weekly.
- If there is weight loss or no weight gain, readmit.

Discharge from outpatient follow-up

- If weight for length/height is at least -2SD or mid-upper arm circumference is at least 12.5 cm.

Table 7.2. Time frame for the management of the child with severe malnutrition

	Stabilization/Transition*		Rehabilitation
	Day 1–2	Day 3–7	Week 2–6
1. Treat/prevent hypoglycaemia			
2. Treat/prevent hypothermia			
3. Treat/prevent dehydration			
4. Correct electrolyte imbalance			
5. Treat/prevent infection			
6. Correct micronutrient deficiencies	No iron	No iron	Give iron
7. Start cautious feeding			
8. Achieve catch-up growth			
9. Provide sensory stimulation and emotional support			
10. Prepare for discharge and follow-up after recovery			

*Iron should be given when the patient has shown clinical improvement with good appetite and weight gain of 10 g/kg/day.
Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website.
http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

7.2. SEVERE ANAEMIA

Anaemia is common in children with severe malnutrition. Severe anaemia is defined as Hb < 4 g/dL (PCV < 12%) or Hb of 4–6 g/dL with signs of respiratory distress/heart failure.

Management

- Give10 mL/kg packed red blood cells or 10 mL/kg whole fresh blood slowly over 3 hours. If child has signs of cardiac failure, give packed red blood cells rather than whole blood.
- Give furosemide 1 mg/kg IV at the start of blood transfusion.
- Stop all oral intake and IV fluids during blood transfusion.
- Stop blood transfusion if a child develops fluid overload.
- Do not give iron in stabilization and transition phases of treatment.
- Do not repeat blood transfusion within 4 days.

7.3. HEART FAILURE

Heart failure is usually a complication of overhydration. It can also be caused by very severe anaemia.

Clinical signs

- Difficulty in breathing, grunting respiration
- An acute increase in respiratory rate more than five breaths per minute or pulse rate of more than 25 beats per minute (during rehydration)
- Basal lung crepitations
- Gallop rhythm
- Prominent superficial and neck veins
- A sudden increase in liver size with tenderness
- Engorgement of the neck veins when the abdomen (liver) is pressed
- Physical deterioration with a gain in weight
- Increasing oedema or reappearance of oedema during treatment
- An acute fall in haemoglobin concentration

Treatment of heart failure

- Stop all oral intakes or IV fluids.
- Administer furosemide 1 mg/kg IV as a single dose.
- Do not give fluid or food until the heart failure has improved (i.e., respiratory rate and pulse rate are slower).
- Avoid giving digoxin to severely malnourished children.

Feeding infants under 6 months

For breastfeeding infant, assist mother to breastfeed or express breast milk.

- Give the prescribed amount of feeding in addition to the breast milk.
- Give expressed breast milk, F-75, or F-100 diluted for children with or without oedema in that order of preference.

Table 7.3. Maintenance amounts of F-75/F-100, diluted to give to an infant aged < 6 months who is breastfed

Body Weight (kg)	Volume per Feed If 8 Feeds per Day	Daily Total
≥ 1.2	25 mL per feed	200 mL per day
1.3–1.5	30	240
1.6–1.7	35	280
1.8–2.1	40	320
2.2–2.4	45	360
2.5–2.7	50	400
2.8–2.9	55	440
3.0–3.4	60	480
3.5–3.9	65	520
4.0–4.4	70	560

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Table 7.4. Amounts of F-100, diluted, or F-75 to give to an infant aged < 6 months who is not breastfed

Stabilization phase		
Body Weight (kg)	**Volume of F-100-Diluted or F-75 If 8 Feeds per Day**	**Daily Volume**
≤ 1.5	30 mL per feed	240 mL per day
1.6–1.8	35	280
1.9–2.1	40	320
2.2–2.4	45	360
2.5–2.7	50	400
2.8–2.9	55	440
3.0–3.4	60	480
3.5–3.9	65	520
4.0–4.4	70	560

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Table 7.5. Amount of F-75/F-100 in transition phase

Body Weight (kg)	Volume of F-75/F-100 Diluted per Feed If 8 Feeds	Daily Volume
≤ 1.5	45	360
1.6–1.8	55	440
1.9–2.1	60	480
2.2–2.4	70	560
2.5–2.7	75	600
2.8–2.9	83	664
3.0–3.4	90	720
3.5–3.9	95	760
4.0–4.4	105	840

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Table 7.6. Amount of F-75/F-100 in rehabilitation phase

Body Weight (kg)	Volume of F-75/F-100, Diluted per Feed If 8 Feeds per Day	Daily Volume
≤ 1.5	60	480
1.6–1.8	70	560
1.9–2.1	80	640
2.2–2.4	90	720
2.5–2.7	100	800
2.8–2.9	110	880
3.0–3.4	120	960
3.5–3.9	130	1,040
4.0–4.4	140	1,120

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Table 7.7. Recipes for F-75 and F-100

	F-75 (starter)	F-100 (catch-up)
Dried skimmed milk (g)	25	80
Sugar (g)	100	50
Vegetable oil (g)	30 or 35 mL	60 or 70 mL
Electrolyte/mineral solution (ML)*	20	20
Water: make up to	1,000 mL	1,000 mL
(*3 g combined mineral and vitamin mixture [CMV] can replace 20 mL electrolyte/mineral solution)		
Contents per 100 mL		
Energy (Cal)	75	100
Protein (g)	0.9	2.9
Lactose (g)	1.3	4.2
Potassium (mmol)	4	6.3
Sodium (mmol)	0.6	1.9
Magnesium (mmol)	0.43	0.73
Zinc (mg)	2	2.3
Copper (mg)	0.25	0.25
% energy from protein	5	12
% energy from fat	36	53
Osmolarity (mOsm/L)	413	419

Adapted from: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

CHAPTER 8. HIV/AIDS

8.1. HIV/AIDS

HIV/AIDS is a disease of the human immune system caused by infection with HIV. AIDS occurs when a person with HIV develops severe immunosuppression, opportunistic infections, or malignancies/cancers. Such conditions are severe weight loss, Kaposi's sarcoma, cryptococcal meningitis, pneumocystis pneumonia, toxoplasmosis, cytomegalovirus, retinitis, etc.—this is WHO's HIV Clinical Stage 4.

Diagnostic criteria

- HIV-positive antibody test for children under 18 months old
- Positive DNA polymerase chain reaction for HIV (indicated for children under 18 months old)
- Presumptive diagnostic of severe HIV in children under 18 months should be made if:
  - HIV antibody-positive
    AND

    A diagnostic of any AIDS indicator condition(s)
    OR

    The child is symptomatic with two or more of the following:
    - Oral thrush
    - Severe pneumonia
    - severe sepsis

Investigations

- Antibody tests for HIV: Bioline, Uni-Gold, and ELISA
- DNA polymerase chain reaction for HIV (indicated for children under 18 months old)
- CD4+/CD8+
- Viral load

- FBP, serum creatinine, BUN, aspartate aminotransferase, alanine aminotransferase, chest X-ray (for evaluation and monitoring of antiretroviral therapy [ART])

Treatment

Pharmacological treatment

Table 8.1. Recommended first-line antiretroviral therapy for under 15 years old

Patient Group	Preferred First Line	Alternatives
Children under 3 years	ABC/3TC+LPV/r	AZT/3TC+LPV/r AZT/3TC/NVP
Children 3–5 years	ABC/3TC+LPV/r	AZT/3TC+EFV ABC/3TC+EFV TDF/3TC/EFV AZT/3TC+LPV/r AZT/3TC/NVP
For TB-coinfected children 3–15 years already on an LPV/r-based regimen	ABC/3TC+LPV/r	
For newly initiated TB-coinfected children 3–15 years	ABC/3TC+EFV	ABC/3TC+LPV/r, but the dose of LPV/r should be doubled due to the interaction between ritonavir and rifampicin

3TC = lamivudine, ABC = abacavir, AZT = azidothymidine, EFV = efavirenz, LPV/r = lopinavir/ritonavir, NVP = nevirapine

Adapted from: Ministry of Health, Community development, Gender, Elderly and Children. 2017. *National Guidelines for the Management of HIV and AIDS*.

Note: Children under 2 years old with weight above 35 kg can use tenofovir.

Table 8.2. Recommended second-line antiretroviral therapy for under 15 years old

Patient Group	If on the Following First-Line	Preferred Second-Line
Children under 3 years	ABC/3TC+LPV/r AZT/3TC/NVP	ABC/3TC+LPV/r AZT/3TC+LPV/r
Children 3–15 years	ABC/3TC+LPV/r	AZT/3TC+EFV ABC/3TC+EFV TDF/3TC/EFV

3TC = lamivudine, ABC = abacavir, AZT = azidothymidine, EFV = efavirenz, LPV/r = lopinavir/ritonavir, NVP = nevirapine

Adapted from: Ministry of Health, Community development, Gender, Elderly and Children. 2017. *National Guidelines for the Management of HIV and AIDS*.

Note:
For dosing of antiretroviral regimens, see Annex 4 paediatric antiretroviral dosage.

- Tenofovir may only be given to children under 2 years old and above 35 kg.
- Atazanavir/ritonavir can be used as an alternative to lopinavir/ritonavir in children over 6 years old if paediatric formulation is available, but adolescents under 40 kg can take adult formulation.
- All children failing second-line ART require expertise review, so follow referral procedure as stipulated in the national HIV/AIDS guideline.

Table 8.3. Third-line regimens for paediatrics and adolescents

Patient Group	Third-Line Options
Children under 12 years	RAL+DRV/r+ETV RAL + 2 NRTIs DRV/r + 2 NRTIs DRV/r + RAL ± 1-2 NRTIs
Children 12 years and above	DTG+DRV/r+ETV DTG (or RAL) + 2 NRTIs DRV/r + 2 NRTIs DRV/r + DTG (or RAL) ± 1-2 NRTIs

DRV/r = darunavir/ritonavir, DTG = dolutegravir, ETV = etravirine, NRTI = nucleoside reverse transcriptase inhibitor, RAL = raltegravir
Adapted from: Ministry of Health, Community development, Gender, Elderly and Children. 2017. *National Guidelines for the Management of HIV and AIDS*.

Give co-trimoxazole 6–8 mg/kg by mouth or trimethoprim once daily to the following:

- All exposed infants until HIV infection is excluded from 4–6 weeks of age
- All children under 5 years old confirmed to be HIV infected regardless of symptoms or CD4%
- All HIV-infected children under 5 years old who are symptomatic (WHO Clinical Stages 2, 3, or 4) or with a CD4 of under 350

Table 8.4. Recommended dosages of co-trimoxazole prophylaxis

Recommended Daily Dose	Suspension (5 mL of syrup 200 mg/40 mg)	Child Tablet (100 mg/20 mg)	Single Strength Adult Tablet (400 mg/80 mg)
< 6 months (< 5 kg)	2.5 mL	One tablet	-
6 months–5 years (5–15 kg)	5 mL	Two tablets	Half tablet
6–14 years (15–30 kg)	10 mL	Four tablets	One tablet
> 14 years (> 30 kg)	-	-	Two tablets

Adapted from: Ministry of Health, Community development, Gender, Elderly and Children. 2017. *National Guidelines for the Management of HIV and AIDS*.

8.2. PROPHYLAXIS FOR HIV-EXPOSED INFANTS

- Administer nevirapine syrup immediately after birth to all HIV-exposed infants and continue until 6 weeks of age.
- In case a high-risk infant is identified, administer additional azidothymidine syrup (twice daily) for the first 6 weeks of life.

  High-risk infants are those who are:

  - Born to women with established HIV infections who have received less than 4 weeks of ART at the time of delivery
    OR

    Born to women with established HIV infection with viral load over 1,000 copies/mL in the 4 weeks before delivery

    OR

    Born to women with incident HIV infection during pregnancy or breastfeeding

    OR

    Identified for the first time during the postpartum period, with or without a negative HIV test prenatally
- Infant prophylaxis is most effective when given immediately after birth, preferably within 6–12 hours.

Table 8.5. Infant nevirapine dosing

Infant Age	Nevirapine Daily Dosing
Birth to 6 weeks • Birthweight 2,000–2,499 g • Birthweight ≥ 2,500 g	 10 mg once daily 15 mg once daily

Adapted from: Ministry of Health, Community development, Gender, Elderly and Children. 2017. *National Guidelines for the Management of HIV and AIDS*.

Based on the dosing required to sustain exposure in the infant of over 100 ng/mL with the fewest dose changes:

- Low-birthweight infants under 2,000 g should receive mg/kg dosing; suggested starting dose is 2 mg/kg once daily.

Table 8.6. Infant azidothymidine dosing

Infant Age	Azidothymidine Twice Daily Dosing
Birth to 6 weeks • Birthweight 2,000–2,499 g • Birthweight ≥ 2,500g	 10 mg twice daily 15 mg twice daily

Adapted from: Ministry of Health, Community development, Gender, Elderly and Children. 2017. *National Guidelines for the Management of HIV and AIDS*.

- Low-birthweight infants (under 2,000 g) should receive mg/kg dosing; suggested starting dose is 4 mg/kg twice daily.

Management of HIV-related conditions

The treatment of most infections (such as pneumonia, diarrhoea, and meningitis) in HIV-infected children is the same as for other children. However, some HIV-related conditions require specific management; these are described below.

Pneumocystis jiroveci pneumonia

This is a serious infection that causes inflammation of the lungs. It is caused by a fungus called *Pneumocystis jiroveci*. It is the major cause of severe pneumonia and death in HIV-infected infants.

Diagnostic criteria

- Marked respiratory distress (chest in-drawing, cyanosis, inability to drink)
- Severe persistent cyanosis/hypoxia (SpO_2 < 90%)

Investigations

- Chest X-ray
- Sputum induction with nasopharyngeal aspirate stained with giemsa or silver, or immunofluorescent stains
- Broncho alveolar lavage
- ABG analysis

Treatment

Nonpharmacological treatment

- Give oxygen therapy.
- Maintain adequate fluid and calorie intake.

Pharmacological treatment

- Give high-dose co-trimoxazole IV or 8 mg/kg by mouth TMP-40 mg/kg sulfamethoxazole given every 8 hours for 21 days.
- Give prednisone at 1–2 mg/kg daily for 7–14 days (taper if given for more than 7 days).

Oral and oesophageal candidiasis

This is the fungal infection of the mucosa lining of the oral cavity and oesophagus.

Diagnostic criteria

- For oral candidiasis, white patches on the oral cavity
- For oesophageal candidiasis, present with refusal to feed and crying during, with white patches on the oral cavity extending to the oesophagus

Treatment

Nonpharmacological treatment

- Clean the mouth at least four times a day, using clean water or salt solution and a clean cloth rolled into a wick.
- Apply 0.25% or 0.5% gentian violet to any sores.

Pharmacological treatment

For oral candidiasis:

- Give nystatin oral suspension 200,000 IU every 6 hours for 14 days. OR
  Give 2% miconazole oral gel 5 mL every 12 hours for 2 weeks.

For oesophageal candidiasis:

- Give fluconazole 3–6 mg/kg by mouth once per day for 7 days.
  OR
  Give fluconazole 3–6 mg/kg IV once per day for 7 days.

CHAPTER 9. CARDIOVASCULAR DISORDERS

9.1. CONGESTIVE HEART FAILURE

A state in which the heart cannot deliver an adequate cardiac output to meet the metabolic needs of the body. Causes include congenital heart diseases (CHDs), rheumatic heart diseases, rheumatic fever, cardiomyopathies, and cardiac arrhythmias. Noncardiac causes are severe anaemia and cor pulmonale as a result of severe acute or chronic lung diseases, like severe pneumonia and bronchial asthma.

Diagnostic criteria

Diagnosis is clinical. A patient may present with the following signs and symptoms:

- Shortness of breath, interrupted breastfeeding or inability to feed, excessive sweating, and failure to thrive
- Tachycardia, tachypnoea, and tender hepatomegaly
- Older children may have oedema of the feet, face, or distended neck veins (raised jugular venous pressure)
- Hypotension with weak pulses, cold peripheries, and poor capillary refill occurs in severe acute heart failure

Investigations

- Pulse oximetry (oxygen saturation) and ABG analysis (hypercapnia/hypocapnia, hypoxaemia)
- FBP
- Serum electrolytes
- Serum creatinine and BUN
- Other investigations related to the possible underlying cause (e.g., echocardiogram in case of CHD)

Treatment

- The main goal is to treat the specific cause.

Nonpharmacological treatment

If the patient has respiratory distress, low cardiac output, or poor perfusion, support the airways, breathing, and circulation.

- Give oxygen 2–4 L/min if the child has central cyanosis, SpO2 < 90% or severe respiratory distress (respiratory rate of ≥ 70/min).
- Nurse the child in a semipropped-up position (cardiac position).
- Insert NGT for feeding.
- Transfuse blood (packed red blood cells) in case of severe anaemia.
- Give paracetamol in case of ≥ 38.5°C.
- Monitor pulse rate, blood pressure, respiratory rate, and temperature every 6 hours.
- Educate and involve parents/guardians in management (low-salt diet, complete bed rest until decompensation ends).

Pharmacological treatment

Give:

- Digoxin
- Digitalization 12.5 mg/kg by mouth every 8 hours for 24 hours
- If oral route not possible, 10 mg/kg IV every 8 hours, each given over 15 minutes for the first 24 hours
- Maintenance dose 5 mg/kg (0.005mg/kg) by mouth every 12 hours

  Note: Nausea, vomiting, blurring of vision, bradycardia may indicate digoxin toxicity.

AND

- Furosemide 2 mg/kg by mouth once a day
- Spironolactone 2 mg/kg by mouth once a day

If no improvement, add:

- Captopril 1 mg/kg by mouth every 12 hours
  OR
  Enalapril 0.2 mg/kg by mouth every 12 hours

If the patient presents with anxiety, stress, or dyspnoea, give morphine 0.2 mg/kg IV/IM/SC or by mouth every 4 hours.

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

9.2. CONGENITAL HEART DISEASES

Heart diseases that occur during intrauterine life and can be diagnosed in utero, at birth, or later on.

Diagnostic criteria

- Failure to thrive
- Interrupted breastfeeding
- Recurrent cough and difficulty in breathing
- Cyanosis and digital clubbing
- With echocardiographic evidence of CHD

Investigations

- Chest C-ray
- Electrocardiogram
- Echocardiogram

Treatment

9.2.3.1. Nonpharmacological treatment

- Give oxygen in case of respiratory distress or hypercyanotic attack.
- Ensure adequate dietary and fluid intake.

Complications

Common complications are congestive heart failure and paroxysmal hypercyanotic or hypoxic spells. Manage congestive cardiac failure as in Section 9.1.

Paroxysmal hypercyanotic spells

Such spells occur in children with congenital cyanotic heart diseases (tracheoesophageal fistula, tricuspid atresia, pulmonary atresia).

Diagnostic criteria

- Dyspnoea/tachypnoea
- Restlessness
- Syncope
- Worsening of cyanosis
- Convulsions, lethargy, unconsciousness, or hemiparesis

Treatment

Nonpharmacological treatment

- Put patient in knee chest position.
- Give 100% oxygen 4 L/min.

Pharmacological treatment

- Give morphine IV/IM/SC or 0.2 mg/kg by mouth every 4 hours.
- If no improvement response, give sodium bicarbonate 4.2% 2 mL/kg IV slowly.
- Give normal saline 20 mL/kg or transfuse blood if indicated.
- Give propranolol 0.1 mg/kg IV slowly in severe spells OR 1 mg/kg by mouth every 12 hours (continued until surgery is done).
- If all above methods fail, general anaesthesia may be attempted in the intensive care unit.

Note: Refer all patients with CHD to a facility with adequate expertise and facilities.

9.3. ACQUIRED HEART DISEASES

Acute rheumatic fever

This is a nonsuppurative sequela of a group A beta haemolytic streptococcal pharyngeal infection.

Diagnostic criteria

- Primary episode of rheumatic fever
  - Two major or one major plus two minor, plus evidence of preceding streptococcal infection
- Rheumatic fever recurrence in a patient without rheumatic heart disease
  - Two major or one major, plus two minor, plus evidence of preceding streptococcal infection
- Rheumatic fever recurrence in a patient with rheumatic heart disease
  - Two minor, plus evidence of preceding streptococcal infection

Major criteria:

- Migratory polyarthritis
- Sydenham's chorea
- Carditis
- Erythema marginatum
- Subcutaneous nodules

Minor criteria:

- Evidence of recent streptococcal infection based on isolation of beta haemolytic *Streptococcus* from the throat swab, antistreptolysin O titre above 200 units/mL or a reliable history of tonsillitis in the preceding month
- Fever
- Arthralgia
- Elevated acute phase reactant proteins (ESR, CRP) or prolonged pulse rate interval
- Previous evidence of rheumatic fever based on a reliable history of a previous attack or upon the existence of previous cardiac damage

Investigations

- FBP and ESR
- CRP
- Antistreptolysin O titre
- Electrocardiogram

- Chest X-ray
- Echocardiogram

Treatment

Nonpharmacological treatment

- Encourage bed rest.
- Ensure adequate nutrition and fluid intake.

Pharmacological treatment

- Give a single dose of benzathine penicillin IM
  - 0.6 MU (≤ 20kg)
  - 1.2 MU (> 20kg)
    OR
- Penicillin V by mouth for 10 days
  - 1 month–1 year: 62.5 mg every 8 hours
  - 1–6 years: 125 mg every 8 hours
  - 6–12 years: 250 mg every 8 hours and
  - > 12 years: 500 mg every 8 hours
- In case of penicillin allergy:
  - Give erythromycin 12.5 mg/kg by mouth every 6 hours.
    OR

    Give cephalexin 25 mg/kg by mouth every 8 hours for 10 days.

Pharmacological treatment of arthritis and carditis

- Give aspirin 30 mg/kg by mouth every 6 hours, reduced to one-third once fever and joint pain have been abolished. Thereafter, continue until the ESR returns to normal.
- If cardiac signs progress despite adequate dose of aspirin or in case of a relapse, add:
  - Give prednisolone 1 mg/kg by mouth every 12 hours for 3–4 weeks.
- Then reduce the dose gradually and discontinue when there is reduction in clinical disease.
- Aspirin is continued for at least 2 weeks thereafter.

- Pharmacological treatment of Sydenham's chorea
- Give haloperidol 0.5 mg/kg by mouth every 12 hours until symptoms subside.

Prevention of relapses of rheumatic fever

- Benzathine penicillin IM should be given every 4 weeks as routine:
  - Children ≤ 20 kg: 0.6 MU
  - Children > 20 kg: 1.2 MU
- Penicillin V 250 mg by mouth every 12 hours may be used instead of benzathine penicillin.
- Treat patients without proven carditis for 5 years after the last attack or until 18 years of age (whichever is longer).
- Treat patients with carditis for 10 years after the last attack or until 26 years of age (whichever is longer).
- For patients with more severe valvular disease or who have had valve surgery, prophylaxis should be lifelong.

Rheumatic heart diseases

These are complications of acute rheumatic fever and cause permanent damage to the heart valves.

Diagnostic criteria

- Dyspnoea on exertion, cough, wheezing
- Orthopnoea
- Paroxysmal nocturnal dyspnoea
- Haemoptysis
- Exercise intolerance
- Bounding pulses, increased precordial activity and impulse, displaced apical impulse, increased S_2 if there is pulmonary hypertension
- WITH evidence of valvular lesion on echocardiogram

Investigations

- Electrocardiogram
- Chest X-ray
- Echocardiogram
- Cardiac catheterization

Treatment

Nonpharmacological treatment

- Provide primary prophylaxis for infective endocarditis and secondary prophylaxis for acute rheumatic fever.
- Treat heart failure if present (refer to heart failure).

Note: Patients with valvular damage should be referred to the next-level facility with adequate expertise and facilities.

Acute myocarditis

This is an acute inflammation of the myocardium caused by viruses (Coxsackie, enterovirus, echovirus, and adenovirus), bacteria (diphtheria), fungal, parasites, or autoimmune diseases (systemic lupus erythematosus, rheumatoid arthritis, acute rheumatic fever, Kawasaki disease, and sarcoidosis).

Diagnostic criteria

- Sudden onset of features of shock and heart failure in a child who has previously been well
- Accompanyed by abdominal pain, fever, anorexia, and cough

Investigations

- Chest X-ray
- Electrocardiogram
- Echocardiogram
- FBP and ESR

Treatment

Nonpharmacological treatment

- Give oxygen therapy 2 L/min.

Pharmacological treatment

- Treat congestive cardiac failure as above.
- If signs of shock are present, give dopamine IV as a continuous infusion:
  - 1 month–18 years: 5 mcg/kg/minute adjusted according to response

    OR

    Norepinephrine 100 nanograms/kg/minute adjusted according to response

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

Cardiomyopathy

This is a disease of the heart muscle causing dilatation and/or impaired contraction. There are three types: hypertrophic, dilated, and restrictive cardiomyopathy.

Diagnostic criteria

- Angina
- Features of heart failure in severe cases

Investigations

- Electrocardiogram
- Chest X-ray
- Echocardiogram
- Cardiac catheterization
- CT
- Angiogram

Treatment for hypertrophic cardiomyopathy

Nonpharmacological treatment

- Avoid strenuous exercise.

Pharmacological treatment

- Give propranolol 2 mg/kg by mouth every 6 hours.
  OR
  Give atenolol 1 mg/kg by mouth once per day.

Treatment for dilated and restrictive cardiomyopathy

Nonpharmacological treatment

- Bed rest

Pharmacological treatment

- Give digoxin.
- Give furosemide and spironolactone dose as above.

9.4. PERICARDITIS

This is an inflammation of pericardium caused by infections (viral: Coxsackie, echoviruses, adenoviruses, influenza; bacterial: *Mycobacterium tuberculosis*, *Staphylococcus*, haemophilus influenza type B, *Neisseria meningitides*), fungi, rickettsia, and protozoa.

Other causes are postoperative (autism spectrum disorders, Fontan repair), and collagen vascular diseases (juvenile idiopathic arthritis/juvenile rheumatoid arthritis, systemic lupus erythematosus, acute rheumatic fever, Kawasaki disease).

Diagnostic criteria

- Precordial pain worsened by inspiration
- Dyspnoea
- Fever
- Cardiac tamponade

- Pulsus paradoxicus
- Distended neck veins (raised jugular venous pressure)
- Distant and muffled heart sounds
- Hepatomegaly

Investigations

- FBP and ESR
- Chest X-ray
- Electrocardiogram and echocardiogram
- Viral antibody screening (within 3–4 weeks of onset of illness)
- Antistreptolysin O titre
- Rheumatoid factor

Treatment

Nonpharmacological treatment

- Encourage bed rest.
- Give oxygen 4 L/min in case of severe respiratory distress.
- Perform pericardiocentesis (removal of pericardial fluid) if there is tamponade.
- Treat the underlying cause.
- Septic pericarditis will require intensive antibacterial treatment according to the sensitivities of the causal bacteria, preferably IV for 4 weeks (drain pericardial effusion by paracentesis or thoracotomy).

9.5. INFECTIVE ENDOCARDITIS

This is a bacterial or fungal infection of the endocardial layer of the heart, which can involve native or prosthetic valve and congenital defects/shunts.

Diagnostic criteria

For definitive infective endocarditis, you need:

- Two major criteria OR
- One major and three minor criteria OR
- Five minor criteria

For possible bacterial infective endocarditis, you need:

- One major and one minor criteria OR
- Three minor criteria

Modified Duke Criteria

Major criteria

- Positive blood cultures of typical organisms of infective endocarditis from at least two separate blood cultures
- Evidence of endocardial involvement by echocardiogram (transthoracic echocardiogram/transoesophageal echocardiogram)

Minor criteria

- Fever > 38°C
- Presence of rheumatic heart disease, CHD
- Vascular phenomena: major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, intracranial haemorrhage, conjunctival haemorrhage
- Immunological phenomena: glomerulonephritis, Osler's nodes, Roth's spots, rheumatoid factor
- Serologic evidence of active infective endocarditis or blood culture not meeting major criteria

Investigations

- Blood cultures, at least 2–3 over a 24-hour period (not only with temperature spikes)
- FBP
- Acute phase reactants (CRP and ESR)
- Urinalysis
- Chest X-ray
- Electrocardiogram and echocardiogram

Treatment

Pharmacological treatment

- Use bactericidal antibiotics for at least 6 weeks.
- Give benzyl penicillin 50,000 U/kg IM or IV every 6 hours for 6 weeks and gentamicin 7.5 mg/kg IV or IM daily for 2 weeks.
- If patient is allergic to penicillin, give vancomycin 10 mg/kg IV every 6 hours for 4 weeks.

For patients with enterococcal or resistant streptococcal endocarditis:

- Give ampicillin 50 mg/kg IV or IM every 6 hours and gentamicin 7.5 mg/kg IV or IM once a day for 6 weeks.

Patients with staphylococcal endocarditis:

- Give cloxacillin 50 mg/kg IM or IV.
  OR

  Give flucloxacillin 50 mg/kg IM or IV every 6 hours and gentamicin 7.5 mg/kg IM or IV once a day for 6 weeks.

For patients with penicillin-resistant organisms:

- Give ceftriaxone 100 mg/kg IV once a day and gentamicin 7.5 mg/kg IM or IV once a day for 6 weeks.

Antibiotic prophylaxis against bacterial endocarditis

All patients with CHD undergoing dental, gastrointestinal, or genitourinary procedures should receive antibiotic prophylaxis before the procedure.

Oral/nasal/pharyngeal procedures
Local anaesthesia:

- Give amoxicillin 50 mg/kg by mouth every hour as a preoperative single dose only.
- Penicillin-sensitive patients: Give clindamycin 20 mg/kg by mouth every hour preoperative as a single dose only.

General anaesthesia:

- Give ampicillin/amoxicillin 50 mg/kg IV at induction for a single dose only.

- Penicillin-sensitive patients: Give clindamycin 20 mg/kg IV infusion or oral for a single dose only.
- Give vancomycin 20 mg/kg IV infusion over 1 hour for a single dose only.

Gastrointestinal/genitourinary procedures

- Give ampicillin/amoxicillin 50 mg/kg IV at induction for a single dose only and gentamicin 7.5 mg/kg IV or IM.

Information for parents of children with CHDs:

Immunization: CHD is not a contraindication to immunization—indeed, it could be urged that immunization is more important still.

Exercise restriction: All children with CHD except those with aortic stenosis should be allowed to exercise.

Noncardiac surgery: Noncardiac surgery can be undertaken in a child with CHD regardless of the type of lesion or operation contemplated, unless the patient is in frank cardiac failure or has severe pulmonary hypertension.

9.6 HYPERTENSION

This is when the systolic and diastolic blood pressure us above the 95th percentile for age and sex. Most patients are asymptomatic.

Diagnostic criteria

- Elevated blood pressure for age and sex taken at more than one location
- Presence of dysmorphic features (e.g., moon facies, ambiguous or virilised genitalia)

Investigations

- Chest X-ray
- Electrocardiogram and echocardiogram
- Renal ultrasound
- 24-hour urine for catecholamines and metanephrines
- Urinalysis

- Serum electrolytes
- Serum creatinine and BUN
- Uric acid and cholesterol

Treatment

Nonpharmacological treatment

- Mild hypertension can be managed without medication.
- Encourage weight reduction (assuming the patient is obese), increased exercise, and some degree of sodium restriction.

Pharmacological treatment

- Give nifedipine 0.25 mg/kg by mouth every 8 hours.

  OR

  Give hydralazine 0.25 mg/kg by mouth every 12 hours in combination with beta blockers, such as propranolol 0.5 mg/kg, by mouth every 12 hours.

  OR

  Give atenolol 0.2 mg/kg by mouth once a day.

  OR

  Give captopril 1 mg/kg by mouth every 12 hours.

  OR

  Give enalapril 0.1 mg/kg once a day.

  OR

  Give nifedipine sublingual 0.2 mg/kg every 12 hours.

Note: Hypertension in children in most cases is secondary hypertension; refer to the next-level facility with adequate expertise and facilities.

CHAPTER 10. HAEMATOLOGICAL DISORDERS

These are conditions that affect bone marrow, blood, and its products leading to anaemia, altered haemostasis, immunity, and multiorgan dysfunction.

10.1. ANAEMIA

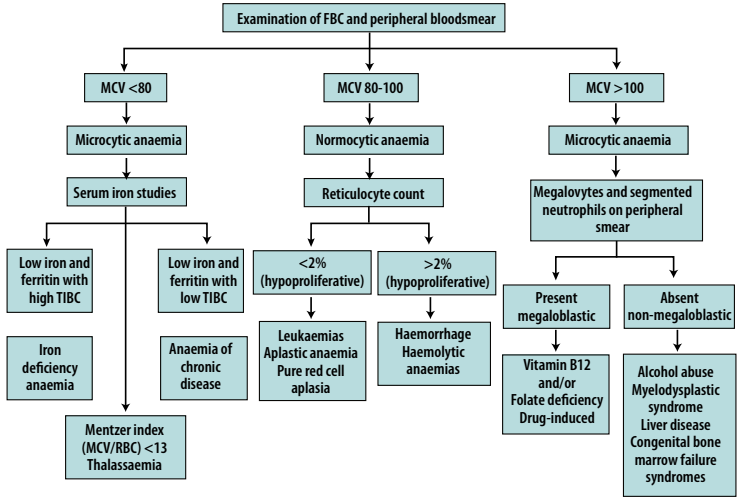
Anaemia is defined as reduced haemoglobin (Hb) concentration below established cutoff levels for age, as shown in Table 10.1.

Table 10.1. Definition of anaemia

Age	Haemoglobin Level
Less than 1 month	<14 gm/dL
1–6 months	<11.5 gm/dL
6–59 months	<11 gm/dL
5–11 years	<11.5 gm/dL
12–14 years	<12 gm/dL

Adapted from: Kliegman RM, Stanton BF, Schor NF, et al. 2016. *Nelson Pediatric Symptom-Based Diagnosis.* 20th ed. Philadelphia, PA: Elsevier.

Figure 10.1. Anaemia approach



Adapted from: Kliegman RM, Stanton BF, Schor NF, et al. 2016. *Nelson Pediatric Symptom-Based Diagnosis.* 20th ed. Philadelphia, PA: Elsevier.

Severe forms of anaemia can lead to cardiac failure. Severity of anaemia can be classified based on Hb as shown below:

- Mild anaemia: Hb 9–11 gm/dL
- Moderate anaemia: Hb 7 to < 9 gm/dL
- Severe anaemia: Hb < 7 gm/dL

Severe anaemia

Diagnostic criteria

- Severe palmar pallor
- Hb < 7 g/dL

Investigations

- FBP
- Malaria rapid diagnostic test
- Blood sample for malaria parasites smear
- PLUS specific investigations as appropriate

Treatment

- Give packed red blood cells 10 mL/kg over 3 hours if:
  - Hb is < 4 gm/dL.
    OR
    Hb is < 7 g/dL with signs of cardiac failure.
- Give furosemide 1 mg/kg IV at the initiation of blood transfusion.

Note: Provide specific treatment based on the underlying cause.

Iron deficiency anaemia

This the type of anaemia is caused by lack of iron, leading to microcytic and hypochromic red blood cells.

Diagnostic criteria

- Palmar pallor
- Koilonychia and/or glossitis in iron deficiency anaemia
- Hb less than cutoff value for age (refer to Table 10.1 above)
- Microcytic and hypochromic red blood cells

Investigations

- FBP
- Reticulocyte count
- Iron studies (serum iron, ferritin, total iron binding capacity)
- Red blood cell folate and vitamin B12

Note: Investigate for the cause of iron deficiency as appropriate.

Treatment

Nonpharmacological treatment

- Ensure adequate dietary intake rich in iron content.
- Give packed red blood cells 10 mL/kg over 3 hours.

Pharmacological treatment

- Give elemental iron 6 mg/kg by mouth in the form of ferrous sulfate or iron syrup/drops once a day for young infants for 3 months.
- If the child is 1 year or older and has not received mebendazole in the previous 6 months, give one dose of mebendazole 500 mg by mouth for possible hookworm or whipworm infestation.

Guidelines for blood transfusion

Table 10.2. Indications for blood transfusion

No.	Indication	Description
1	Acute blood loss	When 20–30% of the total blood volume has been lost and bleeding is continuing
2	Severe anaemia	Children over 1 month: If haemoglobin (Hb) is < 4 g/dL, OR Hb < 7 g/dL and has signs of heart failure or cerebral hypoxia Neonates: If Hb is < 10 mg/dL
3	Septic shock	If IV fluids are insufficient to maintain adequate circulation in addition to antibiotic therapy
4	Platelet depletion	E.g., severe thrombocytopenia: Give platelet concentrates 10 mL/kg over 3 hours
5	Clotting factors deficiency	Give clotting factors if available or fresh frozen plasma 10 mL/kg over 3 hours
6	Exchange transfusion	In neonates with severe jaundice (refer to Chapter 3)
7	For surgical patients	Preoperative Hb < 8 g/dL and surgery is associated with the probability of major blood loss. Note: Preoperative anaemia MUST be investigated, as medical management may be more appropriate than transfusion. Postoperative Hb falls below 7 g/dL

Adapted from: Kliegman RM, Stanton BF, Schor NF, et al. 2016. *Nelson Pediatric Symptom-Based Diagnosis.* 20th ed. Philadelphia, PA: Elsevier.

Note: Consider transfusion in normalvolemic patients ONLY if they have symptomatic anaemia. These symptoms include:

- Heart failure, difficulty breathing, or shortness of breath for no other reason; tachycardia for no other reason; ST depression on electrocardiogram
- Clinically detectable dehydration or shock
- Impaired consciousness
- Very high malaria parasitaemia (> 10% of red cells with parasites)

Giving a blood transfusion

Before transfusion, check the following:

- The blood is the correct group and the patient's name and number are on both the label and the form (in an emergency, cross-match group-specific blood or give O-negative blood if available).
- The blood transfusion bag has no leaks. Do not inject into the blood pack.
- The blood pack has not been out of the refrigerator for more than 2 hours, blood is not pink or has large clots, and the red cells do not look purple or black.
- There are no signs of heart failure. If present, give furosemide as above.
- Do a baseline recording of temperature, respiratory rate, and pulse rate. The volume transfused should initially be 10 mL/kg body weight of packed red blood cells, given over 3 hours.
- You have the correct amount of blood to be transfused:
  - Formula for calculating amount of packed red blood cells needed (in mL):

    3 x weights in kg x (desired Hb–current Hb)

    Example: The desired Hb is 10 gm/dL, therefore for a 20 kg child with an Hb of 6gm/dL, the required amount of blood is 3 x 20 x 4 =240 mL of packed red blood cells.
- A standard blood infusion set with an inline filter must be used to infuse all red blood cell transfusions.
- The transfusion time per unit is 2–4 hours, with a maximum time of 5 hours from the time the blood is removed from the refrigerator to the completion of transfusion.

10.2. SICKLE CELL DISEASE

Sickle cell disease refers to a group of disorders that are characterized by the presence of sickle haemoglobin (haemaoglobinopathies). The most common sickle cell disease syndrome is sickle cell anaemia (SCA).

Diagnostic criteria

- Pallor
- Jaundice
- Painful swelling of hands and feet (dactylitis)
- Bossing of the skull
- Splenomegaly
- Recurrent infections
- WITH evidence of Hb SS on Hb electrophoresis

Note: Patients are symptomatic from 3 months.

Investigations

- FBP
- Peripheral smear
- Reticulocyte count
- Sickling test and Hb electrophoresis

Note: For children with sickle cell disease:

- Give booster doses of pneumococcal polysaccharide vaccine at 2 years and 5 yearly thereafter for life.
- Give folic acid, mebendazole, and penicillin V as shown in Table 10.3.

Table 10.3. Folic acid, mebendazole, and penicillin V dosage

Drug	Dose: Child under 6 Years Old	Dose: Older Child
Folic acid	< 1 year: 1.25 mg daily 1–3 years: 2.5 mg daily 3 years: 5 mg daily	5 mg daily
Mebendazole	500 mg once every 6 months	500 mg once every 6 months
Penicillin V	< 1 year: 62.5 mg every 12 hours	Not given above 6 years of
	1–6 years: 125 mg every 12 hours	age

Source: Muhimbili National Hospital. 2014. *Management of Sickle Cell Disease Guidelines*.

Management of specific conditions

Pain

- For mild pain:
  - Reassure, reposition for comfort, massage, distraction (stories, play).
  - Give paracetamol 15 mg/kg by mouth every 6 hours.
- For moderate pain, ADD:
  - Give Ibuprofen 5 mg/kg by mouth every 8 hours.

    OR

    Give diclofenac 1 mg/kg IM orby mouth every 8 hours.
- For severe pain, ADD:
  - Give liquid morphine 0.5 mg/kg (max 20 mg) by mouth every 3 hours.

    OR

    Give pethidine 1 mg/kg IM or IV every 8 hours.

Reassess after 1 hour and give further analgesia if needed.

Hydration

- Oral fluids should be encouraged.
- For IV infusion: Recommended IV fluids are dextrose normal saline or one-half strength NaCl 0.45%. If not available, use normal saline or RL, as shown in Table 10.4.

Table 10.4. Fluid requirement in 24 hours

Body Weight (kg)	Amount of Fluid Required in 24 Hours
0–10	150 mL/kg
11–20	• 1,500 mL for the first 10 kg • PLUS 75 mL/kg for every kg above 10 kg • Added to 1,500 mL for the first 10 kg of weight
Above 20	2,250 mL for the first 20 kg of weight

Adapted from: Kliegman RM, Stanton BF, Schor NF, et al. 2016. *Nelson Pediatric Symptom-Based Diagnosis.* 20th ed. Philadelphia, PA: Elsevier.

Note: Divide total daily volume by 24 to obtain hourly rate.

Acute chest syndrome/acute chest crisis

This is a complication of SCA resulting from vasoocclusive crises of pulmonary vasculature.

Diagnostic criteria

- Pleuritic pain (worse with breathing)
- Respiratory distress
- Fever
- Wheeze
- WITH evidence of new pulmonary infiltrates on chest X-ray

Investigations

- Blood grouping and cross match
- ABG analysis if $SpO_2 < 90\%$ in room air
- Chest X-ray
- FBP
- Serum electrolytes
- Serum creatinine and BUN
- Liver function tests

Treatment

Nonpharmacological treatment

- Admit the patient.
- Give oxygen 2 L/min to maintain $SpO_2 > 95\%$.
- Manage pain (see dose above).
- Give fluids as indicated above.
- If $SpO_2 < 95\%$, give top-up transfusion to achieve Hb 10 g/dL and HbS < 70%.
- If $SpO_2 < 90\%$, give exchange transfusion to achieve Hb 10g/dL and HbS < 30%.

- Do high-performance liquid chromatography to monitor HbS concentration.

Pharmacological treatment

- Give antibiotics IV as in severe pneumonia (refer to section on severe pneumonia).
- If above 5 years, add:
  - Give erythromycin 12.5 mg/kg every 6 hours.
    OR
    Give azithromycin 10 mg/kg once daily.

Note:

- Diuretics are contraindicated, even if signs and chest X-ray may mimic pulmonary oedema.
- Refer to the next-level facility with adequate expertise and facilities.

Sequestration syndromes

Splenic sequestration is a sudden onset of splenomegaly or enlargement of a pre-existing splenomegaly commonly found in children under 5 years of age.

Hepatic sequestration can also occur, usually in children over 4 years old.

All of these conditions can lead to hypovolaemic shock.

Diagnostic criteria

- Acute anaemia (fall of Hb ≥ 2g/dL from the steady state)
- Premature cells (nucleated red blood cells) on film, thrombocytopenia of varying degree
- High or normal reticulocyte count
- Bone marrow hyperplasia
- Regression of splenomegaly after transfusion

Investigations

- FBP
- Peripheral smear
- Reticulocyte count

Treatment

Nonpharmacological treatment

- Give high-flow oxygen 2 L/min to keep SpO_2 > 95%.
- Give normal saline 20 mL/kg 0.9% bolus while waiting for blood.
- Give top-up transfusion to steady state Hb immediately (within 3 hours of admission).
- Give fluids orally/IV (see above).
- Provide pain relief (refer to pain management section).

Pharmacological treatment

- Give ampicillin 50 mg/kg every IV 6 hours for 5 days and gentamicin 7.5 mg IV once daily for 5 days.

Hypersplenism

This is a hyperactive splenic disorder that leads to premature destruction of blood cells and progressive enlargement of the spleen from vascular congestion, phagocytic hyperplasia, and cellular infiltration.

Diagnostic criteria

- Enlargement of the spleen
- Cytopenia: reduction in more than one cell line in the peripheral blood
- Compensatory marrow hyperplasia

Investigations

- FBP
- Peripheral smear
- Reticulocyte count

Treatment

- Manage cytopenia accordingly.
- Definitive treatment is splenectomy.

Note: Indications for splenectomy are:

- Severe hypersplenism: splenomegaly > 10 cm and neutrophils < 0.5x109/L, Hb <5 g/L, platelet < 50x109/L
- At least two episodes of acute splenic sequestration crisis

Priapism

This is defined as persistent, painful, unintentional erection. If left unattended, it can lead to infarction subsequent penile amputation.

Diagnostic criteria

- Prolonged and persistent painful penile erection more than 4 hours
- Not associated with sexual intention, interest, or stimulation

Treatment

- Encourage patient to pass urine.
- Give IV fluids as above.
- Administer analgesia.
- Aspirate the retained blood and irrigate the corpus cavernosum.

Note: Refer to the next-level facility with adequate expertise and facilities if the condition is not resolved within 2 hours of initiation of treatment.

Neurological manifestations of a stroke

These are vaso-occlusive events that occur in the major arteries supplying the brain, leading to ischaemic or haemorrhagic infarcts.

Diagnostic criteria

- Unilateral weakness
- Seizures
- Other focal neurological deficits

Investigations

- Neuroimaging (preferably MRI/MRA; if not available, cranial CT)
- Transcranial Doppler ultrasound

Treatment

Nonpharmacological treatment

- Support airway, breathing, and circulation.
- Give oxygen 2 L/minute.
- Give IV fluids as shown above.
- Give 10% dextrose 5 mL/kg if RBG is <2.5 mmol/L and maintain normoglycaemia.
- Provide physiotherapy and occupational therapy.

Pharmacological treatment

- Give paracetamol 15mg/kg by mouth if temperature is > 38.5□C.
- Give phenobarbitone 5 mg/kg by mouth daily for 1 month if the patient has a seizure.
- Give antibiotics IV if meningitis is suspected (refer to the section on meningitis).
- Give hydroxyurea 15 mg/kg by mouth once a day for life to prevent further infarcts.

Note: Refer to next-level facility with adequate expertise and facilities.

10.3. BLEEDING DISORDERS

These are congenital or acquired haematological disorders leading to impaired haemostasis.

Haemophilia

This is an X-linked inherited bleeding disorder caused by deficiency of coagulation factor VIII or IX or XI.

Diagnostic criteria

- Recurrent bleeding into the joints and muscles
- History of bleeding disorder in the family
- WITH evidence of coagulation factor deficiency, as above

Investigations

- Prothrombin time, partial thromboplastin time, and international normalized ratio
- Coagulation factor assay
- FBP
- Peripheral smear

Treatment

Nonpharmacological treatment

- Do not give aspirin and NSAIDs.
- Avoid IM injections and femoral punctures.
- Splint an involved limb and arrange for physiotherapy as soon as it can be tolerated to prevent deformity.

Pharmacological treatment

- Give infusion of factor VIII for haemophilia A and factor IX for haemophilia B.

Haemophilia A

- Give units factor VIII = (weight in kg) x (50 mL plasma/kg) x (desired factor VIII minus patient factor level).
- The second dose should be administered 12 hours after first dose and is half of the initial dose.

Note:

- Correct to 100% in potentially serious bleedings (CNS, major trauma, gastrointestinal tract, major surgery, epistaxis) and 30–50% in minor bleeding (haemarthrosis, oral-mucosal, and muscular).
- When factor VIII is not available:
  - Give cryoprecipitate 10 mg/kg once a day OR
  - Tranexamic acid 20 mg/kg by mouth every 12 hours daily OR IV 10 mg/kg (maximum 1 g) over at least 10 minutes every 12 hours OR by continuous IV infusion 45 mg/kg over 24 hours

- Ensure patient does not have blood in urine/haematuria and no thromboembolic disease or disseminated intravascular coagulopathy.
- Give units factor VIII = (weight in kg) x (50 mL plasma/kg) x (1 U of factor VIII/mL plasma) x (desired factor VIII minus patient factor level).
  - For example: A 20 kg boy with haemophilia 1% factor VIII activity presents with severe upper GI bleeding Unit factor VIII = 20 kg x 50 mL/kg x 1 unit factors/mL x 0.99 =990 IU
- For minor bleeds and when factor VIII concentrate is not available, one of the following can be used:
  - Cryoprecipitate 10 mg/kg once a day
  - Fresh frozen plasma 10 mL/kg
  - Desmopressin 0.3 mg/kg IV per dose
- For mild cases, intranasal desmopressin is used at a dose of 150 mg:
  - < 50 kg: 1 spray
  - > 50 kg: 2 sprays
- Tranexamic acid is also used to prevent excessive bleeding after dental procedures in children with haemophilia aged 6–18 years at a dose of 10 mg/kg by IV injection preoperatively, followed by 20 mg (max. 1.5 g) by mouth every 12 hours for up to 8 days.

Haemophilia B

- Give factor IX 30 units/kg or more for major bleeding.
- Repeat every 24 hours until bleeding stops.

Von Willebrand disease

This is a bleeding disorder resulting from either dysfunction or reduced quantity of von Willebrand factor.

Diagnostic criteria

- Mucocutaneous bleeding
- Positive family history (menorrhagia) from maternal side
- WITH laboratory evidence of von Willebrand factor deficiency or dysfunction

Investigations

- FBP
- Peripheral smear
- Reticulocyte count
- Prothrombin time, partial thromboplastin time, and international normalized ratio
- Coagulation factor assay VIII, IX, and von Willebrand factor

Treatment

Pharmacological treatment

- Give desmopressin acetate 0.3 mg/kg IV per dose.
- If desmopressin is not available, give factor VIII concentrate 20 units/kg IV.

Note: Refer the patient if there are no facilities for diagnostic and treatment.

Immunethrombocytopenic purpura

This is a bleeding disorder characterized by autoantibodies destruction against normal platelets leading to mucocutaneous bleeding.

Diagnostic criteria

- Recurrent mucocutaneous bleeding
- WITH laboratory evidence of isolated thrombocytopaenia AND exclusion of other causes of thrombocytopaenia

Note: Anaemia and/or neutropenia may indicate other diseases.

Treatment

Nonpharmacological treatment

- Ensure adequate dietary and fluid intake.

Pharmacological treatment
For initial (induction) treatment: (platelet count 20–30X109/L and/or mucocutaneous bleeding):

- Give prednisone 1 mg/kg every 12 hours with the intent of a rapid and complete taper after 7–10 days or when the platelet count reaches 50X109/L, whichever occurs first in 3–4 weeks.

- In critical situations:
  - Give methylprednisolone 30 mg/kg IV once a day for 3 days.
    OR

    Give high-dose dexamethasone 0.15 mg/kg every 6 hours for 48 hours.
    OR

    Give immunoglobulin 1 g/kg IV once a day for 2 days.
- Repeat the infusions at 4-week intervals (maintenance) until a satisfactory platelet count is achieved.

Note:

- If the platelet count is not maintained after three infusions, the patient's case might be refractory, and a different treatment should be considered.
- Refer to the next-level facility with adequate expertise and facilities.

Disseminated intravascular coagulopathy

This is a repeating series of clot formations and fibrinolysis of the clot, leading to the depletion of platelets and coagulation factors, including the continuous release of anticoagulants.

Diagnostic criteria

- Spontaneous bruising, petechiae
- GI, intracranial, and or respiratory tract bleeding
- Profuse bleeding at surgical wound site/injection site
- WITH evidence of an underlying condition associated with disseminated intravascular coagulopathy

Investigation

- FBP
- Prothrombin time, partial thromboplastin time, and international normalized ratio
- Presence of fibrin-degradation products in plasma
- Low plasma levels of fibrinogen and coagulation inhibitors, such as antithrombin III

Treatment

Nonpharmacological treatment

- Ensure adequate dietary and fluid intake.
- Treat the underlying disorder or condition, such as sepsis.
- Some patients benefit from infusion of platelet concentrate and flash frozen plasma 10 ml/kg.

Pharmacological treatment

- Give vitamin K 1 mg/kg IV or IM slow.
- Antithrombin III may be considered for use as part of the overall treatment of the patient with disseminated intravascular coagulopathy.

10.4. APLASTIC ANAEMIA

This is a syndrome of bone marrow failure characterized by marrow hypoplasia with consequent peripheral pancytopenia.

Diagnostic criteria

- Severe anaemia
- Recurrent infections
- Bleeding tendency
- WITH laboratory evidence of pancytopenia and bone marrow hypoplasia

Treatment

Nonpharmacological treatment

- Give packed red blood cells and platelet concentrate transfusions to patients with severe anaemia and thrombocytopenia, respectively.
- Encourage eating well-cooked meat, dairy products, and vegetables to avoid infection.
- Perform allogenic bone marrow transplantation from a sibling matched for HLA–A, HLA–B, and HLA–DR.

Pharmacological treatment

- Immunosuppressive therapy using antithymocytoglobulin and cyclosporine-A is alternative to bone marrow transplantation.

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

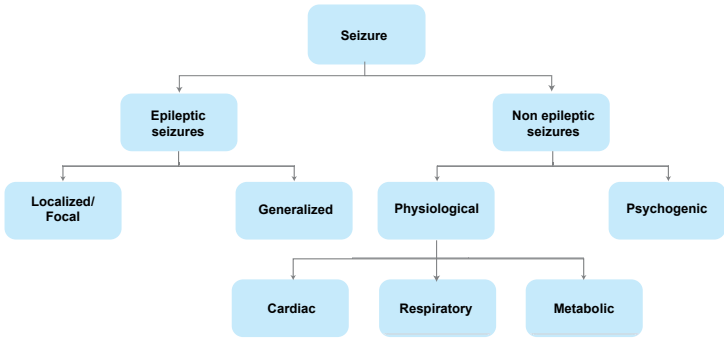
CHAPTER 11. NEUROLOGICAL DISORDERS

These are disorders affecting the CNS. A patient usually presents with seizures and/or neurological deficit. Common causes in children include hypoxic ischaemic encephalopathy, CNS infections, metabolic derangements, epilepsy, and space-occupying lesions.

11.1. SEIZURES

These are sudden clinical events arising from excessive and/or a hypersynchronous electrical discharge of neurons located within the cerebral cortex. Seizures are classified as either focal or generalized.

Figure 11.1. Seizure syndromic flow chart



Treatment

Nonpharmacological treatment

- Manage the airway and breathing.
- Ensure circulatory access.
- Treat shock if present.
- Do not put anything in the mouth.

- Gentle suction through the nose if required.
- Give oxygen 2 L/min.
- Position the child in a recovery position.

Pharmacological treatment

- Give diazepam per rectal 0.5 mg/kg or IV 0.3 mg/kg. If convulsions continue after 10 minutes, give a second dose of diazepam. If convulsions continue after another 10 minutes, suspect status epilepticus.
- Give phenobarbital 20 mg/kg IM or IV over 15 minutes.
  OR

  Give phenytoin 15 mg/kg IV (through a different line from diazepam) over 60 minutes.
- If convulsions do not stop despite of the above treatment, general anaesthesia should be done in the intensive care unit.
- Once status epilepticus has been controlled, the patient should be maintained on other antiepileptic medication.
- Give 10% glucose 5 mL/kg if RBG ≤ 2.5 mmol/L.
- Give 10% calcium gluconate 2 mL/kg if serum calcium concentration < 2.20 mmol/L as slow IV infusion.

Note

- Do not give more than two doses of diazepam.
- Lorazepam 0.1 mg/kg IV can be used for convulsions instead of diazepam.
- Ensure a very good IV line, as phenytoin is caustic and will cause local damage if it extravasates.
- Investigate and treat the underlying cause.

Simple febrile seizures

These are convulsions in a child caused by a rise in body temperature in genetically predisposed children without intracranial infections. They occur in children 6 months to 5 years old.

Diagnostic criteria

- Generalized seizures lasting less 15 minutes precipitated by fever (temperature ≥ 38.5°C) without loss of consciousness after the event

Investigations

- No specific investigation

Treatment

Nonpharmacological treatment

- Expose the child.

Pharmacological treatment

- If the child is convulsing now, give diazepam per rectal 0.5 mg/kg or 0.3 mg/kg IV.
- Give paracetamol 15 mg/kg every 8 hours when temperature ≥ 38.5ºC.

Note: Complex febrile seizure may presents with generalized or focal seizures lasting more than 15 minutes precipitated by fever (temperature ≥ 38.5°C) with loss of consciousness after the event.

Epilepsies

These are CNS disorders with an enduring predisposition to develop seizures.

Diagnostic criteria

- Two or more recurrent unprovoked seizures at least 24 hours apart

Investigations

- Electroencephalogram
- Brain MRI; if not available, cranial CT scan

Note:

- Children with more than one seizure type may require metabolic workup, renal and liver function tests, FBP, blood glucose, serum calcium, magnesium, and sodium.
- Refer to the next-level facility with adequate expertise and facilities.

Treatment

- Treatment depends on the type of epilepsy.

Focal epilepsies

These present as focal seizures with or without secondary generalization.

Pharmacologic treatment

- Give carbamazepine 2.5 mg/kg by mouth every 12 hours. Increase gradually every 2 weeks by 2.5 mg/kg every 12 hours to a maximum dose of 10 mg/kg every 12 hours.
  OR

  Give lamotrigine 0.15 mg/kg by mouth every 12 hours for 2 weeks, then increase gradually by 0.15 mg/kg every 12 hours every 2 weeks to a maximum dose of 10 mg/kg/day IF NO SEIZURE CONTROL.
- Give sodium valproate 5 mg/kg by mouth every 12 hours. Increase gradually by 5 mg/kg every 2 weeks to a maximum of 30 mg/kg/day.

Note: For lamotrigine:

- If used in combination with sodium valproate, gradually increase to a maximum dose of 5 mg/kg/day.
- If used in combinations with carbamazepine, gradually increase to a maximum dose of 10mg/kg/day.

Generalized epilepsies

These present with generalized seizures and produce loss of consciousness, either briefly or for a longer period of time.

Pharmacological treatment

- Give sodium valproate (refer dose above) IF NO SEIZURE CONTROL.
- Add carbamazepine (refer dose above) or lamotrigine (refer dose above).

Childhood absence epilepsies

These presents with multiple brief periods of behavioural unresponsiveness.

Pharmacological treatment

- Give ethosuximide 2.5 mg/kg by mouth every 12 hours. Increase gradually over 2 weeks to a maintenance dose of 20 mg/kg/day (max 1 g/day).
  OR

  Give sodium valproate (refer dose above) IF NO SEIZURE CONTROL.
- Add lamotrigine (refer dose above).

Myoclonic epilepsies

These presents with rapid, brief contractions of bodily muscles, which usually occur at the same time on both sides of the body. These usually occur with other seizure types.

Pharmacological treatment

- Give sodium valproate (refer dose above).
  OR

  Give clonazepam 0.25 mg by mouth at night, then increase in 5 days to usual maintenance dose of 1–2 mg once a day.
  OR

  Give clobazam 5 mg by mouth at night. If seizures are not controlled, increase to 10 mg at night.

Note: If the patient presents with more than one seizure type, refer to next-level facility with adequate expertise and facilities.

Epilepsy syndromes

Epiletic Spasms

These present with sudden stiffening of the arms flung out as the knees are pulled up and the body bends forward ("jack-knife seizures"). Each seizure lasts only a second or two, but they usually occur in clusters.

Pharmacological treatment

- Give adrenocorticotropic hormone 20 IU IM once a day for 10 days. OR

  Give prednisolone 2 mg/kg by mouth every 12 hours for 10 days (if adrenocorticotropic hormone is not available).
  OR

Give vigabatrin 15 mg/kg by mouth every 12 hours, then increase gradually every 3 days to a maximum of 100 mg/kg/day (preferred first line for children with tuberous sclerosis complex).

Note:

- Do not use vigabatrin for more than 6 months due to increased risk of permanent peripheral visual field defects.
- All patients with infantile spasms should subsequently initiated on sodium valproate as a maintenance treatment (see dosages above).

Lennox-Gastaut Syndrome

Presents with multiple seizure types, predominantly nocturnal tonic seizures. clonic, atonic, generalized tonic clonic and atypical abscences.

Pharmacological treatment

- Give sodium valproate, then add lamotrigine, then add clobazam. OR

  Give levetiracetam 10 mg/kg every 12 hours, then increase gradually every 2 weeks by 10 mg/kg/day to a maximum of 60 mg/kg/day.
  OR

  Give topiramate 0.5 mg/kg every 12 hours, then increase gradually by 0.5 mg/kg every 12 hours every 2 weeks to a maximum of 9 mg/kg/day.

Note: For sodium valproate, lamotrigine, and clobazam (refer dose above), usually, these patients require more than one drug, which should be added sequentially. Refer to the next-level facility for adequate expertise and facilities.

11.2. CEREBRAL PALSY

This is a group of disorders of development of movement and posture causing activity limitations that are attributed to nonprogressive disturbances that occurred in the developing foetal or infant brain.

Diagnostic criteria

- History of delayed developmental milestones without regression
- Neurological deficits: spasticity, rigidity, ataxia
- Involuntary movements—choreoathetosis, dystonia

Note: May also present with one or more of the following: intellectual disability, seizure disorders, vision and hearing impairment, feeding and swallowing disorders, gastroesophageal reflux disorders, malnutrition, speech and language disorders, pain, behaviour disorders, bladder control disorders, sleep disorders, drooling, and hip displacement.

Treatment

Nonpharmacological treatment

- Multidisciplinary approach
- Speech therapy
- Occupational therapy
- Physiotherapy
- Social worker
- Orthopaedic surgeon
- Ophthalmologist
- Paediatrician
- Paediatric neurologist with the goal of rehabilitating the child to the maximum potential for development depending on the type and severity of cerebral palsy

Pharmacological treatment

- For spasticity: Give Baclofen 1 mg/kg by mouth every 12 hours.
- Treat epilepsy if present (see treatment of epilepsy).

11.3. ACUTE FLACCID PARALYSIS

Guillain-Barre syndrome

This is an acute inflammatory demyelinating polyradicular neuropathy. Presents with progressive ascending distal weakness and areflexia. If severe, bulbar dysfunction and respiratory failure may occur.

Diagnostic criteria

- Progressive ascending distal weakness

- Areflexia with evidence of increased protein on CSF analysis with normal cell count

Investigations

- CSF analysis for biochemistry, microbiology, and cytology

Treatment

Nonpharmacological treatment

- Maintain airway, breathing, and circulation.
- If the patient shows signs of respiratory failure or bulbar dysfunction, refer urgently to intensive care unit for respiratory support.

Pharmacological treatment

- If the patient has lost ambulation or if there is disease progression, give immunoglobulin 1 g/kg IV once a day to run for 12 hours for 2 days.

Note: Notify immunisation and vaccine development programme for polio surveillance. If the patient has bladder or bowel symptoms, consider spinal cord lesion and investigate accordingly.

CHAPTER 12. ENDOCRINOLOGICAL DISORDERS

These are disorders that affect synthesis and function of hormones.

12.1. DIABETES MELLITUS

This is a group of disorders characterized by chronically high blood glucose levels resulting from defects in insulin secretion/action or both.

Diagnostic criteria

- Fasting blood glucose > 6.1 mmol/L
  OR

  2-hour postprandial blood glucose > 11.1 mmol/L
  OR

  Glycosylated haemoglobin (HbA1C) > 5.7%

Investigation

- RBG or FBG
- HbA1C
- Urine analysis

Treatment

Nonpharmacological treatment

- Balanced diet with no added sugar, exercise, and psychological support

Note: Avoid adding sugar in porridge and tea. Avoid all beverages (e.g., soda and juice).

Pharmacological treatment

- Total dose of insulin contains soluble and intermediate/long-acting insulin
- Give total dose of insulin:
  - Prepuberty: 0.5 IU/kg/day SC for life
  - Puberty: 1–2 IU/kg/day SC for life
  - After puberty: less than 2 IU/kg/day SC for life

Divide total insulin dose as per recommended percentage below.

Table 12.1. Recommended insulin regimen

Time	Type of Insulin	Proportion
Breakfast	Short acting	30% of total daily dose
Lunch	Short acting	20% of total daily dose
Supper	Short acting	10% of total daily dose
Bedtime	Long acting /intermediate acting	40% of total daily dose

Source: Danne T, Bangstad HJ, Deeb L, et al. 2014. Insulin treatment in children and adolescents with diabetes. *Pediatric diabetes*. 15(S20):115–34.

Note: The dose should be given for life and adjusted according to weight and glucose response.

Diabetes ketoacidosis

This is a complication of diabetes occurring due to metabolic decompensation leading to severe dehydration, altered level of consciousness, acidosis, ketonemia and ketonuria, and electrolyte imbalance.

Diagnostic criteria

- Acidosis (pH < 7.3, Anion gap > 12 mEq/L)
- Ketonemia/ketonuria

Investigations

- RBG
- ABG analysis
- FBP
- Serum electrolytes
- Serum creatinine and BUN
- Urine analysis

Treatment

- Management of diabetes ketoacidosis includes: management of shock, dehydration, hyperglycaemia, electrolytes, acidosis, and infections.
- Detailed management of diabetes ketoacidosis is presented in the algorithm for management of paediatric diabetic ketoacidosis in low-resource centre below:
  - Give normal saline or RL for 48 hours.
  - Fluid Requirements = DEFICIT + 48 hours MAINTENANCE
    Fluid DEFICIT = estimated % dehydration x body weight (kg)
    *DEFICIT = estimated % dehydration x body weight (kg)

Table 12.2. Maintenance fluid in diabetes ketoacidosis

Approximate Age (years)	Weight (kg)	Maintenance Fluid (mL/kg/24 hours)
< 1	3–9	80
1–5	10–19	70
6–9	20–29	60
10–14	30–50	50
> 15	> 50	30

Source: Wolfsdorf JI, Allgrove J, Craig ME, et al. 2014. Diabetic ketoacidosis and hyperglycemic hyperosmolar state. *Pediatric diabetes*. 15(S20):154–79.

Note: For any child with diabetes ketoacidosis, assume there is 10% water loss (100 mL/kg).

- Identify and treat any underlying event.

Monitoring

- After resuscitation, the rate of fall of blood glucose should not exceed 5 mmol/hour.
- Do not stop insulin infusion or decrease below 0.05 units/kg/hour because a continuous supply of both insulin and glucose substrate is needed to promote anabolism and reduce ketosis.
- To prevent rebound hyperglycaemia, do not stop IV insulin infusion until 60 minutes after the first subcutaneous injection of short-acting/rapid-acting insulin.

Management of complications of diabetic ketoacidosis cerebral oedema

This occurs in the first 24 hours after starting rehydration when the general condition of the child might seem to be improving.

Treatment

Exclude hypoglycaemia and do the following:

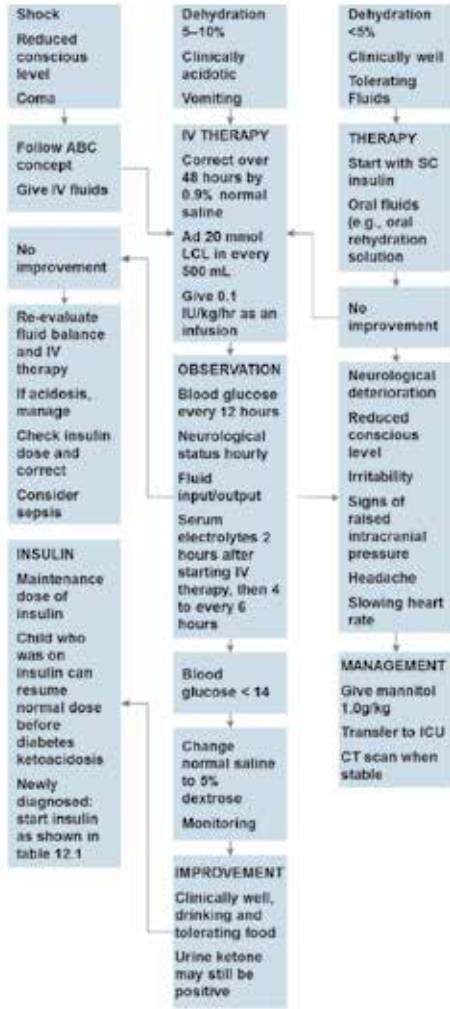
- Give mannitol 1 g/kg IV over 20 minutes; repeat if there is no initial response in 30 minutes.
- Slow down infusion rate of rehydration fluid by half until level of consciousness is regained.
- Nurse the child with head elevated.
- Then continue mannitol infusion 0.25 g/kg/hour to prevent rebound increase in intracranial pressure (or repeat bolus doses every 6 hours).

Hypokalaemia

- ADD 0.5 mEq/kg sufficient KCl in the rehydration fluid.
- Give foods rich in potassium (e.g., milk, fruits, such as bananas) when patient can take orally.
- Monitor serum potassium levels.

Note: For children with uncontrolled diabetes—three consecutive HbA1C ≥ 14% measurements—refer to the next-level facility with adequate expertise and facilities.

Figure 12.1. Algorithm for management of paediatric diabetic ketoacidosis in low-resource centre



12.2. HYPOTHYROIDISM

This is a state in which the hypothalamic pituitary-thyroid axis is failing or is in danger of failing to produce sufficient thyroid hormone (T4). It can be congenital or acquired.

Diagnostic criteria

- Decreased activity
- Large anterior and posterior fontanelle
- Poor feeding and weight gain
- Small stature or poor growth
- Prolonged jaundice
- Decreased stooling or constipation
- Hypotonia
- Mottled, cool, and dry skin
- Hoarse cry

Investigation

- Thyroid-stimulating hormone, T3, FT4
- Thyroid ultrasonography and/or thyroid scan
- Thyroglobulin antibodies (Tg-Ab), thyroid peroxidase antibodies, (TPO-Ab), thyroid-binding globulin (TBII)
- Thyroid-binding globulin concentration
- Thyroid-releasing hormone test
- Bone age
- Cholesterol
- ECG

Treatment

Pharmacological treatment

- Give L-thyroxine 10 mg/kg by mouth once a day (max 100 mg/day).

12.3. HYPERTHYROIDISM

This refers to overactivity of the thyroid gland, which leads to excessive release of thyroid hormones and consequently accelerated metabolism in the peripheral tissues.

Diagnostic criteria

- Presents with hyperactivity, nervousness, and emotional lability.
- Deterioration of behaviour and school performance in a child who previously did well may be the earliest warning signal.
- Experiences weight loss despite excellent appetite, insomnia, fatigue, palpitations, heat intolerance, sweating, diarrhoea, deterioration in handwriting.
- Has menstrual irregularities, muscle weakness.
- Has eye symptoms, which may include pain or diplopia but are rarely severe in children.
- Has diffuse goitre, thyroid ophthalmopathy, tachycardia, increased systolic blood pressure, tremor, increased height velocity, and advanced bone age.

Investigation

- Thyroid-stimulating hormone, T3, FT4
- Thyroid ultrasonography and/ or Thyroid scan
- Radioiodine I-131 (131 I) technetium 99m (99m Tc) or 123 I scan

Treatment

Pharmacological treatment

- Give carbimazole 0.25 mg/kg by mouth once a day for 6 weeks.
  OR

  Give propylthiouracil 5 mg/kg by mouth once a day for 6 weeks.
- Give propanolol when cardiac symptoms are prominent.

Note: For patients who require surgery and/or replacement therapy, refer to the next-level facility for adequate expertise and facilities.

CHAPTER 13. PAEDIATRIC ONCOLOGY

This chapter covers common neoplastic conditions and management of their complications. The common neoplastic conditions include the following:

- Lymphoma (non-Hodgkin's and Hodgkin's)
- Acute lymphoblastic leukaemia and acute myeloid leukemia
- Retinoblastoma
- Nephroblastoma (Wilms' tumour)
- Neuroblastoma
- Sarcomas of soft tissue and bone

Note: Early diagnostic, appropriate, and timely treatment of childhood cancers significantly improves outcome.

Helpful warning signs of childhood cancer:

- Headache/signs of haemorrhage (bleeding)
- Eye changes: white pupil, new onset squint, loss of vision, swellings
- Lumps or swellings, especially if painless
- Pallor or fatigue, weight loss
- Fever: persistent and unexplained
- Unusual nausea or vomiting (especially early morning or worsening over days)
- Changes in speech
- Limb or bone pain, limp, bones breaking easily

13.1. ACUTE LYMPHOBLASTIC LEUKAEMIA

This is a haematopoietic malignancy resulting in overproduction and accumulation of immature white blood cells.

Diagnostic criteria

- Recurrent fever
- Mucocutaneous bleeding
- Easy fatigability
- Severe pallor

- Generalized lymphadenopathy
- Hepatosplenomegaly
- WITH evidence of blast cells on peripheral smear and bone marrow aspirate/biopsy

Investigations

- FBP
- Peripheral smear
- Reticulocyte count
- Bone marrow aspirate/biopsy
- Serum electrolytes, calcium, and phosphate
- Serum creatinine and BUN
- Lactic dehydrogenase
- Uric acid
- Liver enzymes

Treatment

Give vincristine IV, daunorubicin IV, dexamethasone by mouth, L-asparaginase IM, methotrexate intrathecal/by mouth, doxorubicin IV/cytarabine IV, 6-mercaptopurine, cyclophosphamide IV.

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

13.2. LYMPHOMA

This is a malignant neoplasm that originates in the immune system. These include Hodgkin's and non-Hodgkin's lymphoma.

Non-Hodgkin's lymphoma

Thhis is a tumour originating from lymphoid tissues mainly lymph nodes.

Diagnostic criteria

- Generalized lymphadenopathy

- Hepatosplenomegaly
- Fever
- Weight loss
- Excessive night sweats

Investigation

- FBP
- Peripheral smear
- Reticulocyte count
- Lymph node biopsy
- Serum electrolytes, calcium, and phosphate
- Serum creatinine and BUN
- Lactic dehydrogenase
- Uric acid
- Liver enzymes
- HIV serology
- Abdominal pelvic ultrasound
- WITH evidence of hyperchromatic diffuse lymphoid tissue composed of monotonous medium sized cells with coarse chromatin and scanty cytoplasm

Treatment

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

Burkitt's lymphoma

It is a type of non-Hodgkin's lymphoma originating in the germinal centre B lymphocytes associated with impaired immunity.

Diagnostic criteria

- Rapidly growing jaw/facial swelling
- Loosening of teeth
- WITH evidence of starry sky pattern on histology

Investigations

- FBP
- Peripheral smear
- Reticulocyte count
- Biopsy of the swelling
- Serum electrolytes, calcium, and phosphate
- Serum creatinine and BUN
- Lactic dehydrogenase
- Uric acid
- Liver enzymes
- HIV serology
- Abdominal pelvic ultrasound

Treatment

Give first line: vincristine IV, cyclophosphamide IV, methotrexate IV/IT, cytarabine IT

Second line: ifosfamide, mesna, etoposide IV, cytarabine IV/IT, methotrexate IT

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

Hodgkin's lymphoma

This is a malignant neoplasm of the lymphoid tissue originating in germinal centres or postgerminal centre B cells.

Diagnostic criteria

- Peripheral lymphadenopathy, predominantly on cervical area
- Mediastinal mass
- Intra-abdominal mass
- Fever
- Weight loss
- Excessive night sweats

- WITH evidence of mononucleate and binucleate Reed-Sternberg cells in a background of inflammatory cells

Investigations

- Chest X-ray
- FBP
- Peripheral smear
- Reticulocyte count
- Biopsy of the mass
- Serum electrolytes, calcium, and phosphate
- Serum creatinine and BUN
- Lactic dehydrogenase
- Uric acid
- Liver enzymes
- HIV serology
- Abdominal pelvic ultrasound

Treatment

Give first line: doxorubicin, vinblastine, bleomycin, dacarbazine, chlorambucil by mouth, vincristine IV, procarbazine by mouth, and prednisolone by mouth

Second line: etoposide IV, cisplatin IV, ifosfamide IV, mesna IV, and prednisolone by mouth

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

13.3. WILMS' TUMOUR (NEPHROBLASTOMA)

This is a malignant neoplasm that originates from the kidney.

Diagnostic criteria

- Intra-abdominal mass
- Painless haematuria

- Hypertension
- WITH evidence of epithelial, blastemal, and stromal elements on histology

Investigations

- Abdominal ultrasound/CT abdomen
- Urinalysis
- Serum creatinine and BUN
- Serum electrolytes, calcium, and phosphates
- Uric acid
- Lactic dehydrogenase

Treatment

- Surgery: partial/total nephrectomy
- Give vincristine IV, actinomycin D IV, doxorubicine IV, carboplatin IV, etoposide IV, cyclophosphamide IV, doxorubicin IV

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

13.4. NEUROBLASTOMA

This is an embryonal malignancy of the sympathetic nervous system arising from the neuroblast.

Diagnostic criteria

- Intra-abdominal mass
- Abdominal pain
- Easy fatigability
- Weight loss
- WITH evidence of small, uniform cells containing dense hyperchromatic nuclei with scanty cytoplasm

Investigations

- Abdominal X-ray

- Abdominal ultrasound/CT abdomen
- Urinalysis, vanillylmandelic acid, homovanillic acid
- Serum creatinine and BUN
- Serum electrolytes, calcium, and phosphates
- Uric acid
- Lactate dehydrogenase

Treatment

- Surgery
- Give carboplatin IV, etoposide IV, cyclophosphamide IV, doxorubicin IV, vincristine IV

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

13.5. RHABDOMYOSARCOMA

This is a malignant neoplasm that originates from immature striated muscles.

Diagnostic criteria

- Nontender mass/localized swelling with or without overlying erythema
- WITH evidence of rhabdomyoblasts or cross striations on histology

Investigations

- Abdominal ultrasound/CT abdomen
- Chest X-ray
- Serum creatinine and BUN
- Serum electrolytes, calcium, and phosphates
- Uric acid
- Lactate dehydrogenase
- Biopsy

Treatment

- Give ifosfamide IV, mesna IV, vincristine IV, actinomycin D IV.

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

13.6 OSTEOSARCOMA

This is a malignant neoplasm of the bone that originates from primitive mesenchymal bone forming cells leading to production of osteoid. Common areas of occurrence include (in descending order): distal femur, proximal tibia, proximal humerus, middle and proximal femur, and other bones.

Diagnostic criteria

- Localized pain
- Limping
- Large, tender soft tissue mass
- WITH evidence of malignant osteoid on histology

Investigation

- X-ray of the affected bone
- Chest X-ray
- Serum electrolytes, calcium, and phosphate
- Serum creatinine and BUN
- Lactate dehydrogenase
- Uric acid
- Liver enzymes
- Abdominal ultrasound/CT abdomen

Treatment

- Surgery
- Give cisplatin IV, doxorubicin IV, methotrexate IV, folinic acid IV/by mouth

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

13.7. BRAIN TUMOURS

These are neoplasms that originates from neuroelements within the brain.

Diagnostic criteria

- Headache
- Nausea and vomiting, predominantly on awakening
- Seizures
- Altered level of consciousness
- Visual or gaze abnormalities
- Speech abnormalities
- Focal neurological deficits
- WITH evidence of intracranial mass on neuroimaging and biopsy confirmation

Investigation

- Cranial CT/brain MRI
- Biopsy

Treatment

- Craniotomy

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

13.8. MANAGEMENT OF COMMON COMPLICATIONS OF NEOPLASTIC CONDITIONS

Common associated complications include:

Febrile neutropenia

This is a raise in body temperature in a child with a malignant condition.

Diagnostic criteria

A child with or suspected with malignancy:

- Axillary temperature ≥ 38.5°C is noted on one occasion or axillary temperature ≥ 38.0°C and ≤ 38.4°C on two occasions, taken at least 1 hour apart
- Absolute neutrophil count of less than 1.0 x 10^9/L

Investigations

- FBP
- Malaria rapid diagnostic test
- Blood cultures (aerobic and anaerobic)
- Urinalysis and urine for culture and sensitivity
- Serum creatinine and BUN
- Serum electrolytes
- Chest X-ray
- Swab of any infected site (specific attention to the central venous line site)
- Throat swab
- Stool analysis and culture

Treatment

- Give antibiotics as shown below WITHIN THE FIRST HOUR of admission awaiting culture and sensitivity results.
- Patients with no significant beta-lactam resistance:
  - Give ceftriaxone 75 mg/kg IV every 12 hours for 3 days and amikacin 7.5 mg/kg IV every 12 hours for 3 days.
- Patients with significant beta-lactam reaction(s):
  - Give erythromycin 12.5 mg/kg by mouth every 6 hours for 3 days, amikacin (dose as above), and metronidazole 7.5 mg/kg IV every 8 hours (max single dose: 500 mg) for 3 days.

Culture-negative patients

Day 3 of antibiotics: If patient remains febrile and neutropenic on day 3, reculture and look for:

Give the following medication in the following disease conditions:

Disease condition	Treatment
Oral herpes	Give acyclovir 500 mg/m2 IV every 8 hours. OR Give 400 mg by mouth five times per day.
Severe mucositis	Give fluconazole 6 mg/kg by mouth/IV AND acyclovir (dose as shown above).
Skin or IV line site infection	Give vancomycin 15 mg/kg IV every 8 hours.
Gastroenteritis	Give ciprofloxacin 15 mg/kg by mouth/IV every 12 hours AND metronidazole 7.5 mg/kg by mouth/IV every 8 hours.

Note: If the patient is persistently febrile but stable and there is no obvious new infection site, continue initial empirical antibiotics and seek second opinion.

Day 5–7 of antibiotics: If patient remains febrile, neutropenic, and with cultures negative, consider:

Give amphotericin B	Day 1: 0.25 mg/kg in 50 mL of 5% dextrose over 3 hours Day 2: 0.5 mg/kg in 100 mL of 5% dextrose over 3 hours Day 3: 0.75 mg/kg in 150 mL of 5% dextrose over 3 hours Day 4: 1.0 mg/kg in 200 mL of 5% dextrose over 3 hours once daily for 7 days
AND	
Give amiloride	200 mcg/kg by mouth every 12 hours (maximum 5 mg) OR Slow K 2 mmol/kg by mouth every 12 hours

Day 10–14+ of antibiotics: If the patient is persistently neutropenic or becomes febrile again after discontinuation of a 14-day course of antibiotics, reculture and restart broad-spectrum antibiotics as per day 1 of febrile neutropenia guidelines.

Culture-positive patients

- If the patient becomes afebrile, wait for identification of organism and sensitivity results before modifying treatment.
- If the patient remains neutropenic, continue with broad-spectrum IV antibiotics for at least 10 days.

Note: If *Staphylococci* sensitive to cloxacillin are cultured, change vancomycin to cloxacillin 50 mg/kg IV every 6 hours, as this is more potent in sensitive organisms.

Medicine	Dose	Route of Administration and Frequency
Give dexamethasone	4.0 mg/m2/dose (maximum 8 mg/dose)	By mouth/IV every 12 hours
AND		
Give metoclopramide	< 1 year: 1 mg	By mouth/IV every 8 hours
	1–3 years: 1 mg	By mouth/IV every 12 hours
	3–5 years: 2 mg	By mouth/IV every 8 hours
	5–10 years: 5 mg	By mouth/IV every 8 hours
	> 10 years: 10 mg	By mouth/IV every 8 hours
OR		
Give promethazine	5–10 years: 10 mg	IV infusion over 15 mins. every 8 hours
	> 10 years: 20 mg	IV infusion over 15 mins. every 8 hours
OR		
Give cyclizine	1 month–6 years: 0.5–1.0 mg/kg	By mouth/IV over 5 mins. every 8 hours
	6–12 years: 25 mg	By mouth/IV over 5 mins. every 8 hours
	12–18 years: 50 mg	By mouth/IV over 5 mins. every 8 hours

Nausea and vomiting

Chemotherapy-induced nausea and vomiting is classified into three types: acute, delayed, and anticipatory

Acute phase chemotherapy-induced nausea and vomiting

Occurs from first dose of chemotherapy to 24 hours following the end of each course of chemotherapy.

Treatment

- Give ondansetron 5 mg/m² (maximum 8 mg/dose) by mouth/IV prechemotherapy, then every 8 hours during the period of chemotherapy.
  OR

  Give dexamethasone 4 mg/m² (max 8 mg/dose) by mouth/IV prechemotherapy over at least 10 minutes, THEN every 12 hours thereafter for duration of chemotherapy and 48 hours thereafter if risk of delayed nausea/vomiting (maximum period less than 6 days).

Note: DO NOT GIVE dexamethasone to patients with brain and spinal cord tumours.

Delayed phase chemotherapy-induced nausea and vomiting

Occurs 24 hours after the last dose of chemotherapy/radiation and may persist for up to 7 days.

Anticipatory chemotherapy-induced nausea and vomiting

Occurs 24 hours before the administration of chemotherapy.

Treatment:

- Give lorazepam:
  - 5–10 years: 0.5 mg/kg orally the night before and/or the morning of chemotherapy
  - > 10 years: 1 mg/kg orally the night before chemo and/or the morning of chemotherapy

Severe anaemia

If Hb is less than 7 g/dL:

- Give 10 mL/kg of packed red blood cells over 3 hours.
  OR

  Give 20 mL/kg of whole blood over 3 hours.

Thrombocytopenia

This is considered significant with platelet count less than 50 x 10^9, which has a risk of spontaneous bleeding.

Treatment

Prophylactic (no active bleeding):

- Give platelet concentrate 10 mL/kg to maintain a platelet count of greater than 10 x 10^9/L.
- If there is sepsis, fever (> 38.0ºC), abnormal clotting time, platelet functional defect (i.e., uraemia, NSAIDs):
  - Give platelet concentrate 10 mL/kg to maintain platelet count of ≥ 50 x 10^9/L therapeutic (active bleeding).
  - Give platelet concentrate 10 mL/kg to maintain a platelet count to the maximum of 100 x 10^9/L.

Note:

- A standard blood infusion set with an inline filter must be used.
- Accepted levels of platelets before different procedures are as shown below.
- For NGT and for chest physiotherapy at a count of 20 x 10^9/L.
- Lumbar puncture or intrathecal injections at a count of 25 x 10^9/L.
- Invasive procedures at a count of 50–100 x 10^9/L.
- A bone marrow aspirate may be performed with a platelet count < 10 X10^9/L, but for a bone marrow biopsy, the count must be > 25X 10^9/L.
- Some children may develop a minor or major reaction to blood or platelets (transfusion reactions).
- Refer to Chapter 10 on haematological disorders for management.

Management of pain

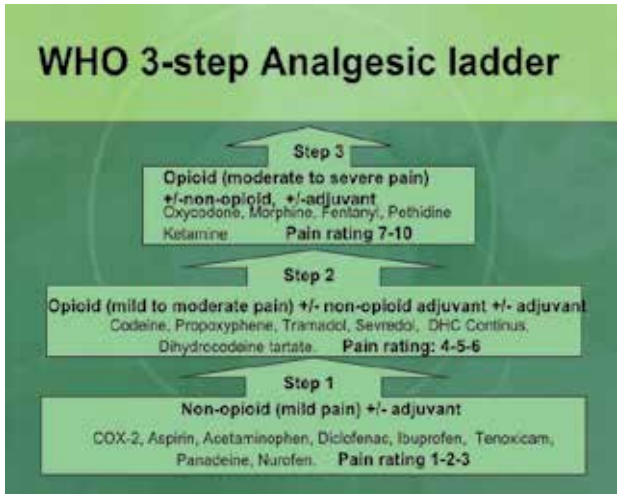
Pain is the physical suffering or distress caused by disease, injury, or something that hurts the body.

Table 13.1. Assessment of severity of pain

Minor	0	No pain; feeling perfect normal
Able to adapt to pain	1 Mild pain	Very light barely noticeable pain, occasionally twinges, no medication needed
	2 Discomforting	Minor pain, like pinching the fold of skin, occasional strong twinge, no medication needed
	3 Tolerable	Very noticeable pain, annoying enough to be distracting, over-the-counter (OTC) pain reliever needed
Moderate Interferes with many activities	4 Distressing	Strong, deep pain, like an average toothache, can be ignored if one is very focused on a task. OTC pain reliever may be effective.
	5 Very distressing	Strong, deep, piercing pain that cannot be ignored for more than 30 minutes. OTC pain reliever may reduce pain for 3–4 hours.
	6 Intense	Strong, deep, piercing pain that cannot be ignored, but one may be able to work or attend social events. Narcotic pain relievers (codeine, Vicodin) may be effective every 3–4 hours.
Severe Patient is disabled and unable to function independently	7 Very intense	It is difficult to concentrate or sleep, can still function with effort, stronger narcotic pain relievers are only partially effective, strongest pain reliever to relieve pain (oxycodone, morphine)
	8 Utterly horrible	Physical activity severely limited, can read and converse with effort. Nausea and dizziness set in as factor of pain, strongest pain relievers are minimally effective. Strongest pain relievers reduce pain for 3–4 hours.
	9 Excruciating unbearable	Unable to speak, crying out or moaning uncomfortably, near delirium, strongest pain relievers are minimally effective.
	10 Unimaginable/ unlikable	Unconscious, pain makes you pass out, strongest pain relievers are partially effective.

Note: If a child is neutropenic, any antipyretic agent should only be used with extreme caution because it may mask fever.

Figure 13.1 World Health Organization three-step analgesic ladder



Source: https://www.slideshare.net/gerlam/pain-management-in-nursing4-with-k-i-w-i-n

Table 13.2 Dosage for step-ladder analgesics

Medicine	Dosage
Paracetamol	15 mg/kg by mouth every 6 hours
Morphine	1–12 months: 0.1 mg/kg by mouth every 4 hours 1–12 years: 0.5 mg/kg by mouth every 4 hours
Morphine loading dose	0.05 mg/kg IV over 10 minutes

Mucositis

This is chemotherapy-induced mucosal atrophy and breakdown leading to mouth ulcers.

Treatment

- Give Difflam spray (benzydamine hydrochloride) every 6 hours and taper down as per response.
- Give Benylin, Maalox, Xylocaine mouthwash every 8 hours until ulcers subside.

In severe cases:

- Give morphine infusion 1 mg/kg.

Tumour lysis syndrome

This is a constellation of biochemical abnormalities resulting from massive tumour cell lysis, which may be apparent at diagnostic or during the first few days of chemotherapy. Usually seen in Burkitt's lymphoma, acute leukaemia, and neuroblastoma. Principal biochemical abnormalities are hyperuricemia, hyperphosphatemia, hypocalcaemia, and hyperkalaemia.

Treatment

- Give dextrose normal saline 3/m^2/24 hours for a total of 5 days.
- Give allopurinol 100 mg/m^2 by mouth every 8 hours for 5 days.
- Note:
  - Strict adherence to fluid balance; ensure urine output of at least 3 mL/kg/hour.
  - If diuresis is not adequate and there is no evidence of obstructive uropathy, give furosemide 1 mg/kg as a stat dose and repeat as indicated.
  - Hypocalcaemia
    - Give oral calcium supplementation when there is symptomatic hypocalcaemia (i.e., tetany) or laboratory result confirms hypocalcaemia.
  - Hyperkalaemia (K+ > 5.4)
    - Give calcium gluconate.
    - Give 5% dextrose IV.
    - Give insulin infusion 0.1 IU/kg stat.
    - Give furosemide 1 mg/kg every 8 hours.

13.9. IMMUNIZATION

Note:

- Immunize an additional booster of pentavalent (DPT-Hb-HiB) and oral polio vaccine for all children.
- Measles-rubella may be administered at this time if the child is eligible and has not been vaccinated.
- If patient has had the bacillus Calmette–Guérin vaccine, check tuberculin test and, if negative, revaccinate. If patient has not been vaccinated, immunize according to the immunisation and vaccine development programme.

CHAPTER 14. EYE DISEASE CONDITIONS

These are disorders that affect the eye; if they are not identified and treated early, they have the potential to cause irreversible blindness.

14.1. CATARACT

Opacity of the lens is seen as a white paper behind the pupil and iris.

Diagnostic criteria

- Poor vision
- The whole pupil is seen with opacity like white paper

Figure 14.1. A child with cataract

Photo by MOHCDGEC/MUHAS Tanzania, Ophthalmology Unit

Investigations

- Ultra sound biometry (A-scan, B-scan)
- Serological titres for TORCHES

Treatment

- Cataract surgery: lens washout ± intraocular lens

Note: Refer all children with cataract to the next-level facility with adequate expertise and facilities.

14.2. CONGENITAL GLAUCOMA

This is an ocular disease characterized by increased intraocular pressure and damage of optic nerve due to abnormality of aqueous outflow in children.

Diagnostic criteria

- Epiphora (excessive tearing)
- Photophobia (scared of light)
- Blepharospasms (difficulties to open the eyes)
- Clouding of the cornea (cornea haziness)
- The cornea is larger than normal for the age (buphthalmos)

Figure 14.2. A child with glaucoma

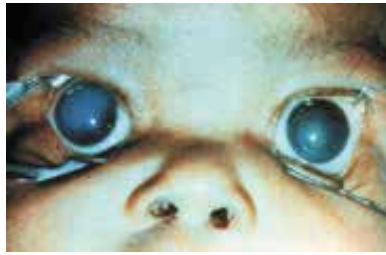


Photo by MOHCDGEC/MUHAS Tanzania, Ophthalmology Unit

Treatment

Pharmacological treatment

- Give timolol 0.25% or 0.5% one drop in the affected eye every 12 hours.
  OR

  Give dorzolamide 2% one drop every 12 hours.

When the patient does not respond on the above drugs given separately, THEN:

- Give dorzolamide 2% and timolol 0.5% eye drops) one drop every 12 hours.

For surgery

- Give pilocarpine hydrochloride 2% one drop in the affected eye every 6 hours and acetazolamide (Diamox) 5 mg/kg by mouth every 6 hours until intraocular pressure is lower than 40 mmHg.

THEN:

- Continue with timolol 0.25% or 5% OR dorzolamide 2%, OR proceed with surgery.

For patients with very high intraocular pressure who need emergency surgery

- Give mannitol 1 mg/kg IV slowly over 30 minutes.
  OR
  Give oral glycerol syrup 1 g/kg stat as they lower intraocular pressure rapidly.

Note:

- Timolol should be used with caution in patients with asthma and cardiac diseases.
- Dorzolamide is used in those who are resistant to beta blockers or for whom beta blockers are contraindicated.
- Pilocarpine causes long-standing pupil constriction; give it when patient is prepared for glaucoma surgery.
- Mannitol and glycerol have diuretic effect, so they are only used as a single dose.
- Refer all children with congenital glaucoma to the next-level facility with adequate expertise and facilities.

14.3. EYE INJURIES

These are traumatic eye conditions that result from blunt, penetrating, or chemical splashing, potentially leading to irreversible loss of vision.

Perforating eye injury

This is trauma to the eye due to sharp objects, like thorns, needles, iron nails, pens, knives, wire, etc.

Diagnostic criteria

- Cut on the cornea and/or sclera
- Affected eye may be smaller than the fellow eye
- Pupil may be irregular or not visible
- Part of the intraocular structures, like iris or lens, may be protruding out with blood into the anterior chamber

Figure 14.3. Eye injury

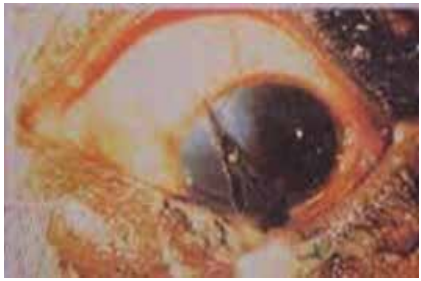


Photo by MOHCDGEC/MUHAS Tanzania, Ophthalmology Unit

Treatment

Nonpharmacological treatment

- Apply an eye shield.

Pharmacological treatment

- Apply chloramphenicol 1% eye ointment every 8 hours to the affected eye.
- Give tetanus toxoid-containing vaccine 0.5 mL IM.
- Give paracetamol 15 mg/kg by mouth every 8 hours.
- Surgery should be done within 48 hours of injury.
- Give gentamicin 200 μin 0.1 mL injection stat given in the anterior chamber.

If there are signs of endophthalmitis:

- Give vancomycin 1,000 μin 0.1 mL IV.
  OR

Give amikacin 0.4 mg in 0.1 mL IV.
OR

Give cefuroxine 1,000 µin 0.1 mL IV injections.

Antibiotics drops used after surgery are the following:

- Give tobramycin 0.3% one drop in the affected eye every 2 hours and give chloramphenicol 0.5% ointment at night.
  OR

  Give ciprofloxacin 0.3% one drop every 12 hours.

For dilating drops:

- Give cyclopentolate 1% eye drops every 12 hours.
  OR

  Give atropine 1% eye drops or ointment once per day.

Note: Refer all children who need surgery to the next-level facility with adequate expertise and facilities.

Blunt eye injury

This is trauma resulting from objects with blunt impact to the eyes.

Diagnostic criteria

- Pain and/or poor vision
- Blood in anterior chamber
- Normal or distorted pupil
- Normal or raised intraocular pressure

Figure 14.4. Eye with a blunt injury

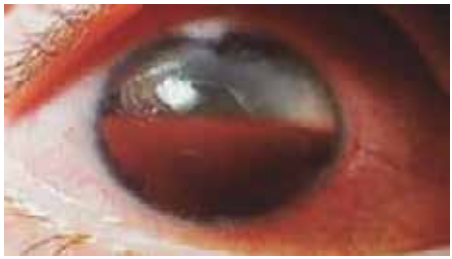


Photo by MOHCDGEC/MUHAS Tanzania, Ophthalmology Unit

Investigation

- No specific investigation

Treatment

Nonpharmacological treatment

- If no hyphema with normal vision, observe for 2 days.
- If no hyphema, normal vision with pain, give paracetamol 15 mg/kg by mouth every 8 hours and observe for 2 days.

Pharmacological treatment

For uncomplicated blunt injury:

- Give dexamethasone 1% eye drops every 2 hours.
  OR

  Give betamethasone 0.1% eye drops every 2 hours.
  OR

  Give prednisolone acetate 1% eye drops every 2 hours, then reduce frequency according to response.

Whenever infection is suspected:

- Give dexamethasone/chloramphenicol 0.1% to 0.5% eye drops every 2 hours.
  OR

Give dexamethasone/neomycin 1% eye drops, one drop every 2 hours.
OR

Give betamethasone/neomycin 0.5% eye drops, one drop every 2 hours.

- Give paracetamol 15 mg/kg by mouth every 8 hours if there is pain.

Note: Refer children with pain persisting more than 2 days, children with hyphaemia, or children with poor vision and pain to the next-level facility for adequate expertise and facilities.

Burns and chemical injuries

This is a condition that occurs when chemicals, such as acid or alkali, snake spit, traditional eye medicine, cement, or lime, enter into the eye.

Diagnostic criteria

- Photophobia
- Excessive tearing
- Haziness of cornea with
- History of an acid or alkali entering the eye

Figure 14.5. An eye with chemical injury

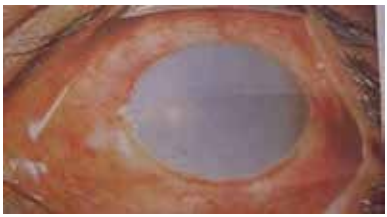


Photo by MOHCDGEC/MUHAS Tanzania, Ophthalmology Unit

Treatment

Nonpharmacological treatment

This is an ophthalmological emergency. Do the following:

- Irrigate the eye with clean water persistently for a minimum of 30 minutes.
- Apply an eye shield/pad.

Pharmacological treatment

- Apply eye ointment (chloramphenicol 1% or tetracycline 1%),

Note: Refer within 12 hours to the next-level facility with adequate expertise and facilities

14.4. FOREIGN BODIES

Foreign bodies, like a piece of metal, vegetable matter, or animal parts, enter into any part of the eye during playing or fieldwork, such as digging, fetching, or chopping firewood, and adhere into eye structures.

Diagnostic criteria

- Pain, redness, excessive tearing, loss of vision
- Visible foreign body with or without slit lamp

Figure 14.6. Foreign body in the eye

Photo by MOHCDGEC/MUHAS Tanzania, Ophthalmology Unit

Treatment

Pharmacological treatment

- Give amethocaine 0.5% or 1% one drop.
  OR

  Give tetracaine eye drops 0.5% one drop, wait for 3 minutes, and remove it with a cotton wool bud.
- Apply tetracycline eye ointment and pad the eye for 24 hours (if the foreign body is not vegetable matter).

For vegetable matter injuries

- Give natamycin 5% one drop every 2 hours.
  OR
  Give econazole 1% one drop every 2 hours.

For intraocular foreign body

- Apply chloramphenicol ointment 1%.
- Pad eye.

Note:

- Do not attempt to remove foreign bodies using sharp tips, like needles or knives.
- If removing with cotton wool is not possible, refer only to be removed under biomicroscopy/slit lamp.
- Refer to the next-level facility with adequate expertise and facilities.

14.5. CORNEAL ULCER

This is the breakdown of the lining of the corneal epithelium causing a painful red eye.

Diagnostic criteria

- Painful eye with or without hyperaemia
- Severe photophobia
- WITH evidence of corneal epithelium breakdown slit lamp examination

Figure 14.7. Corneal ulcer

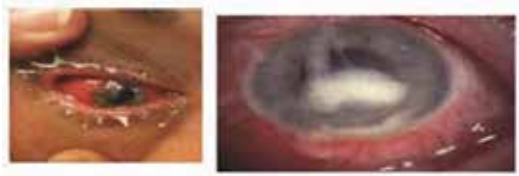


Photo by MOHCDGEC/MUHAS Tanzania, Ophthalmology Unit

Investigations

- Use fluorescence dye to assess the pattern of the ulcer and measure the size of corneal defect under slit lamp.
- Perform corneal scrapping for gram stain, potassium hydroxide (KOH) test.

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

14.6. RETINOBLASTOMA

This is a malignant tumour of the eyes arising from the retina.

Diagnostic criteria

- White pupil reflex-leukocoria; looks like cat's eye when illuminated with a torch at night
- Proptosis

Figure 14.8. Retinoblastoma

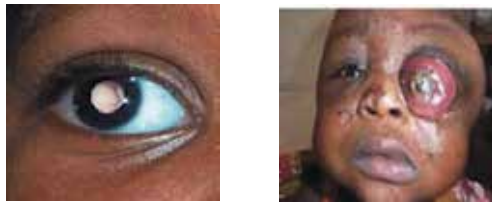


Photo by MOHCDGEC/MUHAS Tanzania, Ophthalmology Unit

Note: Refer all children with retinoblastoma to the next-level facility with adequate expertise and facilities.

14.7. TRACHOMA

This is a chronic conjunctivitis caused by infection with *Chlamydia trachomatis*. There is a chronic inflammation of the conjunctiva leading to scarring of the upper eyelid tarsal plate, entropion and, in turn, of eyelashes.

Diagnostic criteria

- Follicles in the upper tarsal plate seen as round and white nodules inactive stages are diagnostic.
- In late stages, in-turned eyelashes rub on the cornea, leading to corneal ulcers.
- There is loss of vision due to corneal scarring.

Treatment and prevention

- **SAFE** is the recommended strategy by WHO for treatment and prevention of trachoma.
  - **S**-Surgical correction of entropion in trachomatous trichiasis patients.
  - **A**-Antibiotic treatment of individual cases with trachomatous inflammation follicular and trachomatous inflammation intense to prevent transmission as follows:
    - Give tetracycline ointment 1% every 12 hours for 6 weeks.
      OR
      Give oxytetracycline ointment 3% once a day for 6 weeks.
    - Oral azithromycin is distributed in communities that have a district prevalence of active disease of 10% or more for preventive chemotherapy in mass treatment campaign and is given as a single dose.

Table 14.1. Dosage of azithromycin in children and adolescents

Weight (kg)	Dose
< 15	20 mg/kg once daily
15–25	400 mg once daily
26–35	600 mg once daily
36–45	800 mg once daily
> 45	1 gm once daily

  - **F**– Face washing and total body hygiene should be practiced to prevent transmission of disease from one person to the other.
  - **E** – Improve environment/hygiene.

14.8. VITAMIN A DEFICIENCY

This deficiency results from inadequate intake, fat malabsorption, or liver disorders. This impairs immunity, haematopoiesis, and typical ocular effects (e.g., xerophthalmia, night blindness). Vitamin A deficiency is associated with a higher infant and childhood mortality rate, particularly associated with measles. The age group at risk of blindness due to vitamin A deficiency is 6 months to 6 years.

Diagnostic criteria

- Night blindness
- Dry appearance of the conjunctiva or cornea (conjunctival/corneal xerosis)
- Localized white foamy appearance most often on the temporal conjunctiva (Bitot's spots)
- Corneal ulceration with xerosis
- Corneal melting that is of abrupt onset (corneal ulceration/keratomalacia severe vitamin A deficiency)
- Corneal scarring

Investigation

- No specific investigation

Treatment

Nonpharmacological treatment

- Encourage diet containing dark green, leafy vegetables.
- Pad the eye.
- Give vitamin A capsules.

Table 14.2. Vitamin A dosage

Age up to 1 year	Age Above 1 Year
100,000 IU First day	200,000 IU First day
100,000 IU Second day	200,000 IU Second day
100,000 IU Third dose after 4 weeks	200,000 IU Third dose after 4 weeks

Pharmacological treatment

- Apply tetracycline 1% eye ointment every 8 hours.
  OR
  Apply chloramphenicol 1% eye ointment every 8 hours.

14.9. SQUINT

A squint means misalignment of the eyes where one eye is looking at an object and the other eye is looking in different directions.

Diagnostic criteria

- Clinically
- Through orthoptic assessment

Figure 14.9. Squint

Photo by MOHCDGEC/MUHAS Tanzania, Ophthalmology Unit

Note: Squint can be a clinical presentation of fatal disease, like retinoblastoma. Refer to the next-level facility for adequate expertise and facilities.

14.10. UVEITIS

This is the inflammation of the uveal tissue (iris, choroid, and ciliary body).

Diagnostic criteria

- Painful red eye
- Excessive tearing and severe photophobia
- Visual acuity is usually reduced

- Pupil is small or may be irregular due to synechiae (adhesion among iris, cornea, and/or lens)
- WITH evidence of cells and keratic precipitates on the cornea and pus in the anterior chamber (hypopyon), cells in the vitreous, retinal exudates, and haemorrhages on slit lamp examination

Investigations

- FBP and ESR
- Serum titres for toxocara and toxoplasma
- Serum lysosome
- X-rays to rule out tuberculosis
- Fluorescence treponema antibody absorption
- Rheumatoid factor

Treatment

Give topical steroid:

- Dexamethasone 1% eye drops one drop every 3 hours
  OR
  Prednisolone acetate 0.5% or 1% eye drops one drop every 3 hours

Give oral steroid:

- Prednisolone 1 mg/kg by mouth, given in a tapering manner to maximum of 6 weeks

Give steroid injections:

- Triamcenolone 20 mg subtenon stat; can be repeated after 4 weeks OR
  Depomedron 20 mg subtenon stat; can be repeated after 4 weeks

Give dilating drops:

- Atropine eye drops 0.5% or 0.1% one drop every 12 hours
  OR
  Atropine ointment 1% every 12 hours
  OR
  Cyclopentolate 1% eye drops every 8 hours

Note: Acute uveitis is a serious problem, and the patient should be referred urgently for specialist treatment.

14.11. CONJUNCTIVITIS

This is an inflammation of the conjunctiva.

Allergic conjunctivitis

This is caused by allergens like dust, pollens, and animal fur.

Diagnostic criteria

- Itching of eyes, sand sensation, irritation
- Watery or mucoid discharge
- WITH evidence of limbal hyperpigmentation and papillae (small nodules) and papillae of the upper tarsal conjunctiva under slit lamp examination

In advanced stages, may present with corneal infiltrations.

Table 14.3. Treatment

Severity	Treatment
In mild cases	Advise the patient to wash the face with clean, cool water 4 times a day.
In moderate cases	Give sodium chromoglycate 2% or 4 % one drop every 6 hours for 1 month. OR Give iodoxamide tromethamine 0.1% (Alomide) one drop every 6 hours for 1 month. OR Give zinc sulfate 0.25% eye drops 6 one drop hourly for 1 month.
In severe cases (cornea infiltrations)	Give dexamethasone 0.1% one drop every 6 hours for a maximum of 14 days. OR Give prednisolone acetate 0.5% one drop every 6 hours for a maximum of 14 days.
In very severe form	Give injection triamcinolone acetonide 20 mg/mL subtenon stat. OR Give methyl prednisolone sodium acetate 20 mg/mL subtenon stat.

Note: All patients with moderate to severe allergic conjunctivitis should be referred to eye specialist for further specialized care.

Viral conjunctivitis

Diagnostic criteria

- Painless, watery eye discharge
- Photophobia if the cornea is involved
- Haemorrhages of conjunctival vessels

Treatment

Nonpharmacological treatment

- Self-limiting condition

Pharmacological treatment

- If secondary bacterial infection, give chloramphenicol eye drops.

Note: Viral conjunctivitis is very contagious, so patients and members of the family should be alerted.

Bacterial conjunctivitis

Diagnostic criteria

- Acute onset of painless purulent discharge
- Conjunctiva shows a velvety beef red appearance

Investigation

- No specific investigation

Treatment

Pharmacological treatment

- Give chloramphenicol 0.5% eye drops, one drop every 3 hours for 5 days.
  OR

  Give tobramycine 0.3% eye drops, one drop every 3 hours for 5 days.
  OR

Give ciprofloxacin 0.3% eye drops, one drop every 3 hours for 5 days.
OR

Give gentamicin 0.3% eye drops, one drop every 3 hours for 5 days.

Note: If there is no improvement after 2 days, refer to the next-level facility with adequate expertise and facilities.

14.12. ORBITAL CELLULITIS

This is an infection of the soft tissues behind the orbital septum.

Diagnostic criteria

- Sudden onset of unilateral swelling of conjunctiva and eyelids
- Proptosis bulging of the eye
- Pain with movement of the eye, restriction of eye movements, blurred vision, reduced visual acuity, and diplopia
- Pupil reactions may be abnormal-relative afferent papillary defect

Investigations

- FBP
- Swab for gram stain, culture, and sensitivity
- MRI may complement the CT in diagnosing a cavernous sinus thrombosis
- Lumbar puncture (if meningeal signs present)

Treatment

- Give ampicillin 50 mg/kg IV every 6 hours for 10 days.
  OR

  Give ceftriaxone 100 mg/kg IV once a day for 10 days.
  OR

  Give cefotaxime 50 mg/kg IV every 6 hours for 10 days.

Note:

- Treatment may be modified according to microbiology results and lasts for 10 days.

- Surgery is indicated where there is CT evidence of an orbital collection.

14.13. CAVERNOUS SINUS THROMBOSIS

Results from an infection that has spread beyond the face, sinuses, or teeth and sometimes from infection of the ears. Usually presents as a late complication of an infection of the central face or paranasal sinuses.

Diagnostic criteria

- Severe headache
- Swelling, redness, or irritation around one or both eyes
- Drooping eyelids
- Inability with eye movements
- High fever
- Pain or numbness around the face or eyes
- Vision loss or double vision

Investigations

- CT and MRI
- Lumbar puncture
- FBP
- CRP
- Blood cultures
- Pus swab for gram stain, culture, and sensitivity

Treatment

- Give chloramphenicol 25 mg/kg IV every 6 hours and ampicillin 50 mg/kg IV every 6 hours for 14 days.
  OR

  Give ceftriaxone 100 mg/kg once a day for 14 days.
  OR

  Give cefotaxime 50 mg/kg every 6 hours for 14 days.

Note: Corticosteroids may help to reduce inflammation and oedema, and should be considered as an adjunctive therapy.

14.14. DISEASES OF THE RETINA

Most of the diseases of the retina cause blindness if not identified and treated early. Some of the diseases of the retina are congenital (persistent foetal vasculature, retinal/optic disc, coloboma, toxoplasma/toxocara, optic nerve hypoplasia) and/or can be acquired (retinopathy of prematurity).

Diagnostic criteria

- Poor vision since birth
- Strabismus (squint)
- Leucocoria

Note:

- Routine fundus examination should be done on all neonates under oxygen therapy.
- Refer to the next-level facility with adequate expertise and facilities.

CHAPTER 15. PAEDIATRIC DENTISTRY

These are disorders that affect the oral cavity and its decidual structures.

15.1. DENTAL CARIES (TOOTH DECAY)

This is a breakdown in the tooth enamel and dentine caused by acid produced by bacteria due to poor oral hygiene and high-sugar diet in children.

Diagnostic criteria

- Whitish discoloration of the teeth
- Brown or black spot on any surface of the tooth
- Obvious cavity on the tooth surface
- Swelling around the tooth or jaw (gingivitis)
- Pain/toothache
  - Triggered by hot, cold, or sweet foods/drinks
  - During chewing
  - Spontaneous and interferes with sleep

Investigations

- Periapical X-ray
- X-ray orthopanthomogram

Treatment

Nonpharmacological treatment

- Early stage: brush properly with fluoridated tooth paste twice daily

Pharmacological treatment

- Give paracetamol 15 mg/kg by mouth every 8 hours for 5 days.
  OR

  Give diclofenac 1 mg/kg IM every 8 hours for 3 days.
- Give amoxicillin DT 40 mg/kg by mouth every 12 hours and metronidazole 7.5 mg/kg by mouth every 8 hours for 5 days.

Surgical treatment

- Cavity confined in the dentine: Fill with either glass ionomer, ketac molar, compomer, and composite.
- For teeth with reversible pulpitis, do indirect pulp capping and vital pulpotomy.
- For nonvital and abscessed primary molars, do pulpectomy or root canal treatment.

Note: Refer to next-level facility with adequate expertise and facilities.

Referral criteria

- No restorative/filling materials and instruments for root canal treatment
- Patients in need of advanced restorative techniques (e.g, bleaching, direct/indirect veneer)
- Habit of sleeping throughout the night with a bottle of liquid containing sugar may lead to dental carries

15.2. PERIODONTAL DISEASES

Periodontal diseases are a group of infections that affect the supporting structures of teeth (marginal and attached gingival, periodontal ligament, cementum, and alveolar bone). Can complicate to herpetic gingival stomatitis and necrotizing ulcerative gingivitis.

Diagnostic criteria

- Reddened, swollen gingiva
- Easy bleeding from the gums/gingival
- Severe pain, necrotic papilla, bad breath from the mouth
- Enormous periodontal breakdown without the presence of plaque
- Angular defect of the gingiva at the first molar or incisor
- Loose/mobile teeth
- Gingival recession
- Periodontal pockets

Investigation

- X-ray orthopanthomogram

Treatment

- Proper oral hygiene, dental scaling
- Gingivoplasty: If refractory/resistant to treatment or patient has systemic herpetic gingival stomatitis
  - Mouth washes
    - Hydrogen peroxide 3% every 8 hours for 7 days
      OR
      Chlorhexidine gluconate 0.2% every 8 hours for 7 days
      OR
      Povidone iodine 0.5% every 8 hours for 5 days

Note: Immunocompromised patients (diabetes mellitus, renal disease, undernutrition, and HIV/AIDS) tend to get severe forms of periodontal diseases and may need referral to the next-level facility with adequate expertise and facilities.

1. Herpetic gingival stomatitis
   - Give oral acyclovir.
     - Children ≤ 12 years: 10 mg/kg five times in 24 hours for 5 days
     - Children ≥ 12 years: 20 mg/kg five times in 24 hours for 5 days
     - Neonates: 20 mg/kg every 8 hours for 14 days
2. Necrotizing ulcerative gingivitis
   - Give metronidazole 7.5 mg/kg by mouth every 8 hours for 5 days.
   - Give amoxicillin DT 40 mg/kg by mouth every 12 hours for 5 days.

Note: Refer to the next-level facility with adequate expertise and facilities if no improvement.

15.3. DENTAL TRAUMA

These are injuries involving the tooth, periodontal ligaments, and alveolar bone, which can lead to permanent loss of teeth.

Injury to the dental hard tissue of permanent teeth

Enamel infraction

An incomplete fracture (crack) of the enamel without loss of tooth substance.

Treatment

- No specific treatment required.

Enamel fracture

A fracture confined to the enamel.

Treatment

- Selective grinding of the injured part

Enamel-dentine fracture (uncomplicated crown fracture)

A fracture involving enamel and dentine but not exposing the pulp.

Treatment

- Restore aesthetics, either by composite resin buildup or reattachment of the fractured crown fragment.

Enamel-dentine fracture with pulp exposure (complicated crown fracture)

A fracture involving enamel and dentin with loss of tooth structure and exposure of the pulp.

Investigation

- Periapical X-ray
- Orthopanthomogram

Treatment

- Pulp capping or partial pulpotomy in patients with open apices

Complicated crown-root fracture

A crown-root fracture involves enamel, dentine, and cementum

Diagnostic criteria

- Pulp inflammation and/or necrosis of permanent maxillary incisors

Treatment

- Orthodontic or surgical extrusions

Root fracture

Dentine and cementum fracture involving the pulp.

Diagnostic criteria

- Apical fragment in its original position
- Displaced coronal fragment

Investigations

- Periapical X-ray
- X-ray orthopanthomogram

Treatment

- For root fractures with avulsed out-of-socket coronal fragment, rinse exposed root surface with saline.
- If displaced, reposition the coronal segment of the tooth as soon as possible.
- Put in a flexible splint for 4 weeks.

Note:

- Stabilize the root fracture if the root fracture is near the cervical area up to 4 months.
- Consider root canal treatment for complicating pulp.

Injury to the supporting structures

Luxation tooth injuries

Concussion

An injury to the tooth-supporting structures without abnormal loosening or displacement of the tooth but with marked reaction to percussion.

Diagnostic criteria

- Tender teeth with pressure of biting

Investigation

- Periapical X-ray
- X-ray orthopanthomogram

Treatment

- Occlusal relief
- Soft diet

Subluxation (loosening)

An injury to the tooth-supporting structures with abnormal loosening but without displacement of the tooth.

Diagnostic criteria

- Loose teeth with evidence of periodontal ligament fibres inflammation

Investigation

- X-ray of the tooth

Treatment

- No treatment
- Occlusal relief
- Soft diet

Intrusive luxation

Displacement of the tooth into the alveolar bone.

Diagnostic criteria

- Impaction of a tooth into its socket in the fractured alveolar bone

Investigation

- Periapical X-ray
- Orthopanthomogram

Treatment

Primary tooth:

- If the root is displaced into the follicle zone, extract the tooth young permanent tooth (tooth with immature root formation).
- Await spontaneous reeruption.
- If it does not occur in 6 weeks, do orthodontic extraction.
- If there is pulp necrosis, do root canal.
- Teeth with fully developed apical root: do orthodontic extraction and splinting.
- If no part of the crown is visible in the oral cavity: surgical extrusion, splint, and root canal treatment; refer to the next-level facility with adequate expertise and facilities.

Extrusive luxation

Partial displacement of the tooth out of its socket.

Diagnostic criteria

- Centrally dislocated tooth with evidence of periodontal ligament laceration and inflammation

Investigation

- Periapical X-ray
- Orthopanthomogram

Treatment

- Reposition the extruded permanent tooth.
- Apply flexible splint for 3 weeks.

Lateral luxation

Luxation-displacement of the tooth other than axially. Accompanied by comminution fracture of the alveolar socket.

Diagnostic criteria

- The tooth is displaced anteriorly, posteriorly, or laterally.
- WITH evidence of periodontal laceration and fracture of the supporting bone

Investigation

- X-ray of the tooth

Treatment

- Reposition the extruded permanent tooth.
- Apply flexible splint for 3 weeks.

Avulsion

Complete displacement of the tooth out of its socket.

Diagnostic criteria

- Displaced tooth from the alveolar ridge
- Severe periodontal ligament with or without fracture of the alveolus

Investigation

- Periapical X-ray
- Orthopanthomogram

Treatment

Nonpharmacological treatment

- Good oral hygiene

Pharmacological treatment

- Give chlorhexidine 0.12% mouthwash every 12 hours for 10 days.
- Administer tetanus vaccine.
- Give metronidazole 7.5 mg/kg by mouth every 8 hours for 5 days.
- Give amoxicillin DT 40 mg/kg by mouth every 12 hours for 5 days.

Surgical treatment

- Replant the injured tooth (4–6 hours).
- Apply a flexible splint for 1–2 weeks.
- In case pulp necrosis occurs, do root canal treatment.

Note: Recommended transport media of the avulsed tooth:

- Henk's Balanced Salt Solution
- Cow's milk
- Normal saline
- Child's vestibule/saliva, water

15.4. ODONTOGENIC AND NONODONTOGENIC OROFACIAL INFECTIONS

Periapical abscess

This is a complication of inflammation of the dental pulp or periodontal pocket. It is located in the apical aspect of the supporting bone.

Diagnostic criteria

- Toothache
- Pain during intake of hot or cold foods/drinks, or occlusion
- Tenderness on percussion (vertical percussion)
- Swelling of the gingival around the affected tooth

Investigation

- Pus swab for gram stain, culture, and sensitivity
- FBP

Treatment

- Extraction of the offending tooth
- Root canal
- Apicectomy
- Paracetamol 15 mg/kg by mouth every 8 hours 7 days
- Metronidazole 7.5 mg/kg by mouth every 8 hours for 7 days
- Amoxicillin DT 40 mg/kg by mouth every 8 hours for 7 days

Infected socket

This is a postextraction complication due to super infection of the clot; if not managed well, could lead to osteomyelitis.

Diagnostic criteria

- Severe painful socket 2–4 days after tooth extraction
- Fever
- Necrotic blood clot in the socket
- Swollen gingival around the socket
- With or without lymphadenopathy and trismus (inability to open the mouth)

Investigation

- Periapical X-ray of the socket
- FBP
- Pus swab for gram stain, culture, and sensitivity

Treatment

- Debride socket.

- Irrigate with hydrogen peroxide once daily for 5 days.
- Give paracetamol 15 mg/kg by mouth every 8 hours for 5 days.
- Give metronidazole 7.5 mg/kg by mouth every 8 hours for 5 days.
- Give amoxicillin DT 15 mg/kg by mouth every 8 hours for 5 days.

Note: Instruct patient to rinse with warm saline or 3% hydrogen peroxide every 8 hours for 5 days.

Dry socket

This is a postextraction complication due to failure to form a clot (dry socket).

Investigation

- No specific investigation

Diagnostic criteria

- Severe pain 2–4 days postextraction, exacerbated by entry of air on the site
- Socket devoid of clot
- Inflamed gingival

Treatment

- Do socket debridement and irrigate with hydrogen peroxide 3% once daily for 4 days.
- Give paracetamol 15 mg/kg by mouth every 8 hours for 5 days.

Dental abscess

This is an acute inflammation characterized by localization of pus in the structures that surround the tooth.

Diagnostic criteria

- Fever and chills
- Throbbing pain of the offending tooth
- Swelling of the gingiva and surrounding tissues
- Pus discharge around the gingival of the affected tooth or teeth
- Trismus (inability to open the mouth)
- Enlarged and tender regional lymph nodes

Investigation

- Pus swab for gram stain, culture, and sensitivity
- FBP

Treatment

- Perform incision and drainage.
- Irrigate with 3% hydrogen peroxide once daily followed by rinsing with normal saline.
- Give metronidazole 7.5 mg/kg by mouth every 8 hours for 7 days and amoxicillin 40 mg/kg by mouth every 12 hours for 7 days.

For severe infection (when patient cannot swallow):

- Give ampicillin 50 mg/kg IV every 6 hours for 7 days.
  OR
  Give ceftriaxone 100 mg/kg IV once daily for 7 days and metronidazole 7.5 mg/kg IV every 8 hours for 7 days.

Note: Incision and drainage are mandatory in deeper space involvement followed by course of antibiotics.

15.5. OSTEOMYELITIS OF THE JAW

This is a progressive infection of the jaw bone, resulting in inflammatory distraction followed by new bone formation.

Diagnostic criteria

- Fever
- Enlarged regional lymph nodes
- Pain, with evidence of increased radio density of the mandible

Investigation

- Orthopanthomogram
- Culture and sensitivity

Treatment

- Do incision and drainage.
- Give amoxicillin DT 40 mg/kg by mouth every 12 hours for 2 months and metronidazole 7.5 mg/kg by mouth every 8 hours for 2 months.

15.6. VIRAL INFECTIONS

These are infections caused by viruses, including herpes simplex virus type 1 and 2, cytomegalovirus, HIV, and herpes zoster.

Herpes simplex virus

This is a viral infection of lips, mouth, or gums caused by herpes simplex virus, which can lead to herpetic gingivostomatitis, pharingotonsilitis, and herpes labialis.

Diagnostic criteria

- Painful mucocutaneous vesicular lesions involving the buccal cavity with or without fever

Investigation

- Immunoflourescence stain
- Tissue culture

Treatment

- Ensure adequate hydration.
- Apply petroleum jelly on the exposed lesions.

Herpes labial

- Apply acyclovir cream every 4 hours for 5 days.

Herpes stomatitis

- Give acyclovir 20 mg/kg by mouth five times in 24 hours for 5 days.

In immunocompromised:

- Give acyclovir 40 mg/kg by mouth five times in 24 hours for 5 days.
- Give paracetamol 15 mg/kg by mouth every 8 hours for 3 days.
  OR
  Give diclofenac 1 mg/kg IM every 12 hours for 3 days.

For oral facial lesions:

- Give acyclovir 6 mg/kg by mouth five times a day for 5 days.

15.7. APHTHOUS ULCERATION

Aphthous ulcer or recurrent aphthous stomatitis are painful recurrent mucous membrane ulcerations.

Diagnostic criteria

- Small round of ovoid ulcers about 2–4 mm in diameter
- Painful/ulcers 1–3 cm edged ulcers on nonkeratinized
- Erythema and oedema around lesions
- With or without fever

Treatment

- Apply topical hydrocortisone cream 0.5% every 12 hours for 7 days. OR

  Apply triamcinolone 0.1% or 0.5% every 12 hours for 7 days and give paracetamol 15 mg/kg by mouth every 8 hours for 5 days.

15.8. POSTEXTRACTION BLEEDING

This commonly occurs after tooth extraction caused by inadequate compression of the gauze or spitting and rinsing or due to bony/tooth remnants.

Diagnosing criteria

- Active bleeding from the socket postextraction with or without blood clot in the socket

Treatment

- Give local anaesthesia (lignocaine 2% with adrenaline 1 in 80,000 IU).
- Clear any clot available and examine the socket.
- Remove any foreign body, like bone spicule. If found, smooth any sharp edges.
- Suture the wound when necessary.
- Repack the socket with gauze containing oxidized cellulose.
- Give paracetamol 15 mg/kg by mouth every 8 hours for 3 days.
  OR

  Give diclofenac 1 mg/kg IM/by mouth every 12 hours for 3 days.
- Give tranexamic acid 10 mg/kg IV followed by 25 mg/kg by mouth every 8 hours for 24 hours.

Note:

- Correct dehydration or anaemia accordingly.
- Exclude bleeding disorders.
- Refer to the next-level facility with expertise and facility if bleeding continued after 24 hours despite steps above.

15.9. MALOCCLUSION

This is any variation in the arrangement of teeth leading to abnormal alignment to the extent that may be functionally harmful or cosmetically disfiguring.

Diagnostic criteria

- The upper teeth slightly overlap the lower teeth
- Upper jaw and teeth severely overlap the bottom jaw and teeth (eetrognathism or overbite)
- Protrution of the lower jaw
- Prognathism or underbite

Investigation

- Orthopanthomogram
- Lateral view and cephalometry and impression and study model.

Treatment

- Preventive orthodontics: serial extraction
- Habit breaker (e.g., for patients with thumb sucking)
- Removable orthodontic appliance
- Fixed orthodontic appliance (braces) (refer to orthodontist)

Teething (primary tooth eruption)
Normal development of tooth growth and eruption in children that starts from 4 months of age onwards.
The general eruption pattern is:

- Two bottom front teeth (central incisors)
- Four upper front teeth (central and lateral incisors)
- Two lower lateral incisors
- First molars
- Four canines or eye teeth
- Remaining molars on either side of the existing teeth

Symptoms and signs of teething:

- Excessive drooling, which may lead to a rash on the face or chest
- Gum swelling and sensitivity
- Irritability or fussiness
- Low-grade fever (rare)
- Refusing food
- Rubbing of ears and cheeks
- Sleep problems
- Urge to bite on hard objects

Note: Diarrhoea, frequent ear pulling, cough, and severe diaper rashes are not teething symptoms.

15.10. NATAL AND NEONATAL TEETH

Natal teeth are teeth that are present at birth; they generally develop in the lower jaw.

Neonatal teeth these are teeth that develop during the first 30 days after birth.

Treatment

- Remove the natal teeth immediately.
- For neonatal teeth: Reassure and schedule two monthly follow-ups until other deciduous teeth erupt.

Note: Natal teeth that are centrally located in the upper jaw may be associated with pituitary abnormalities, so refer to the next-level facility with expertise and facilities.

CHAPTER 16. URINARY TRACT DISORDERS

These are disorders resulting from structural malformation or function of the genitourinary system, which may lead to renal impairment.

16.1. NEPHROTIC SYNDROME

This is a renal disorder characterized by urinary protein loss, leading to generalized body swelling.

Diagnostic criteria

- Generalized body swelling worse in the morning
- Dipstick urine protein ≥ 3+ or 24 hours urinary protein > 40 mg/m²/h or a protein-to-creatinine ratio greater than 2.0 (more than 200 mg/mmol)
- Hypoalbuminaemia < 25g/L
- Raised serum cholesterol and triglyceride levels

Investigations

- Urinalysis
- 24-hour urine protein (Esbach's test)
- Urinary protein-to-creatinine ratio
- Serum albumin
- Serum cholesterol, triglycerides
- Serum creatinine and BUN
- Serum electrolytes

Treatment

Nonpharmacological treatment

- Encourage the patient to reduce salt intake in the diet and fluid intake.

Pharmacological treatment

- Give prednisolone 2 mg/kg by mouth (maximum dose 60 mg/day) daily for 6 weeks, then 1.5 mg/kg on alternate days for anotherr 6 weeks, then STOP.

If the patient is hypertensive, ADD:

- Captopril 2 mg/kg by mouth every 12 hours
  OR

  Nifedipine 1 mg/kg by mouth every 12 hours until the hypertension resolves

If the patient has severe oedema causing respiratory distress or genital oedema, add furosemide 1 mg/kg IV every 12 hours until severe oedema subsides.

Note:
Refer to the next-level facility with adequate expertise and facilities children with:

- Nephrotic syndrome below 1 year and above 10 years of age
- Failure to attain remission after 4 weeks of prednisolone therapy
- Frequent relapses (i.e., > 2 relapses in 6 months or > 4 relapses in 1 year)

16.2. ACUTE GLOMERULONEPHRITIS

This is a postinfectious inflammation of the glomeruli leading to renal dysfunction.

Diagnostic criteria

- Haematuria
- Oliguria/anuria
- Oedema
- Hypertension
- Elevated serum creatinine
- Dysmorphic red blood cells and red blood cell casts, and mild to moderate proteinuria (< 3+) on urinalysis

Investigations

- Urinalysis
- Serum creatinine and BUN
- Serum electrolytes
- Antistreptolysin O titre

- FBP
- Abdominal ultrasound

Treatment

Nonpharmacological

- Encourage the patient to reduce salt in diet.
- Restrict fluid intake; give oral fluids 400 mL/m2 or 30 mL/kg PLUS the volume of urine output.

Pharmacological treatment

- Give ampicillin 50 mg/kg IV every 6 hours for 10 days.
- If the child has oliguria and oedema (including pulmonary oedema), give furosemide 2 mg/kg by mouth or 1 mg/kg IV every 12 hours until oedema and oliguria resolve.
- If there is hypertension, add nifedipine 0.5 mg/kg by mouth every 6 hours until hypertension subsides.

Indications for peritoneal dialysis
- Volume overload with evidence of hypertension and/or pulmonary oedema refractory to diuretic therapy
- Persistent hyperkalaemia
- Severe metabolic acidosis unresponsive to medical management
- Neurologic symptoms (altered mental status, seizures)
- Blood urea nitrogen greater than 100–150 mg/dL (or lower but rapidly rising)

Note: Children in whom no recovery is observed in 2 weeks or require peritoneal dialysis should be referred to the next-level facility with adequate expertise and facilities.

16.3. HAEMOLYTIC UREMIC SYNDROME

This is a toxin-mediated clinical syndrome characterized by progressive renal dysfunction, microangiopathic haemolytic anaemia, and thrombocytopenia as a result of *Shigella* and *E. coli* infections.

Diagnostic criteria

- Raised serum creatinine and BUN

- Thrombocytopenia (platelets < 150,000/mm3)
- Features of haemolysis (low Hb and elevated total bilirubin) with or without a prior history of diarrhoea

Investigations

- FBP
- Peripheral smear
- Reticulocyte count
- Serum creatinine and BUN
- Serum electrolytes
- Stool culture
- Urinalysis

Treatment

Nonpharmacological treatment

- Encourage patient to reduce salt intake.
- Encourage plenty of fluid intake.
- If the child has severe anaemia, give packed red blood cells (see the dose on Chapter 1).
- If the child has active bleeding, give platelet transfusion (see dose in Chapter 10).

Pharmacologic treatment

- If hypertensive, give nifedipine (see dose above).
- If *S. dysentriae* is isolated, give ciprofloxacin 15 mg/kg 12 by mouth hourly for 10 days.

Note: Patients with severe renal impairment who are not responding to treatment may require dialysis as per indications.

16.4. ACUTE KIDNEY INJURY

This is an abrupt (within 48 hours) reduction in kidney function leading to metabolic derangements.

The main causes of acute kidney injury in children include:

- Acute tubular necrosis secondary to hypovolemia, sepsis
- Nephrotoxic agents
- Acute glomerulonephritis
- Haemolytic uremic syndrome

Diagnostic criteria

- Absolute increase in serum creatinine of either ≥0.3 mg/dL (26.5 mmol/L)
  OR

  A percentage increase in serum creatinine of ≥ 50%
  OR

  Reduction in urine output (oliguria of < 0.5 mL/kg/hr for 6 hours)

Investigations

- Urinalysis and urine culture
- FBP
- Serum creatinine and BUN
- Serum electrolytes, calcium, phosphate, and bicarbonate
- Chest X-ray
- Abdominal ultrasound
- Peripheral smear and reticulocyte counts
- Antistreptolysin O titre

Treatment

Nonpharmacological treatment

- Ensure adequate nutritional intake.
- Salt restriction in case there is hypertension.
- Give oral fluids 400 mL/m2 PLUS the equivalent volume of urine output.

Pharmacological treatment

- If there is hypertension, give nifedipine 0.5 mg/kg by mouth every 6 hours.

- If there is hypertensive encephalopathy, give sublingual nifedipine orally 0.5 mg/kg every 6 hours.
- If there are signs of fluid overload, give Furosemide 1 mg/kg by mouth every 12 hours OR Furosemide IV 1 mg/kg every 6 hours

Note:

- The maximum dose of furosemide is 6 mg/kg/day if the patient is passing urine.
- Avoid nephrotoxic drugs such as gentamicin, ciprofloxacin, radio-contrast media, diclofenac, and captopril.

Renal replacement therapy

There are two modalities of renal replacement therapy: peritoneal dialysis and haemodialysis. Indications for renal replacement therapy include severe or persistent hyperkalaemia, fluid overload (pulmonary oedema), and severe metabolic acidosis.

Note: Patients requiring renal replacement therapy must be referred to the next-level facility with adequate expertise and facilities.

16.5 CHRONIC KIDNEY DISEASE

This is a structural and functional malformation of the kidney with or without decreased glomerular filtration rate for at least 3 months. Renal function in chronic kidney diseas may deteriorate gradually and progress to end-stage renal disease.

Common causes of chronic kidney disease in children include:

- Obstructive europathy
- Hypoplastic or dysplastic kidneys
- Reflux nephropathy
- Chronic glomerulonephritis
- Polycystic kidney diseases

Diagnostic criteria

- Volume overload
- Hyperkalaemia

- Metabolic acidosis
- Hypertension
- Anaemia
- Osteodystrophy
- Anorexia, nausea, vomiting
- WITH evidence of elevated serum creatinine and BUN for at least 3 months

Treatment

Nonpharmacological treatment

- Encourage balanced diet that provides adequate protein and calories.

Note:

- Protein restriction is not recommended in children.
- Avoidance of nephrotoxic drugs as above.

Pharmacologic treatment

- Give elemental iron 6 mg/kg by mouth per day (to achieve Hb of 11–12 g/dL).
- If there is proteinuria of +1 dipstick and/or hypertension, give nifedipine 2 mg/kg by mouth every 12 hours.
- If hypertension is not controlled, add furosemide 1 mg by mouth every 12 hours.

Note: All children with chronic kidney disease should be referred to the next-level facility with adequate expertise and facilities.

16.6. URINARY TRACT INFECTION

This is an infection in any part of the urinary system that may potentially lead to sepsis, renal scarring, hypertension, or chronic kidney disease.

Diagnostic criteria

- Fever
- Vomiting and poor feeding

- Increased frequency of micturition
- Pain on passing urine
- Lower abdominal or loin pain in older children
- With presence of:
  - 10 leukocytes/mm3 in un-centrifuged sample
    OR
    > 5 leukocytes/mm3 high-power field in centrifuged sample
    OR
    Positive leukocyte esterase and nitrite
    OR
    Positive urine culture

Treatment

Pharmacological treatment

- Give amoxicillin DT 40 mg/kg by mouth every 12 hours for 10 days. OR
  Give ciprofloxacin 15 mg/kg by mouth every 12 hours for 10 days.

Note:

- Ciprofloxacin is safe to use in children.
- If no improvement, give specific antibiotics depending on culture and sensitivity pattern.

CHAPTER 17. PRINCIPLES OF ANAESTHESIA

This chapter explains principles that allow patients to undergo surgical procedures without feeling unbearable pain or potentiate extreme physiologic exacerbations.

17.1. PERIOPERATIVE FLUIDS

Give maintenance fluids (refer to Chapter 1).

Preoperative

Note: Fluid resuscitation may be required in patients with hypovolaemia or dehydration.

Intraoperatively

Preoperative preparations

- Preanaesthetic visit must be done a day before surgery.
- For emergency case, preanaesthetic review must be done before patient is sent to operating room.
- Obtain consent.
- Catheterize the patient and monitor urine output (urine output of 1–2 mL/kg/hr implies adequate volume resuscitation).
- For neonates, give vitamin K.
- Check haemoglobin (Hb) level:
  - For neonates, if Hb < 10 g/dL, transfuse 10 mL/kg.

    OR

    If Hb < 8g/dL for older children, transfuse 10 mL/kg packed red blood cells for 3 hours.
- **For children with haemoglobinopathy** (HbSS, HbAS, HbSC, and thalassaemia), do not use tourniquet and avoid cold conditions, pain, and hypoxia during procedures/operations.

- **For children with diabetes mellitus requiring minor surgery (lasting < 3 hours)**
  - If blood glucose is < 20 mmol/L, continue with normal insulin dose and give short-acting insulin 0.1 IU/kg IV intraoperatively each hour.
  - If blood glucose is ≥ 20 mmol/L, give intermediate-acting insulin SC two-thirds of total daily dose in the morning, one-third of total daily dose in the evening, and give short-acting insulin 0.1 IU/kg IV intraoperatively each hour.
  - Give glucose 5% IV as maintenance fluid throughout the procedure.
  - Monitor blood glucose level every 1–2 hours to maintain blood glucose level between 10–14 mmol/L.
- Major surgery (lasting > 3 hours)
  - If blood glucose is < 20mmol/L, continue with normal insulin dose and give short-acting insulin 0.05 IU/kg IV intraoperatively each hour.
  - If blood glucose is ≥ 20mmol/L, give intermediate-acting insulin SC two-thirds in the morning, one-third in the evening of total daily dose, and give short-acting insulin 0.05 IU/kg IV intraoperatively each hour.
  - Give dextrose normal saline IV as maintenance fluid throughout the procedure.
  - Monitor blood glucose level every 1–2 hours to maintain blood glucose level between 6–14 mmol/L; if < 5mmol/L, reduce infusion rate of insulin by 50%; continue infusion therapy until food intake is re-established.

Investigations for preoperative laboratory screening

- FBP
- Blood group and cross matching
- Urinalysis
- Sickling test when sickle cell disease is suspected
- Serum creatinine and BUN
- Liver function test
- Serum electrolytes
- Blood gases analysis

Preoperative antibiotics

They should be given for:

- Infected and contaminated cases (e.g., those requiring bowel or bladder surgery)
  - Give ampicillin 50 mg/kg IV every 6 hours, gentamicin (neonates < 3 week, 5 mg/kg; neonates > 3 weeks, give 7.5 mg/kg) IV, and metronidazole 7.5 mg/kg by mouth every 8 hours for 5 days.
- Children at risk of endocarditis (undergoing dental, oral, respiratory, and oesophageal procedures)
  - Give amoxicillin 50 mg/kg by mouth before the operation or, if unable to take oral medications, give ampicillin 50 mg/kg IV 30 minutes before the surgery.
- Urinary tract infections
  - Give ampicillin 50 mg/kg IV every 6 hours and gentamicin (neonates < 3 weeks 5 mg/kg; > 3 weeks 7.5 mg/kg) IV for 5 days after the operation.

17.2. GIVING GENERAL ANAESTHESIA

Premedicants and sedatives

- Apply lignocaine 2.5% and prilocaine 2.5% (1:1) cream locally at the venous puncture site.
- Intubate the child with an appropriate type and size endotracheal tube and provide supportive ventilation.
- Set the fresh gas (oxygen and nitrous oxide) flow to 300 mL/kg/min with a maximum of 3 L/min.

Table 17.1. Drugs used as premedicants and sedatives

Premedicants And Sedatives	Dose	Route of Administration	Special Precautions Side Effects
Atropine	0.02 mg/kg	IV	
Glycopyrrolate	5–10 mcg/kg	IV	
Midazolam Chlorohydrate	0.5 mg/kg 50 mg/kg	By mouth By mouth	Give 20–30 minutes Preoperatively. Give 15–20 minutes before procedure (radiological procedures).
Metochloropropamide	0.2 mg/kg	IV or IM	
Ondasetron IV	0.15 mg/kg	IV	

Table 17.2. Drugs used in preoperative muscle relaxants

Muscle Relaxants	Dose	Route of Administration	Special Precautions Side Effects
Suxamethonium	1 mg/kg	IV	Anaphylactoid reactions, malignant hyperthermia (very rare), drug degrades in hot climates, often causes bradycardia Currently recommended only for rapid sequence induction
Pancuronium	0.1 mg/kg	IV	Use only if you have reversal medicines
Atracurium	0.5 mg/kg	IV	
Vecuronium	0.1 mg/kg	IV	Use only if you have reversal medicines

Table 17.3. Drugs used as preoperative analgesia

Type of Analgesia	Dose	Route of Administration	Special Precautions Side Effects
Paracetamol	15 mg/kg	IV or rectal	
Diclofenac	1 mg/kg	IM	
Tramadol	1 mg/kg	IV, IM	
Opioids			
Morphine	Infant and child 0.05–0.1 mg/kg Neonates 0.025 mg/kg	IV IV	
Pethidine	0.5–1 mg/kg	IV	Respiratory depression
Fentanyl	1–2 mcg/kg	IV	Respiratory depression

Note: NSAIDs are only recommended for children 3 months and above. Avoid in patient with aspirin hypersensitivity, asthma, hypovolaemia, dehydration, coagulopathy, or renal problem.

Table 17.4. Drugs used in induction of anaesthesia

Inducing Agent	Dose	Route of Administration	Special Precautions Side Effects
Thiopental	5 mg/kg	IV	Cardiorespiratory depression, loss of airway
Propofol	3 mg/kg	IV	Cardiorespiratory depression, apnoea, loss of airway
Ketamine	1 mg/kg 6 mg/kg	IV IM	Hypertension, avoid in pre-eclampsia, epilepsy, and head injury
Midazolam	0.1 mg/kg	IV	Respiratory depression

Table 17.5. Drugs used in maintenance of anaesthesia

Inhalational Agents	Dose	Route of Administration	Special Precautions Side Effects
Propofol	0.2 mg/kg/min	IV	
Thiopental	1 mg/kg	IV	
Midazolam	0.1 mg/kg/hour	IV	

Inhalational Agents	Dose	Route of Administration	Special Precautions Side Effects
Halothane	1–2%	Inhalation	Hypotension, cardiac arrhythmias
Sevoflurane	2.5–3%	Inhalation	
Nitrous oxide	50–70%	Inhalation	Awareness, hypoxic mixtures
Isoflurane	1.5–2%	Inhalation	Only for maintenance

Reversal and Recovery from Anaesthesia

- Suction of the pharynx
- 100% oxygen at least 10 breaths

Table 17.6. Drugs used in reversal of anaesthesia

Reversal Agents	Dose	Route of Administration
Atropine	0.02 mg/kg	IV
Neostigmine	0.05 mg/kg	IV

17.3. POSTOPERATIVE CARE

- Monitor the vital signs—respiratory rate, pulse, temperature, and blood pressure—every 15 minutes until stable.
- Give maintenance fluids (refer to Chapter 1).
- Give pain medication every 8 hours up to 72 hours as per dose strength above, then switch to oral as needed.

Note: If the child develops bradycardia, desaturation, shock, or uncontrolled bleeding, notify and manage accordingly.

Common postoperative problems

Laryngospasm

- This is a common complication during anaesthesia.
- Caused by secretions, inhalation of anaesthetic agents, or attempts at intubation and extubation.

Treatment

- Give 100% oxygen, jaw thrust, and airway suction.
- If this fails, give xuxamethonium 0.25 mg/kg and ventilate with mask.
- If no improvement, reintubate.

Local anaesthesia

For minor procedures in children above 10 years.

Table 17.7. Drugs used during giving local anaesthesia

Local Anaesthetics	Maximum Dose	Route of Administration	Special Precautions Side Effects
Lidocaine plain	5 mg/kg	IV/INF/spinal/ topical	Central nervous system and cardiovascular depression, convulsions
Lidocaine with epinephrine (adrenaline)	7 mg/kg	IV/INF/spinal/ topical	Central nervous system and cardiovascular depression, convulsions
Bupivacaine (0.25%)	2.0 mg/kg	IV/INF/spinal/ topical	Central nervous system depression and cardiac arrest
Levobupivacaine (0.25%)	2.5 mg/kg	Not for IV	Central nervous system depression and cardiac arrest

Regional anaesthesia

- Caudal block, peripheral nerve blocks, and local surgical wound infiltration are common regional techniques in paediatric anaesthesia.
- Administration of a regional anaesthesia will depend on the type and site of surgery.
- For caudal block:
  - Give 0.25% bupivacaine (sacral) 0.5 mL/kg.
    OR
    Give 0.25% bupivacaine (lumbar) 1 mL/kg,

Table 17.8. Drugs used during resuscitation

Vasopressors	Dose	Route of Administration	Special Precautions Side Effects
Ephedrine	500–750 mcg/kg	IV	
Medicines used in resuscitation			
Epinephrine (adrenaline)	0.05–0.1 mL/kg 0.1 mL/kg	IV of (1 in 10,000) IV of (1 in 10,000)	For anaphylaxis For cardiac arrest
Atropine	0.02–0.05 mg/kg	IV/IM (up to 3 mg for organophosphate poisoning)	If prolonged resuscitation done or in presence of acidosis
Sodium bicarbonate	1 mEq/kg	IV	
Naloxone	4 mcg/kg	IV (opioid antidote)	
Adenosine	100 mcg/kg	IV (if supraventricular present)	
10% calcium gluconate	0.5 mL/kg (max 20 mL)	IV slow (if hyperkalaemia and during CPR)	
Flumazenil	5 mcg/kg 2–10 mcg/kg/hr	IV stat, every 1 minute to maximum 40 mcg/kg infusion	

Blood volume during surgeries

- Neonates have a proportionately higher blood volume (90 mL/kg of body weight) than adults (70 mL/kg).
- Measure blood loss during operations as accurately as possible; a fully soaked piece of gauze is estimated to be 20 mL of blood loss.
- Consider blood transfusion if blood loss exceeds 10–15% of blood volume.
- See table below as a rough guide; 10 mL/kg of packed cells (or 20 mL/kg whole blood) will raise the haemoglobin by 1 g/dL.

Table 17.9. Blood volume of children by age

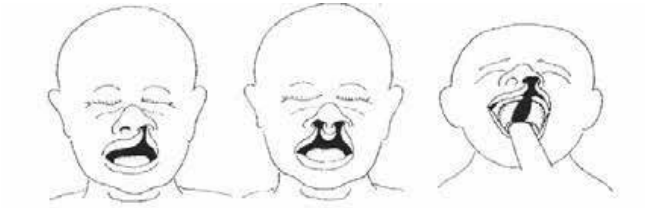
Age Group	mL/kg Body Weight
Neonates	90
Children	80
Adults	70

CHAPTER 18. COMMON PAEDIATRIC SURGICAL DISORDERS

Paediatric surgical problems can be congenital or acquired. There are many types of congenital anomalies. Only a few of them are common. Some require urgent surgical attention.

18.1. CLEFT LIP AND PALATE

This is a failure of the palatal shelves to come fully together on either side of the mouth. Cleft lip and palate may occur together or separately and may be bilateral or unilateral.



Cleft lip and palate

Source: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Diagnostic criteria

- Feeding difficulties
- Food/milk may be aspirated into the lungs during feeding
- WITH evidence of cleft or lip defect either unilateral or bilateral

Investigation

- No specific investigation

Treatment

- Feed using expressed breast milk via a cup and spoon or a special teat.
- Surgically close the lip at 6 months of age and close the palate at 1 year of age.

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

18.2. OESOPHAGEAL ATRESIA

These are congenital anomalies affecting the oesophageal continuity with or without fistula to a trachea or bronchi. The most common is tracheoesophageal fistula.

Diagnostic criteria

- Frothing, drooling, or regurgitation
- Choking or coughing is followed by any attempt to feed the baby with evidence of coiled up NGT in an air-filled area on chest X-ray

Investigations

- Chest X-ray with a NGT in situ
- Gastrografin swallow

Note: This may be associated with vertebra, anal, cardiac, limb, and renal anomalies. Investigate accordingly.

Treatment

Nonpharmacological

- Nothing is taken orally.
- Use frequent suction to prevent aspiration pneumonia.
- Keep the infant warm and nurse in the 30° head up position.
- Give 10% glucose 60 mL/kg IV in 24 hours; refer management of fluids to Chapter 1.

Pharmacological

For infections

- Give ampicillin 50 mg/kg IV every 12 hours (first week of life) and every 8 hours (2–4 weeks of life), and gentamicin 3 mg/kg/dose (low-birthweight babies), 5 mg/kg/dose (normal birthweight babies), and 7.5 mg/kg/dose (weeks 2–4 of life) IV once daily for 10 days.
- Give cloxacillin 50 mg/kg IV every 12 hours (first week of life) and every 8 hours (2–4 weeks of life) for 10 days.

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

18.3. PYLORIC STENOSIS

This is a congenital disorder characterized by hypertrophy of the pyloric musculature, leading to a mechanical obstruction of the gastric outlet in the affected infant.

Diagnostic criteria

- Postprandial nonbilious projectile vomiting with sonographic evidence of hypertrophy of the pyloric musculature

Investigation

- Abdominal ultrasound
- Serum electrolytes
- FBP
- Blood gas analysis

Treatment

- Nothing is taken orally.
- Correct dehydration, electrolyte imbalance, or anaemia if detected.
- Then give maintenance fluid (refer Chapter 1).
- Perform pyloromyotomy.

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

18.4. HIRSCHSPRUNG'S DISEASE

This is the congenital absence of ganglion cells of the distal bowel, leading to functional intestinal obstruction.

Diagnostic criteria

- Failure to pass meconium in the first 48 hours of life
- Constipation
- Abdominal distension
- Rectum full of faeces on digital rectal exam
- WITH evidence of aganglionic cells on rectal biopsy

Investigation

- Plain abdominal X-ray erect and supine
- Barium enema
- Full thickness rectal biopsy

Treatment

- Correct dehydration if present.
- Give maintenance fluids.
- Give normal saline enema to evacuate stool. If it fails, perform a diverting colostomy.
- Duhamel or Swenson procedure is definitive treatment.

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

18.5. MECONIUM ILEUS (MECONIUM PLUG SYNDROME)

This is a transient disorder of the newborn colon characterized by delayed passage of the meconium and intestinal dilatation.

Diagnostic criteria

- Failure to pass meconium (> 24–48 hours)
- Bilious vomiting
- Abdominal distension

- WITH evidence of a filling or a double contrast effect on contrast enema

Investigation

- Contrast enema (gastrografin)

Treatment

- Push the water-soluble contrast enema up to the level of obstruction, flushing out the meconium plug. If the water-soluble contrast enema fails, perform laparotomy.

Note: A water-contrast enema that can be both diagnostic and therapeutic for this condition.

18.6. ANORECTAL MALFORMATION (ARM)

This is a condition where the anus is missing, malformed, or has a blockage that does not allow faeces to pass and may be associated with abnormal communication with the urinary or reproductive system.

Diagnostic criteria

- Absence of an anus and/or presence perianal fistula
- Abdominal distension
- Vomiting

Investigations

- Inventogram
- Colostogram

Treatment

- Nothing is taken orally.
- Correct dehydration if present.
- Give maintenance fluids.
- Do anoplasty with or without prior colostomy.

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

18.7. ABDOMINAL WALL DEFECTS

These are congenital malformations of the abdominal wall. These include exomphalos and gastroschisis.

Exomphalos

This is the protrusion of the bowel and the liver outside the abdominal cavity covered by a loose sac that surrounds the umbilical cord.

Diagnostic criteria

- Anterior midline abdominal mass with a covering membrane at the site of the cord insertion

Investigation

- No specific investigation

Treatment

Nonpharmacological treatment

- Apply a sterile wet dressing and cover with a plastic wrap (to prevent fluid loss).
- Put an NGT to decompress the stomach.
- Give IV fluids (refer Chapter 3).

Pharmacological treatment

- Give ampicillin 50 mg/kg IV every 6 hours for 7 days, cloxacillin 50 mg/kg IV every 6 hours for 7 days, and gentamicin 5 mg/kg IV once daily for 7 days.

Surgery

- Primary surgical closure of the abdominal wall

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

Gastroschisis

This is a full thickness abdominal wall defect associated with evisceration of the bowel.

Diagnostic criteria

- Protrusion of abdominal cavity contents outside the abdominal cavity with no overlying membrane

Figure 18.1. Gastroschisis

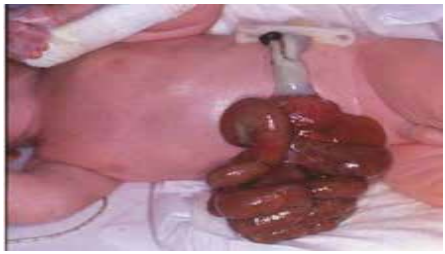


Photo by MUHAS/MNH Surgical Department 2017

Investigation

- No specific investigation

Treatment

Nonpharmacological treatment

- Apply a sterile wet dressing and cover with a plastic wrap (to prevent fluid loss).
- Put an NGT to decompress the stomach.
- Give IV fluids (refer to Chapter 3).

Pharmacological treatment

- Give ampicillin 50 mg/kg IV every 6 hours for 7 days, cloxacillin 50 mg/kg IV every 6 hours for 7 days, and gentamicin 5 mg/kg or 7.5 mg/kg IV once daily for 7 days.

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

18.8. HYDROCEPHALUS

This is a disturbance of CSF formation, flow, or absorption, leading to an increase of CSF within the cranial cavity. It can be congenital or acquired.

Diagnostic criteria

- Progressively increasing size of the head
- Failure to thrive
- Blurred and double vision
- Sunset appearance of the eyes (in severe forms)

Investigation

- Cranial ultrasound
- Brain CT scan

Treatment

- Ventriculoperitoneal shunt insertion
- Endoscopic third ventriculostomy

Note:

- For the rapid onset hydrocephalus: Do ventricular tap in infants, open ventricular drainage in children, and do lumbar puncture in posthaemorrhagic and postmeningitic hydrocephalus.
- Refer to the next-level facility with adequate expertise and facilities.

18.9. MYELOMENINGOCELE

This is a small sac that protrudes through a bony defect in the vertebrae.

Diagnostic criteria

- Swelling at the back
- With or without neurological deficits

Investigation

- Ultrasound of the swelling
- Cranial ultrasound
- Serum electrolytes
- Renal function tests
- Septic screening

Treatment

Nonpharmacological treatment

- Apply a sterile dressing.
- Ensure adequate fluid and dietary intake.

Pharmacological treatment

- Give ampicillin 50 mg/kg IV every 6 hours for 7 days, cloxacillin 50 mg/kg IV every 6 hours for 7 days, and gentamicin 7.5 mg/kg IV once daily for 7 days.

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

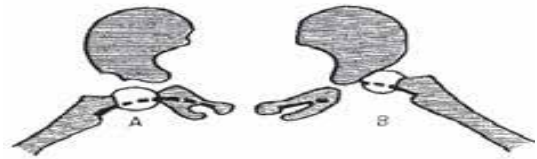
18.10. DEVELOPMENTAL DYSPLASIA OF THE HIP

Abnormal development of the hip is where patients are born with dislocation or instability of the hip, leading to hip dysplasia

Diagnostic criteria

- The affected limb is short with limited abduction when the hip is flexed.
- Skin crease at the back of the hip appears asymmetrical.
- When the flexed hip is abducted, a click can often be felt (Ortolani's sign).

Figure 18.2. Radiological diagnosis of congenital dislocation of the hip



Radiological diagnosis of congenital dislocation of the hip

A) Normal Shenton's line

B) The line is broken in dislocation of the hip.

Source: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Treatment in milder cases

- Keep the hip in flexion and abduction through double nappies or an abduction brace in an abducted position for 2–3 months.

Note: The culture of carrying the child on the back with the hip flexed and abducted will serve the same purpose.

Treatment in severe cases

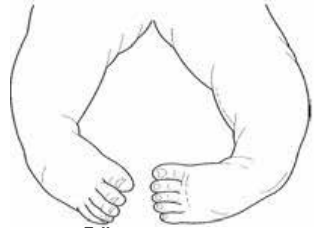
- Keep the hip abducted and flexed in a splint.

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

18.11. TALIPES EQUINOVARUS (CLUBFOOT)

This is a congenital deformity in which the affected foot is rotated internally at the ankle.

Figure 18.3. Talipes



Source: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Diagnostic criteria

- The foot points down and inwards, and the soles of the feet face each other.

Treatment

For mild deformity

- Stretch the foot repeatedly beginning shortly after birth.

Moderate deformity

- Do serial manipulations with tape strapping or well-padded plaster-of-Paris casts shortly after birth.
- These manipulations need to be repeated every 2 weeks until the deformity is corrected.

Severe deformity

- Do surgery on the affected limb(s).

18.12. GASTROINTESTINAL BLEEDING

This is bleeding that occurs in any part of the gastrointestinal tract. It can be upper or lower gastrointestinal bleeding. When it presents acutely, acute

gastrointestinal bleeding is a common medical emergency that can result in morbidity and mortality.

Diagnostic criteria

- Hematemesis
- Melena
- Haematochezia
- Chronic occult bleeding

Investigation

- FBP
- Blood grouping and cross matching
- Coagulopathy profile (partial thromboplastin time, prothrombin time, bleeding time)
- Liver function tests
- Renal function tests
- Oesophago duodenoscopy
- Colonoscopy

Treatment

In case of acute upper gastrointestinal bleeding:

- Nothing is taken orally.
- Insert NGT.
- Do a nasogastric aspiration (insert NGT, then use 0.9% normal saline for gastric lavage that is followed by gastric aspirate).
- When the gastric aspirate is clear, give expressed breast milk for breastfeeding or start feeding for nonbreastfeeding children.
- Give oxygen if needed.
- Give IV fluids.
- Give blood transfusion with packed red blood cells (10 mL/kg).
- Correct severe thrombocytopenia with packed platelet concentrates.
- Give vitamin K 5 mg IM stat.
- Give ranitidine

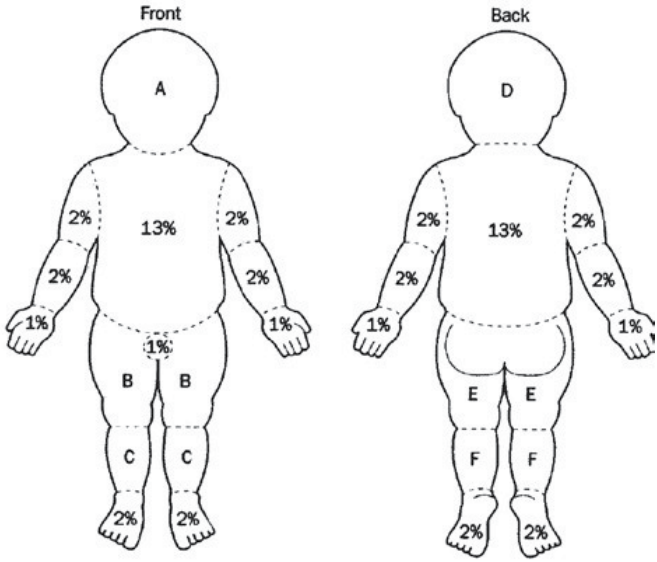
- Neonates: 0.5 mg/kg IV every 6 hours for 72 hours
- Child > 1 month: 1 mg/kg IV every 6 hours for 72 hours

- Give metronidazole 7.5 mg/kg IV every 8 hours for 7 days and ceftriaxone 100 mg/kg IV once daily for 7 days.

18.13 BURNS

This is an injury to the skin caused by fire, radiant heat, chemical, or electrical contact leading to temperature dysregulation, infection, fluid, and electrolyte imbalance.

Figure 18.4 Diagram for estimating the percentage of body surface burned



Area	By age in years			
	0	1	5	10
Head (A/D)	10%	9%	7%	6%
Thigh (B/E)	3%	3%	4%	5%
Head (A/D)	2%	3%	3%	3%

Source: World Health Organization (WHO). 2005. *Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources*. WHO website. http://www.who.int/maternal_child_adolescent/documents/9241546700/en/. Accessed May 7, 2018.

Note: Alternatively, use the child's palm to estimate the burn area. A child's palm is approximately 1% of the total body surface area.

Investigation

- FBP

- Blood grouping and cross matching
- Serum electrolytes
- Renal function tests
- Total serum protein and albumin
- Septic screening

Treatment

- Follow ABC concept.
- Fluid resuscitation should commence immediately.
- For children with ≥ 10% total body surface area burned, give fluid according to Parkland formula (4 mL x kg x % total body surface area burned) PLUS maintenance fluid.
- Half of this calculated volume should be given in the first 8 hours (from the time the burn occurred) and the rest over the following 16 hours.

Note: Ensure that the urine output is at least 1 mL/kg/hour.

- For patients who have more than 20% total body surface area, insert nasojejunal tube within 12 hours of admission to hospital for feeding.
- Insert an NGT on the same nostril to decompress the stomach within the first 48 hours.
- If skin is intact, clean with antiseptic solution (povidone iodine) gently without breaking the skin.
- If skin is not intact, debride the burn carefully.
- Apply:
  - Mupirocin every 12 hours
    OR

    Silver sulfadiazine every 12 hours
    OR

    Honey every 12 hours
- Clean and dress the wound daily.
- If signs of local infection, give amoxicillin 40 mg/kg by mouth every 12 hours for 5 days.
- If the patient develops signs of septicaemia, treat accordingly (see Chapter 6).

- Give tetanus toxoid-containing vaccine accordingly.
- Give paracetamol 15 mg/kg IV every 6 hours for 24 hours, then give by mouth for 3 days
  OR

  Give morphine sulfate 0.1 mg/kg IV every 2–4 hours (for severe pain), then by mouth.
- Refer to the next-level facility with adequate expertise and facilities

18.14. FRACTURES

This is a break in the continuity of the bone. Fractures can be open or closed.

Diagnostic criteria

- Pain
- Swelling
- Deformity
- Crepitus
- Unnatural movement
- Loss of function
- With radiological evidence of a break in the continuity of the bone

Investigation

- X-ray of the affected bone

Treatment

Open fractures

- Give amoxicillin plus clavulanic acid 30 mg/kg by mouth every 12 hours for 5 days, and gentamicin 7.5 mg/kg IV once a day for 5 days.
- Perform an open reduction.

Closed fractures

- Apply plaster-of-Paris.

Note:

- Apply a posterior splint to stabilize upper and lower extremity injuries.
- Refer to the next-level facility with adequate expertise and facilities.

18.15. HEAD INJURIES

This is any trauma to the skull, scalp, or brain leading to permanent or temporary impairment of cognitive, physical, and psychosocial function.

Diagnostic criteria

- Altered level of consciousness
- Confusion
- Seizure
- Amnesia
- Signs of increased intracranial pressure (unequal pupils, rigid posture, focal paralysis and irregular breathing, vomiting)
- With a recent history of head trauma

Investigations

- Skull X-ray
- Cranial CT

Treatment

- Nothing is taken orally.
- Protect the child's airway (see Chapter 1).
- Give two-thirds of maintenance fluid (refer to Chapter 1).
- Elevate the head of the bed to 30°.

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

18.16. THORACIC AND ABDOMINAL INJURIES

These are injuries to the chest and/or abdomen and may result from blunt or penetrating external mechanical forces.

Thoracic injuries

Diagnostic criteria

- Oesophageal with massive gastric dilatation
- Pneumothorax
- Haemothorax

Investigation

- Chest X-ray
- FBP
- Blood grouping and cross matching

Treatment

- Follow ABC concept.
- Insert an NGT to decompress the stomach.
- If there is evidence of pneumothorax or haemothorax, insert chest tube.

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

Abdominal injuries

Diagnostic criteria

- Abdominal pain
- Abdominal distention
- Guarding
- Severe anaemia
- With recent history of abdominal trauma

Investigation

- FBP
- Blood grouping and cross matching
- Plain abdominal X-ray erect and supine
- Abdominal ultrasound

Treatment

- Follow ABC concept.
- Give IV fluids.
- Give paracetamol 15 mg/kg IV/by mouth every 8 hours for 5 days.
- Bed rest for 7 days.
- Laparotomy may be required for children with severe abdominal trauma.

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

18.17. APPENDICITIS

This is inflammation of the inner lining of the vermiform appendix, which spreads to its other parts and may lead to peritonitis, sepsis, and abscess formation.

Diagnostic criteria

- Periumbilical pain that shifts to the right iliac fossa
- Anorexia, vomiting (variable)
- Fever is usually low grade unless perforation has occurred
- Guarding
- Rebound tenderness

Investigation

- Abdominal ultrasound
- FBP
- Blood grouping and cross matching
- Serum electrolytes
- Serum creatinine and BUN

Treatment

Nonpharmacological treatment

- Nothing is taken orally.
- Give maintenance fluids.

Pharmacological treatment

- Give ampicillin 50 mg/kg IV every 6 hours for 7 days, gentamicin 7.5 mg/kg IV once daily for 7 days, and metronidazole 7.5 mg/kg IV every 8 hours for 7 days.

Surgical treatment

- Urgent appendectomy should be done.

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

18.18. INTESTINAL OBSTRUCTION

This is a mechanical interruption of the flow of intraluminal contents, which may lead to impaired intestinal perfusion, necrosis, or perforation. Bowel obstruction may be due to intussusception, obstructed hernias, and severe *Ascaris* infestation.

Diagnostic criteria

- Abdominal pain
- Vomiting
- Abdominal distension
- Failure to pass stool or flatus

Investigation

- Plain abdominal X-rays erect and supine
- FBP
- Blood grouping and cross matching
- Serum electrolytes
- Serum creatinine and BUN

Treatment

- Follow ABC concept.

- Nothing is taken orally.
- Insert an NGT for bowel decompression.
- Give maintenance fluids.
- Perform laparotomy.

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

18.19. INTUSSUSCEPTION

This is a form of bowel obstruction in which one segment of the intestine telescopes into the adjacent segment. Commonly occurs at the ileal-caecal junction.

Diagnostic criteria

- Colicky abdominal pain/discomfort
- Vomiting
- Palmar Pallor
- Abdominal distension,
- Bloody diarrhoea ('red currant jelly stool'1)
- Palpable abdominal mass in right lower quadrant and may extend along the line of colon
- With evidence of a concave 'meniscus' sign on barium enema

Investigations

- Air or barium enema
- FBP
- Blood grouping and cross matching
- Serum electrolytes
- Serum creatinine and BUN

1 *Source:* Kliegman RM, Stanton BF, Schor NF, et al. 2016. *Nelson Pediatric Symptom-Based Diagnosis.* 20th ed. Philadelphia, PA: Elsevier.

Treatment

Nonpharmacological treatment

- Follow ABC concept.
- Nothing is taken orally.
- Insert an NGT for bowel decompression.
- Give maintenance fluids.
- Perform hydrostatic reduction by barium enema under fluoroscope.

Pharmacological treatment

- Give ampicillin 50 mg/kg IV every 6 hours for 7 days, gentamicin 7.5 mg/kg IV daily for 7 days, and metronidazole 7.5 mg/kg IV every 8 hours for 7 days.

Surgical treatment

- If hydrostatic reduction by barium enema under fluoroscopic fails, perform laparotomy.

Note: Refer to the next-level facility with adequate expertise and facility.

18.20. UMBILICAL HERNIA

This is a fascia defect in anterior abdominal wall at umbilical region.

Diagnostic criteria

- Soft, reducible swelling at umbilicus

Investigation

- No specific investigation

Treatment

- Observation, spontaneous closure

Note:

- Do not put coin on umbilical hernia for treatment.

- Refer to the next-level facility with adequate expertise and facilities for repair if:
  - It is not closed by 5 years of age.
  - There is a history of the hernia being difficult to reduce.

18.21. INGUINAL HERNIA

This is a protrusion of abdominal cavity contents through the inguinal canal.

Diagnostic criteria

- Reducible inguinal swelling worse on coughing

Investigation

- No specific investigation

Treatment

- Herniorrhaphy
- Herniotomy

18.22. RECTAL PROLAPSE

This occurs when a mucosal or full thickness layer of rectal tissue protrudes through the anal orifice.

Diagnostic criteria

- A mass protruding through the anus
- Rectal bleeding
- Pain

Investigation

- No specific investigation

Treatment

Nonpharmacological treatment

- Reduce with gentle constant pressure.
- Ensure adequate fluid and dietary intake.

Pharmacological treatment

- Give mebendazole 100 mg by mouth every hour for 3 days
  OR
  Give mebendazole 500 mg by mouth once daily for 3 days.
- Recurrent prolapsed may require:
  - Sclerotherapy
    OR
    Thiersch stitch
    OR
    Mesh rectopexy

Note:

- Refer to the next-level facility with adequate expertise and facilities.
- Treat underlying cause of diarrhoea and malnutrition.

18.23. UNDESCENDED TESTIS (CRYPTORCHIDISM)

This is the absence of one or both testes from the scrotum.

Diagnostic criteria

- Absence of testes in the scrotum

Investigation

- Abdominal pelvic ultrasound

Treatment

- Orchidopexy at the age of 12 months

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

18.24. HYPOSPADIAS

Hypospadias is an abnormality where the urethral opening is ectopically located on the ventrum of the penis.

Diagnostic criteria

- Incomplete prepuce
- Ectopic-positioned urethral meatus

Investigation

- No specific investigation

Treatment

- Surgical repair

Note: Refer to the next-level facility for adequate expertise and facilities.

18.25. INFECTIONS REQUIRING SURGERY

Abscess diagnostic criteria

- Painful swelling
- Fever
- Tender and fluctuant

Investigation

- FBP
- CRP
- Pus swab for culture and sensitivity

Treatment

- Incision and drainage of an abscess
- Give ampicillin 50 mg/kg IV/by mouth every 6 hours for 5 days and cloxacillin 50 mg/kg IV/by mouth every 6 hours for 5 days.

- If bowel flora is suspected (e.g., perirectal abscess), add metronidazole 7.5 mg/kg IV/by mouth every 8 hours for 7 days.

18.25.2. Pyomyositis

This is a condition where there is pus within the muscle.

Diagnostic criteria

- Fever
- Swelling and tenderness of the involved muscle
- Pain

Investigations

- FBP
- CRP
- Pus for culture and sensitivity
- X-ray of the area affected

Treatment

- Incise and drain the affected site.
- Leave a drain in the abscess cavity for 2–3 days.
- Give ampicillin 50 mg/kg IV/by mouth every 6 hours for 10 days, cloxacillin 50 mg/kg IV/by mouth every 6 hours for 10 days, and gentamicin 7.5 mg/kg IV once a day for 10 days.

Note: Refer to the next-level facility for adequate expertise and facilities.

Empyema thoracis

This is pus accumulation in the pleural space.

Diagnostic criteria

- Intermittent fever
- Dull percussion note

- Decreased or absent breath sounds
- Decreased tactile vocal fremitus
- With history of partially treated pneumonia, disseminated infections (e.g., otitis media)

Investigation

- Chest X-ray
- Pleural aspirate for gram stain, culture, and sensitivity, cytology
- Sputum for gram stain, culture, and sensitivity
- FBP
- CRP

Treatment

- Give ampicillin 50 mg/kg IV/by mouth every 6 hours for 10 days,c loxacillin 50 mg/kg IV/by mouth every 6 hours for 10 days, and gentamicin 7.5 mg/kg IV once a day for 10 days.
- Insert intercostal drainage tube.

Note: Refer to the next-level facility for adequate expertise and facilities.

CHAPTER 19. EAR, NOSE, AND THROAT DISEASES

This chapter covers common disorders affecting the ears, nose, and throat in children.

191. OTITIS EXTERNA

This is an inflammatory condition of the pinna and external auditory canal.

Diagnostic criteria

- Itchy/painful, dry/discharging external ear with an intact tympanic membrane

Investigation

- Ear swab for gram stain, culture, and sensitivity

Treatment

Nonpharmacological treatment

- Aural toilet at least after every 3 days (ear suctioning under direct vision) until discharge subsides
- Dry ear wicking

Pharmacological treatment

- Give aluminium acetate ear drops 13%, 3 drops every 6 hours after cleaning and drying the ear for the first 48–72 hours.
- Then give:
  - Gentamicin ear drops 3 drops every 12 hours for 7 days
    OR
    Ciprofloxacin 0.3% ear drops 3 drops every 12 hours for 7 days

19.2. OTITIS MEDIA

This is an inflammatory condition of the middle ear cavity; if untreated, it can lead to hearing loss. It can either be acute or chronic lasting for ≥ 14 days.

Acute otitis media

Purulent exudates in the middle ear cavity with/without ear discharge lasting less than 14 days.

Diagnostic criteria

- Otalgia (painful ears)
- Ear discharge
- Fever
- With an evidence of inflamed and bulging tympanic membrane on otoscopy

Investigation

- If there is ear discharge, ear swab for gram stain, culture, and sensitivity.

Treatment

Nonpharmacological treatment

- If there is discharge, dry ear wicking every 12 hours until the discharge subsides.

Pharmacological treatment

- Give amoxicillin DT 40 mg/kg by mouth every 12 hours for 5 days. OR

  Give azithromycin 10 mg/kg by mouth once daily for 3 days and paracetamol 15 mg/kg by mouth every every 8 hours for 3 days.

Chronic otitis media

Purulent exudates in the middle ear cavity with an ear discharge (perforated tympanic membrane) that last more than 14 days.

Diagnostic criteria

- Ear discharge
- With an evidence of perforated tympanic membrane

Investigation

- Ear swab for gram stain, culture, and sensitivity
- FBP

Treatment

Nonpharmacogical treatment

- Ear wicking

Pharmacological treatment

- Apply ciprofloxacin 0.3% ear drops, three drops for 14 days.
- Give cephalexin 12.5 mg/kg by mouth every 12 hours for 10 days (maximum dose 25 mg/kg every 12 hours).

Note:

- Refer to the next-level facility with adequate expertise and facilities children with:
  - High fever
  - Severe ear pain
  - Headache
  - Altered state of consciousness
  - Foul-smelling ear discharge (cholesteatoma)
  - Mastoid abscess (after incision and drainage)
  - Otitis in the normal (or better hearing) ear combined with permanent hearing loss in the other ear
  - Secretory otitis with hearing loss that does not improve in 3 months

19.3. CHOANAL ATRESIA

This is a failure of proper development of the posterior nasal choanae leading to obstructed nasal breathing.

Diagnostic criteria

- Cyanosis

- Difficulty breathing
- Inability to pass a small feeding tube (5.5 cm) from the alar rim on one or both nostrils

Investigation

- No specific investigation

Treatment

Nonpharmacological treatment

- Insert and secure an oral airway with a plaster.
- Insert an orogastric feeding tube, then refer the patient for bilateral choanal atresia release and stenting in a tertiary centre.

Surgical treatment

- Children with bilateral choanal atresia require emergency choanal atresia release with stenting.
- Children with unilateral choanal atresia require elective choanal atresia release with stenting.

19.4. ADENOIDS HYPERTROPHY

This is the hypertrophy of the lymphoid tissues in the nasopharynx, resulting from repeated upper respiratory tract infections.

Diagnostic criteria

- Nasal discharge
- Nasal obstruction
- Mouth breathing
- Snoring
- Otitis media

Investigation

- Nasopharyngeal lateral view X-ray

Pharmacological treatment

- Normal saline nasal spray as needed

If symptoms persist for more than 5 days:

- Give amoxicillin DT 40 mg/kg by mouth every 12 hours for 5 days. OR
  Give azithromycin 10 mg/kg by mouth once daily for 3 days.

Note: Refer a patient with persistent (more than 1 month) nasal obstruction (snoring), sinusitis, and/or otitis media.

19.5. ALLERGIC RHINITIS

This is an inflammation of nasal mucosa occurring in a previously sensitized individual.

Diagnostic criteria

- Recurrent
  - Itchy nostrils, throat, and eyes
  - Watery nasal discharge
  - Nasal congestion
  - Sneezing
  - With evidence of mucosal oedema on rhinoscopy

Investigation

- No specific investigation

Treatment

Nonpharmacological treatment

- Avoidance of allergens

Pharmacological treatment

- Give normal saline nasal spray, 1 puff each nostril twice a day for 7 days.
  PLUS
- Give fluticasone nasal spray, 1 puff each nostril twice daily.
  OR

  Give beclomethasone nasal spray, 1 puff each nostril for 7 days.

If fluticasone or beclomethasone are not available:

- Give cetirizine by mouth
  - Children aged 2–6 years: 5 mg daily for 7 days
  - Children aged ≥ 7 years: 10 mg daily for 7 days

19.6. EPISTAXIS

This is spontaneous bleeding from the nasal mucosa, which can be either anterior (Little's area) and posterior (usually associated with severe bleeding).

Diagnostic criteria

- Bleeding from the nose without any prior history of trauma

Investigation

- For mild cases, no investigations needed.
- For severe cases:
  - Blood grouping and cross matching
  - FBP

Treatment

Nonpharmacological treatment

- Advise the patient or parent/guardian to pinch the soft part of the nose gently for 5 minutes.
- Put the patient in a sitting position.
- Evacuate clots.
- Remove a foreign body.

Pharmacological treatment

- If the patient is still bleeding, pack the nose with gauze containing a mixture of lignocaine 2% and oxymetazoline 0.05% in the ratio of 1:1 for up to 72 hours.
- If the patient is still bleeding after 72 hours, repack and refer to the next-level facility with expertise.

19.7. PHARYNGOTONSILLITIS

This is an acute inflammation of the oral pharynx and/or tonsils.

Diagnostic criteria

- Fever
- Drooling and odynophagia
- Evidence of inflammation with or without pus pockets

Investigation

- No specific investigation

Pharmacological treatment

- Give amoxicillin DT 40 mg/kg by mouth every 12 hours for 5 days. OR
  Give azithromycin 10 mg/kg by mouth once daily for 3 days.

Note: Refer to the next-level clinic with expertise and facility if the child has:

- Recurrent tonsillitis (> three attacks in a year or five or more attacks in 2 years)
- Obstructive tonsillitis (causing upper airway obstruction)
- A recurrent peritonsillar abscess (after a previous incision and drainage)

19.8. LARYNGOMALACIA

This is a congenital abnormality of the laryngeal cartilage, resulting in collapse of the supraglottic structures during inspiration leading to airway obstruction; however, the child will remain active except when there is superimposed infection.

Diagnostic criteria

- Inspiratory stridor, which worsens with increased respiratory effort (crying, feeding) or being in the supine position with evidence of omega-shaped epiglottis that prolapses over the larynx during inspiration on flexible laryngoscope

Investigation

- No specific investigation

Note:

- This is a self-limiting condition that will spontaneous improve.
- Refer to the next-level of expertise all children with failure to thrive or whose symptoms persist beyond 18 months of age.

19.9. FOREIGN BODIES (IN THE EAR, NASAL CAVITY)

This is a piece of extraneous matter present in the respiratory tract. Seeds are commonly inhaled—ground nuts, beans, maize.

Diagnostic criteria

- Sudden choking
- Stridor/wheezing
- Unilateral wheeze
- An area of dull percussion note
- A unilateral, foul-smelling nasal discharge
- With evidence of a foreign body in the respiratory tract on laryngoscopy or bronchoscopy and chest X-ray

Investigation

- Chest X-ray

Nonpharmacological treatment

- Remove the foreign body using a cerumen hook (or a hooked office pin) under direct vision.
- Refer to Chapter 1 (a choking child).

Note: If the foreign body has not come out, refer immediately to the next-level facility with adequate expertise.

CHAPTER 20. DERMATOLOGICAL DISORDERS

This chapter covers infectious and noninfectious conditions of the skin.

20.1. BACTERIAL INFECTIONS

These are superficial and deep infections of the skin caused by either *Staphylococcus* alone or together with *Streptococcus*, but rarely *Streptococcus* alone. These include erysipelas, acute cellulitis, impetigo, staphylococcal scalded skin syndrome, boils, and abscesses.

Erysipelas

This is a superficial cellulitis with lymphatic vessel involvement beginning as a small skin break or umbilical stump (infants).

Diagnostic criteria

- Blisters
- High fever
- Pain

Investigations

- Swab for culture and sensitivity may be required.

Treatment

Pharmacological treatment

- Phenoxymethyl penicillin 25 mg/kg by mouth every 6 hours for 7 days

Note:
There is no need for bBenzylpenicillin IV/IM; oral phenoxymethyl penicillin is adequate.

Acute cellulitis

This is inflammation of the deeper, subcutaneous tissues, most commonly caused by *Streptococci* or *Staphylococci*.

Diagnostic criteria

- Erythematous, hot, and tender ill-defined areas of oedema that are rapidly spreading
- Fever
- Lymphangitis and regional lymphadenitis

Investigations

- FBP
- CRP
- Blood culture and sensitivity

Treatment

Pharmacological treatment

Give cloxacillin IV:

- Neonate < 7 days old: 50 mg/kg every 12 hours
- 7–28 days old: 50 mg/kg every 8 hours
- > 1 month old: 50 mg/kg every 6 hours

AND

Give ampicillin IV:

- Neonate < 7 days old: 50 mg/kg every 12 hours
- 7–28 days old: 50 mg/kg every 8 hours
- > 1 month old: 50 mg/kg every 6 hours

Note: If allergic to penicillin, give erythromycin 12.5 mg/kg by mouth every 6 hours for 7 days.

Impetigo contangiosa

This is a superficial, highly contagious, bullous skin infection caused by *Streptococci* or *Staphylococci*.

Diagnostic criteria

- Superficial, fragile blisters and irregular spreading sores with shiny yellow crusts

Figure 20.1. Impetigo on the face of a 15-month-old boy

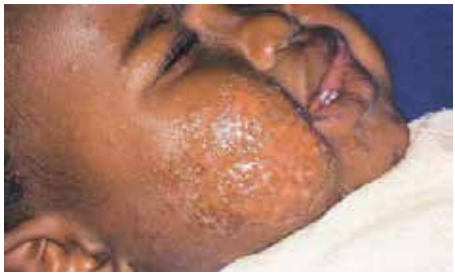


Photo by MOHCDGEC/MUHAS Dermatology Unit

Investigations

- Swab for gram stain, culture, and sensitivity
- FBP
- CRP

Treatment

Nonpharmacological treatment

- Keep infected areas clean and prevent spread to other areas.
- Bathe affected parts/soak off the crusts with cetrimide or chlorhexidine, or simply with soap and water.

Pharmacological treatment

- Apply topical mupirocin ointment 2% every 12 hours for 7 days.
- If severe or systematic symptoms are present (e.g., pyrexia), add cloxacillin and ampicillin (same dose as for acute cellulitis, see above)
  OR
  Erythromycin 12.5 mg/kg by mouth every 6 hours for 7 days

Staphylococcal scalded skin syndrome

This is a severe acute exfoliation of the skin caused by *Staphylococcal exotoxin*, leading to formation of vesicles and blisters.

Diagnostic criteria

- Rapid extending exanthema rash beginning around the orifices
- Positive Nikolsky sign within 24–48 hours
- Purulent conjunctivitis, otitis, and oropharyngitis may be present

Investigations

- Swab for gram stain, culture, and sensitivity
- FBP
- CRP

Treatment

Pharmacological treatment

- Give cloxacillin and ampicillin (doses as in acute cellulitis above)

Note: If allergic to penicillin, give erythromycin (see doses above) plus topical mupirocin ointment 2% every 12 hours for 7 days.

Boil (furuncle)

It is an infection of skin hair follicles caused by *Staphylococcus aureus* that leads to an inflammatory nodule, with a pustular centre.

Note: A carbuncle is two or more confluent furuncles with separate heads.

Diagnostic criteria

- Painful, warm swelling with pus
- Local oedema
- With or without fever

Investigations

- Pus swab for gram stain, culture, and sensitivity

Treatment

- Perform incision and drainage if boil becomes fluctuant and large.
- Give ampicillin by mouth plus cloxacillin by mouth (same dose as for acute cellulitis, see above).

Note: If allergic to penicillin, use erythromycin (see dose above).

20.2. FUNGAL INFECTIONS

These are infections caused by fungi that live in the dead cells of the skin, particularly in the moist areas of the body (such as between the toes, groin, and diaper areas).

Common fungal infections in children include:

- Diaper rash
- Tinea corporis and tinea versicolor
- Tinea capitis

Diaper rash (diaper dermatitis) and candidiasis

This is an inflammation of the infant's skin by irritating substances, such as ammonia, due to prolonged contact with urine and/or faeces. Secondary infection with bacteria or fungus (mostly candidiasis) may occur.

Diagnostic criteria

- Erythematous macules or papulovesicular lesions involving skin folds around the perianal region, buttocks, and genitalia
- Satellite lesions outside the affected region

Figure 20.2. Diaper rash caused by candida

Photo by MOHCDGEC/MUHAS Dermatology Unit

Note: In oral and vulvovaginal mucosa, redness, superficial erosions, and white adherent plaques may be seen. These can be itchy and painful.

Investigations

- No specific investigations required.

Treatment

- Apply potassium permanganate dressings for large oozing lesions, or take baths for 10 minutes twice daily; keep the skin dry.
- Apply gentian violet solution for mucosal or smaller wet lesions once daily until healed.
- Apply nystatin ointment or cream every 12 hours for 14 days.
  OR

  Apply clotrimazole 1% cream every 6 hours until the rash disappears, then continue for further 7 days.
- Cover with zinc oxide cream or ointment after applying clotrimazole cream.

Note: Potassium permanganate solution 1:4,000 to 1:10,000 should always be prepared fresh, as it is rapidly inactivated after being diluted.

Tinea corporis (body ringworm)

This is a superficial dermatophyte infestation characterized by inflammatory and noninflammatory lesions on the body (trunk).

Diagnostic criteria

- Single or multiple round scaly patches with distinct borders on the body or face
- With evidence of segmented hyphae on microscopy

Investigations

- Skin scrapings for microscopy

Treatment

Apply:

- Clotrimazole 1% cream/ointment every 12 hours for 4 weeks

  OR

  Miconazole 2% cream/ointment every 12 hours for 4 weeks

Tinea versicolor (pityriasis versicolor)

This is a cutaneous fungal infection of the chest and back that is caused by yeast that naturally lives on the skin.

Diagnostic criteria

- Depigmented macules/patches of varying sizes on the chest, shoulders, and back (trunk), but rarely on the face
- Lesions worsen on heat and humid conditions or in an immune suppressed child
- Evidence of segmented hyphae on microscopy

Investigations

- Skin scrapings for microscopy

Treatment

Apply:

- Clotrimazole 1% cream/ointment every 12 hours for 4 weeks
  OR
  Miconazole 2% cream/ointment every 12 hours for 4 weeks

Scalp ringworm (tinea capitis)

This is a cutaneous fungal infection of the scalp.

Diagnostic criteria

- Thickened, broken-off hairs with erythema and scaling of underlying scalp
- Flaking area within the scalp, hair loss, weeping, or crusting
- Pustule formation and a boggy, fluctuant mass called kerion may be present
- Evidence of segmented hyphae on microscopy

Investigations

- Skin scrapings for microscopy

Figure 20.3. Severe pustular tinea capitis

Photo by MOHCDGEC/MUHAS Dermatology Unit

Treatment

- Give griseofulvin by mouth:
  - Child 1 month to 12 years: 20 mg/kg (maximum 500 mg) once daily for 6 weeks
  - Age 12–18 years: 500 mg once daily for 6 weeks

Note: Absorption increases with fatty foods, such as whole milk. Do not crush the tablet (use microsize capsule or tablet).

OR

- Give terbinafine by mouth:
  - < 20 kg: 62.5 mg once daily for 4 weeks
  - 20–40 kg: 125 mg once daily for 4 weeks
  - Above 40 kg: 250 mg once daily for 4 weeks

Tinea unguium (nail ringworm)

This is a fungal infection of the nails.

Diagnostic criteria

- Loosening of the nail plate from the nail bed, forming yellowish discoloration
- Thickening of the distal nail plate with scaling and a crumbly appearance of the entire nail plate surface

Investigations

- No specific investigations required.

Treatment

- Give \griseofulvin for 6 weeks and 12 weeks for finger and toenails, respectively (see dose above).

20.3. VIRAL INFECTIONS

These are cutaneous infections caused by viruses. Common viral infections include herpes simplex, varicella-zoster, and human papillomavirus.

Herpes simplex (cold sores)

It is an infection of the skin and/or mucous membrane caused by herpes simplex type I or II.

Diagnostic criteria

- Vesicles and/or pustules with an erythematous base
- Painful blisters and sores with or without fever

Investigations

- Direct fluorescent antibody staining is confirmatory but rarely required

Treatment

- Give acyclovir 20 mg/kg by mouth every 6 hours for 5 days.
- Apply gentian violet every 12 hours for 5 days (use one-half strength 0.25% for mouth lesions).
- Give paracetamol 15 mg/kg by mouth every 8 hours if axillary temperature is ≥ 38.5□C.

Chicken pox (varicella-zoster)

This is a highly contagious cutaneous infection caused by human herpes virus type 3 (varicella-zoster virus).

Diagnostic criteria

- Evidence of progressive red macules and papules concentrated on the face and trunk to clear vesicles, pustules, and then crusting
- Fever
- Headache
- Body malaise

Figure 20.4. Chicken pox in 10-year-old boy

Photo by MOHCDGEC/MUHAS Dermatology Unit

Investigations

- No specific investigations required.

Treatment

- Apply calamine lotion every 8 hours for 7 days.
- Give paracetamol 15 mg/kg by mouth every 8 hours for 5 days.

Shingles (herpes zoster)

This is an acute, painful inflammation of the nerve ganglia, with a skin eruption often forming a girdle (belt) around the middle of the body. It commonly occurs in immunocompromised patients.

Diagnostic criteria

- Painful blistering vesicles on an erythematous base of one-half of the dermatome of any part of the body
  - Preceded a few days earlier by pain and local paraesthesia on affected site

Figure 20.5. 3-year-old boy with herpes zoster

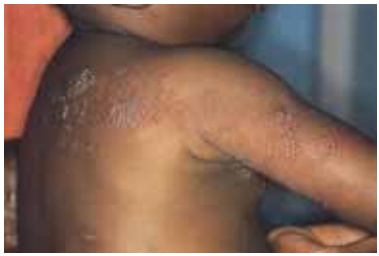


Photo by MOHCDGEC/MUHAS Dermatology Unit

Investigations

- HIV serology

Treatment

- Give acyclovir 20 mg/kg by mouth every 6 hours for 7 days and apply acyclovir cream 5% to the lesions every every 6 hours.
  OR

  Apply zinc oxide 5% twice a day.
- Give gabapentin 5 mg/kg by mouth every 8 hours for 2 weeks.

Note: Acyclovir is most useful when given within 72 hours from the onset of symptoms. Refer to the next-level health facility with adequate expertise and facilities for patients with lesions that are haemorrhagic, extensive, affect the eyes, or are recurrent.

Molluscum contagiosum

This is an infection of the skin caused by pox virus.

Diagnostic criteria

- Generalized small, smooth, painless, pinkish nodules with a central depression, which release a milky fluid when squeezed

Investigations

- No specific investigations required.

Treatment

Usually no need for treatment, except in severe cases.

- Perform cryotherapy with trichloroacetic acid 35–100%.
  OR
  Perform curettage.

20.4 PARASITIC INFESTATIONS

These are cutaneous infestations caused by parasites. Common skin parasitic infestations in children include mites or lice.

Scabies

This is a cutaneous infestation caused by a mite *Sarcoptes scabie*, leading to an intense pruritic eruption along the sides and webs of the fingers, flexor aspects of the wrist, and extensor aspects of the elbows—anterior and posterior axillary folds.

Diagnostic criteria

- Very itchy, small, erythematous, nondescript papules, often excoriated and tipped with haemorrhagic crusts
- Burrows
- With evidence of adult mite, eggs, or faeces on microscopy

Figure 20.6. Burrows

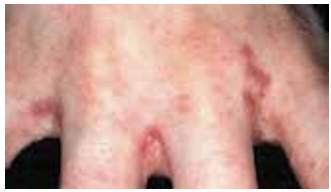


Photo by MOHCDGEC/MUHAS Dermatology Unit

Investigations

- Skin scraping
- Dermatoscopy

Treatment

- Apply benzyl benzoate emulsion 10% or 20% over the whole body except the face after a warm bath; repeat without a bath on the following day and wash off 24 hours later; a third application (last one, if necessary) may be required in some cases.
  OR

  Apply permethrin 5% to the entire body, from the neck down, after the patient bathes. The cream is washed off after 8–12 hours. Permethrin 5% cream may be used in infants older than 2 months.
  OR

  For older children, use 1% gama benzene hexachloride lotion or cream—apply to the entire body and leave on for 4 hours followed by bathing.
- Treat whole family and close contacts simultaneously.
- HIV patients require a second dose 24 hours later or after 2 weeks.

Lice (pediculosis)

Pediculosis is an infestation of hair and scalp caused by *Pediculus humanus capitis*, causing pruritus that can lead to sores with or without secondary infection as a result of intense scratching.

Diagnostic criteria

- Presence of excoriated papules
- Severe itching of the scalp and pubic area with evidence of observation of nits, nymphs, or mature lice on wood lamp examination

Investigation

- Wood lamp examination

Treatment

Apply:

- Permethrin 5% and to clean damp hair and rinse off after 10 minutes
  OR

Malathion 0.5% over whole body; allow to dry naturally, washing off after 12 hours or overnight; repeat application after one week
OR

Benzyl alcohol 5% lotion for two 10-minute treatments 1 week apart

Note:

- Malathion should not be used in infants and it is toxic if ingested.
- Provide advice on:
  - Personal hygiene
  - Boiling clothes for 10 minutes followed by ironing
  - Soaking brushes, combs, and hair ornaments in hot water for 10 minutes

20.5. INFLAMMATORY DERMATOSES

Seborrheic dermatitis

This is a papulosquamous disorder occurring on the sebum-rich areas involving the scalp, face, and trunk, which can lead to mild dandruff to exfoliative erythroderma.

Diagnostic criteria

- Presence of yellow-white greasy scales, erythematous patches on the face (eyebrows, eyelashes, nasolabial fold, and ears), chest, and genital organ

Treatment

Apply:

- 1% hydrocortisone cream every 4 hours daily for at least 14 days, clotrimazole 1% cream thinly every every 6 hours for at least 14 days, and ketoconazole shampoo on alternate days for 1 week.

Pruritic papular eruption

This is a chronic pruritic condition characterized by symmetric papular eruptions on the trunk and extremities with absence of other definable causes of itching in an HIV-infected patient.

Diagnostic criteria

- Pruritic hyperpigmented/hypopigmented follicular, macules, papules with scars found on trunk and extremities

Investigations

- HIV serology

Treatment

- No specific treatment
- Apply mupirocin with dexamethasone cream/ointment every 12 hours for symptom relief and give antiretroviral treatment.

Eczema (atopic dermatitis)

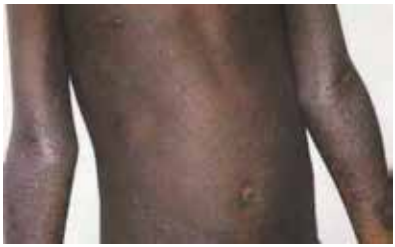
This is a chronic pruritic inflammatory condition of the skin of unknown origin usually starting in infancy, commonly associated with elevated immunoglobulin E.

Diagnostic criteria

- Erythematous, exudation, lichenification, and intense pruritis
- Usually begins in the first 2 years of life

Note: It is associated with allergic rhinitis, asthma, and immunodeficiency.

Figure 20.7. 8-year-boy with recurrent atopic eczema and lichenification in elbow folds



Photos by MOHCDGEC/MUHAS Dermatology Unit

Investigations

- No specific investigations required

Treatment

Apply:

- Clobetasol 0.5% cream every 12 hours for 14 days
  OR

  Betamethasone 0.5% cream/ointment every 12 hours for 14 days OR

  Dexamethasone 0.1% cream every 12 hours for 14 days and moisturizing lotions
- Add chlorpheniramine 0.1 mg/kg by mouth every 12 hours if there is intense itching.

Urticaria (hives)

This is a vascular reaction of the skin, leading to smooth pruritic erythematous papules or plaques.

Diagnostic criteria

- Itchy circumscribed erythematous papules or plaques with central pallor

Investigations

- No specific investigations required.

Treatment

- Identify the aetiology if possible and instruct the patient to avoid it.
- Give chlorpheniramine 0.1 mg/kg by mouth every 12 hours for 5 days.
  OR

  Give cetrizine hydrochloride by mouth:
  - 1 < 2 years: 250 mcg/kg every 12 hours
  - 2 < 6 years: 5 mg once daily
  - 6–18 years: 10 mg once daily for 5 days

  OR

  Give desloratidine by mouth:
  - 1–6 years: 1.25 mg once daily
  - 6–12 years: 2.5 mg once daily
  - 12–18 years: 5 mg once daily for 5 days

Drug allergy

This is an unpredictable adverse reaction to a medication, often an antibiotic, which is mediated by the body's immune system.

- An aphylaxis is a violent immune system reaction that can occur when a child is re-exposed to the drug.
- It can progress very rapidly, leading to collapse, seizures, loss of consciousness, and death. Death can occur within few minutes.

Diagnostic criteria

- Generalized itchy urticarial rash
- Sneezing, runny nose, and congestion

Note: In severe cases, wheezing, difficulty in breathing, nausea, vomiting, and abdominal pain may be present.

Treatment

- Discontinue the medication.
- Replace it with an alternative one.
- Give chlorpheniramine (see the dose above).
- For severe or accelerated cases, give adrenaline (1:1,000) 0.01 mg/kg IM and hydrocortisone 2 mg/kg IM/IV every 6 hours for 24 hours, then give prednisolone 1 mg/kg every 12 hours for 5 days.

Note: If there is airway obstruction, emergency tracheostomy may be required. Refer to the next-level facility with adequate expertise and facilities.

Stevens-Johnson syndrome

This is a severe form of erythema multiforme typically involving the skin and the mucous membranes.

Diagnostic criteria

- Macules that develop into papules, vesicles, bullae, urticarial plaques, or confluent erythema with vesicular, purpuric, or necrotic centre involving the mucocutaneous membranes

Investigations

- FBP
- Serum electrolytes
- Serum creatinine and BUN
- Liver enzymes

Treatment

- Follow ABC concept.
- Discontinue the suspected offending agent.
- Treat skin lesions as for burns.
- Give tetanus toxoid-containing vaccine.
- Treat underlying diseases and secondary infections accordingly.
- Give paracetamol 15 mg/kg by mouth every 8 hours for 7 days.

Acne

This is the occurrence of inflamed or infected sebaceous glands in the skin leading to formation of pimples on the face.

Diagnostic criteria

- Papulopustules and, eventually, nodular lesions on the face, chest, and back, especially in adolescents
- Comedones

Investigations

- No specific investigations

Treatment

- Ensure adequate exercise, exposure to sunshine, and a balanced diet.

- Wash the face with ordinary soap and water 3 times a day.
- In cases with many pustules, apply benzoyl peroxide 5% gel at night for 14 days.
- In severe cases of nodular acne, give erythromycin by mouth (see dose above).
  OR

  Give tetracycline 500 mg by mouth every 12 hours until a significant response is seen, then reduce to 250 mg every 12 hours for 7 days.

20.6. DISORDERS OF SKIN IN NEWBORNS

These are skin disorders occurring in neonates that can be transient and may spontaneously disappear or require specific treatment.

Milia

These are multiple cystic lesions caused by retention of keratin and sebaceous material in the pilaceous follicles.

Figure 20.8. Milia in newborn

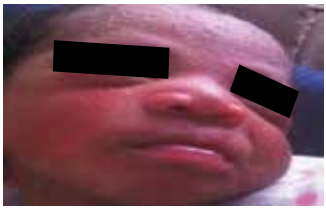


Photo by MOHCDGEC/MUHAS Dermatology Unit

Diagnostic criteria

- White papules scattered over the fore head, nose, and cheeks, which spontaneously rupture and exfoliate their contents
- Erythematous grouped papules in the same areas

Investigations

- No specific investigations required.

Treatment

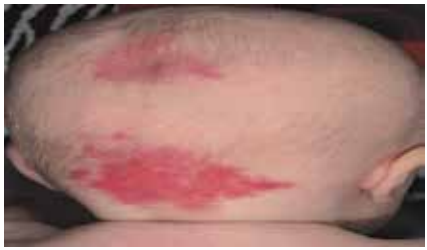
- Dry the involved areas and avoid conditions that induce sweating.

Note: This is a self-limiting condition. Antibiotics are not required.

Salmon patch (nevus simplex)

This is a vascular ectasia probably caused by maternal hormones, usually fading away after few weeks or months.

Figure 20.9. Salmon patch/nevus simples



Diagnostic criteria

- Single or multiple blanchable, pink-red vascular macules that occur commonly on the glabella, eyelids, upper lip, and nuchal area
- More visible during crying or changes in environmental temperature

Investigations

- No specific investigations required.

Treatment

- No treatment is required.

Note: Most facial lesions eventually fade and disappear completely, while those on the posterior neck and occipital areas tend to persist.

Mongolian spots

These are congenital blue or slate-grey macular lesions with variably defined margins.

Diagnostic criteria

- Greyish-blue solitary or numerous macules occurring in the presacral area, posterior thighs, legs, back, or shoulders

Investigations

- No specific investigations required.

Treatment

- No specific treatment required.

Note: Usually fade during the first few years of life due to darkening of the skin.

20.7. HAEMANGIOMA

These are proliferative hamartomas of vascular endothelium present at birth or that become apparent in the first 2 months of life. They occur on the face, scalp, back, and anterior chest.

Diagnostic criteria

- Cystic, firm, or compressible lesions with an overlying skin appearing normal or with bluish hue

Investigations

- No specific investigations required.

Treatment

- Medication is rarely indicated.
- For large haemangioma, give propranolol 1 mg/kg by mouth once a day for 3 months.

20.8. ALBINISM

This is a congenital, inherited genetic abnormality of melanin synthesis in which the amount of melanin pigment formed in the skin, hair, and/or eyes is reduced or absent.

Diagnostic criteria

- Generalized depigmented skin and hair
- Visual impairment

Investigations

- Optometry

Treatment

- Avoid direct sunlight.
- Wear wide hats, sunglasses, and long-sleeved clothes.
- Apply sunscreen cream.

20.9. PSORIASIS

This is a complex, chronic, multifactorial, inflammatory disease that involves hyperproliferation of the keratinocytes in the epidermis, leading to an increase in the epidermal cell turnover rate.

Diagnostic criteria

- Erythematous papules and plaques with a silver scale
- Small areas of scaly redness
- Pruritus
- Dystrophic nails
- Conjunctivitis, blepharitis, and arthritis may be present

Treatment

Nonpharmacological

- Light therapy with solar or ultraviolet radiation
- Stress reduction

- Apply emollient cream/ointment.
  OR

  Take oatmeal baths every 12 hours.

Pharmacological

Apply:

- Betamethasone cream/ointment 0.1% every 12 hours and anthralin cream/ointment every 12 hours
  OR

  Tazarotene aqueous gel and cream 0.05% and 0.1% every 12 hours OR

  Calciprotriene cream/ointment 0.005% every 12 hours

If there is no response, add:

- Give methotrexate 2.5 mg by mouth weekly.
  OR

  Apply tacrolimus 0.1% cream/ointment every 12 hours.

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

CHAPTER 21. COMMON MENTAL DISORDERS IN CHILDREN AND ADOLESCENTS

These are disorders that affect thinking, mood, perception, and/or behaviour leading to functional impairment in children. These include organic mental disorders, anxiety disorders, mood/emotional disorders, bipolar, behavioural/disruptive disorders, conduct disorders, autism spectrum disorders, early onset psychosis, specific developmental disorders, elimination disorders, substances and alcohol abuse disorders, and eating or dieting disorders.

21.1. ORGANIC MENTAL DISORDERS

These are disorders that cause decreased mental function due to a medical or physical disease, rather than a psychiatric illness.

Intellectual disability

This is slow or incomplete mental development resulting in difficulties in learning and problems with social adjustment.

Diagnostic criteria

- Inability to walk and use hands
- Inability to feed, bathe, and use the toilet independently
- Difficulty communicating with others
- Impairment of social functioning (e.g., playing with others, being bullied)

Note: Physical disability in severe cases may have other mental disorders.

Investigations

- Thyroid panel: thyroid-stimulating hormone, T3, T4
- Audiogram
- Other investigations depending on the underlying cause

Note: Refer to the next-level facility for adequate expertise and facilities.

21.2. ANXIETY DISORDERS

These are characterized with excessive worry and fear, leading to functional impairment. These disorders include separation anxiety disorder, phobias, generalized anxiety disorder, panic disorders, and post-traumatic stress disorders.

Separation anxiety disorder

This is a disorder characterized by developmentally inappropriate excessive fear about being away from home and/or those to whom a child has formed an attachment.

Diagnostic criteria

- Developmentally inappropriate excessive clinging and fear of separation
- Has difficulty falling asleep by himself or herself
- When absent, fears parent or loved one will suffer illness or accident
- Repeated nightmares involving the theme of separation
- Separation resulting in severe distress

Pharmacological treatment

- Give imipramine by mouth:
  - Child 6–8 years: 25 mg at bedtime
  - Child 8–11 years: 25 mg at bedtime (maximum 50 mg)
  - Child 11–18 years: 50 mg at bedtime (maximum 75 mg); increase by 10 mg weekly to the maximum dose

  OR

  Give amitriptyline by mouth:
  - Adolescent above 16 years: 10–25 mg every 8 hours (increase gradually by 10 mg weekly to the maximum dose of 150 mg per day)

Note:

- Overdose leads to cardiotoxicity; hence, start with low dose and increase slowly. Observe the therapeutic response and the side effects.

- Amitriptyline is not indicated for the treatment of children under age.
- Refer to the next-level facility with adequate expertise and facilities.

Post-traumatic stress disorders

These are pathological anxieties that usually occur after an individual experiences or witnesses severe trauma that was life-threatening or perceived to be likely to cause serious injury to self or others.

Diagnostic criteria

- Persistent reexperiencing of a traumatic event
- Resultant numbness, avoidance, and hyperarousal
- Recurrent recollection and nightmares
- Negative thoughts and mood or feelings
- Episodes with objective features of a flashback or dissociation
- Relative social withdrawal
- Loss of acquired developmental skills
- Distress at exposure to reminders of the event
- Exaggerated startle response
- New fears of things or situations not obviously related to the trauma

Symptoms should be present for a minimum of 1 month following the initial traumatic event.

Pharmacological treatment

- Give imipramine dose as above.
  OR

  Give amitriptyline by mouth dose as above.

If there is concurrent mood disorder, add:

- Carbamazepine by mouth
  - Child 1 month to 12 years: Initially, 2.5 mg/kg every 12 hours, increase gradually when necessary to every 8 hours. Maximum dose 20 mg/kg/day in divided dose.

- Child 12–18 years: Initially, 100 mg every 12 hours, increase slowly to maintenance dose of 400 mg every 12 hours to maximum total dose of 1.8 g per day).

Note: Refer to the next-level facility for adequate expertise and facilities.

Generalized anxiety disorder

This is a group of disorders characterized by chronic, unrealistic, and intense fear about a number of events and activities. The fear is difficult to control, often punctuated by acute attacks of pain.

Diagnostic criteria

Anxiety and worry associated with at least three of the following six symptoms occurring more days than not for at least 6 months:

- Restlessness or feeling keyed up or on edge
- Being easily fatigued
- Difficulty concentrating or mind going blank
- Irritability
- Muscle tension
- Sleep disturbance

Pharmacological treatment

- Give imipramine by mouth dose as above.
  OR

  Give amitriptyline 25–50 mg at bedtime for selected cases.

For acute states

- Give diazepam 5–10 mg IV stat to calm the patient, then give diazepam 0.1 mg/kg by mouth daily.
  OR

  Give clonazepam 0.25–1 mg by mouth at night for 2 weeks.

Note: Long-term use of benzodiazepines, like diazepam, should be avoided due to risk of addiction. Refer to the next-level facility for adequate expertise and facilities.

Panic disorder

This is a sudden, unexpected, and spontaneous onset of fear or discomfort, typically reaching a peak within 10 minutes, leading to functional impairment.

Diagnostic criteria

- Recurrent panic attacks, with one or more attacks followed by at least 1 month of fear of another panic attack or significant maladaptive behaviour related to the attacks with four or more of the following 13 systemic symptoms:
  - Palpitations or tachycardia
  - Sweating
  - Trembling or shaking
  - Shortness of breath or feeling of smothering
  - Feelings of choking
  - Chest pain or discomfort
  - Nausea or abdominal distress
  - Feeling dizzy, unsteady, lightheaded, or faint
  - Chills or heat sensations
  - Paraesthesia
  - Derealisation
  - Fear of losing control or going crazy
  - Fear of dying

Pharmacological treatment

- Give imipramine by mouth dose as above.
  OR
  Give amitriptyline by mouth dose as above.

For acute states

- Give diazepam dose as above.
- Give clonazepam dose as above.

Note: Refer to the next-level facility for adequate expertise and facilities.

21.3 BIPOLAR DISORDERS

Bipolar affective disorder is characterized by periods of deep, prolonged, and profound depression that alternate with periods of an excessively elevated or irritable mood.

Major depression disorders

These are psychological disorders characterized by lowered mood, leading to significant distress associated with lack of interest with the outside stimuli.

Diagnostic criteria

- Presence of depressed mood, a loss of pleasure and interest
- Decreased energy (or, alternatively, a sense of aimless restlessness)
- Sleep or appetite disturbances
- Feelings of worthlessness
- Hopelessness or guilt

The symptoms should be present for a period of at least 2 weeks.

Pharmacological treatment

- If associated with depression, for children over 8 years:
  - Give fluoxetine 10 mg by mouth once daily.
    OR

    Give amitriptyline by mouth (dose as above).
    OR

    Give imipramine by mouth (dose as above).
- Perform electroconvulsive therapy.

Note: Antipsychotics may be given if depression is associated with psychotic symptoms. Refer to the next-level facility for adequate expertise and facilities.

Mania

This is a psychological disorder characterized by elation, irritability, or expansiveness associated with significant distress, leading to functional impairment.

Diagnostic criteria

- At least 1 week of profound mood disturbance, characterized by elation, irritability, or expansiveness
- At least three of the following symptoms must also be present:
  - Grandiosity
  - Diminished need for sleep
  - Excessive talking or pressured speech
  - Racing thoughts or flight of ideas
  - Clear evidence of distractibility
  - Increased level of goal-focused activity at home, at work, or sexually
  - Excessive pleasurable activities, often with painful consequences

Pharmacological treatment

For acute cases

- Admit.
- Give:
  - Haloperidol 5 mg IM stat, THEN every half-hour, not to exceed 20 mg in 24 hours
    OR

    Clopixol acuphase 100 mg IM once daily for 3 days (not to exceed 400 mg in 96 hours) and diazepam 10 mg IV stat to calm the patient, then give diazepam 0.1 mg/kg by mouth daily
    OR

    Clonazepam 1 mg by mouth at night for 2 weeks

When acute symptoms subside

- Give:
  - Haloperidol 0.05 mg/kg by mouth once daily
    OR

Risperidone to a child of 5–18 years 0.25 mg every 12 hours, then increase gradually by 0.25 mg weekly to a maximum of 1 mg every 12 hours per day
OR

Olanzapine to an adolescent of 12-18 years 10 mg once daily

Failure to adhere to daily medication

- Give:
  - Fluphenazine decanoate (modecate) only to a child over 12 years, 12.5 to 25 mg monthly
    OR

    Clopixol depo 200 mg IM monthly
- For patients with psychotic and depressive symptoms:
  - Give flupenthixol decanoate 20 mg monthly.

Note:

- For the drugs above, start with low dose and increase gradually; observe the therapeutic response and the side effects.
- Avoid risperidone in patient with autism and in acute porphyria.
- Avoid olanzapine in a patient with diabetes mellitus—there is a risk of exacerbation of ketoacidosis; not indicated in a child below 12 years old.

If there is concurrent mood disorder

- Give carbamazepine by mouth; dose as above.

Note: Refer to the next-level facility for adequate expertise and facilities.

21.4. BEHAVIOURAL/DISRUPTIVE DISORDERS

Attention deficit hyperactivity disorder

This is a developmental disorder of inattention and distractibility, with or without accompanying hyperactivity.

Diagnostic criteria

Inattention

This must include at least six of the following symptoms that must have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

- Fails to give close attention to details, careless mistakes
- Restless; unable to sit in a chair through a full lesson
- Difficulty in concentration or paying, (e.g., unable to complete homework)
- Difficulty organizing tasks and activities
- Loses things needed for tasks or activities (e.g., toys, pencils, books)
- Often forgetful in daily activities
- Often does not seem to listen to what is being said
- Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace
- Often easily distracted by extraneous stimuli

Hyperactivity/impulsivity

This must include at least six of the following symptoms that must have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

- Fidgeting with or tapping hands or feet; squirming in seat
- Running about or climbing excessively in situations where this behaviour is inappropriate
- Difficulty playing or engaging in leisure activities quietly
- Unable to be comfortable being still for extended periods of time
- Excessive talking
- Blurting out answers to questions before the questions have been completed
- Difficulty waiting in lines or awaiting turn in games or group situations
- Interrupting or intruding on others

Pharmacological treatment

- Give methylphenidate (Ritalin) by mouth:
  - Children 6–18 years: 5 mg once a day. If there is no response in 2 weeks, increase to 10 mg once daily; discontinue if no response after 1 month.
- Give clonidine hydrochloride by mouth:

- Child 2–18 years: initially, 0.5–1 mcg/kg every 8 hours (increase gradually if necessary).

Note:

- Methylphenidate is not indicated in children under 6 years of age.
- Clonidine is associated with suppression of growth; in older children, it should be given when necessary and with caution while monitoring growth.
- Refer to the next-level facility for adequate expertise and facilities.

Conduct disorder

This is impaired functional behaviour characterized by constant conflict with adults and other children. The disturbance in behaviour causes clinically significant impairment in social, academic, or occupational functioning.

Diagnostic criteria

Presence of at least three of the following 15 criteria in the past 12 months from any of the categories below, with at least one criterion present in the past 6 months:

- Aggression to people and animals:
  - Often bullies, threatens, or intimidates others.
  - Often initiates physical fights.
  - Has used a weapon that can cause serious physical harm to others (e.g., a bat, brick, broken bottle, knife, gun).
  - Has been physically cruel to people.
  - Has been physically cruel to animals.
  - Has stolen while confronting a victim (e.g., mugging, purse snatching, extortion, armed robbery).
  - Has forced someone into sexual activity.
- Destruction of property:
  - Has deliberately engaged in fire setting with the intention of causing serious damage.
  - Has deliberately destroyed others' property (other than by fire setting).
- Deceitfulness or theft:
  - Has broken into someone else's house, building, or car.

- Often lies to obtain goods or favours, or to avoid obligations (i.e., "cons" others).
- Has stolen items of nontrivial value without confronting a victim (e.g., shoplifting, but without breaking and entering; forgery).

- Serious violations of rules:
  - Often stays out at night despite parental prohibitions, beginning before age 13 years.
  - Has run away from home overnight at least twice while living in the parental or parental surrogate home, or once without returning for a lengthy period.
  - Is often truant from school, beginning before age 13 years.

Treatment

For acute cases

- Admit.
- Give:
  - Haloperidol 5 mg IM stat, THEN every half-hour, not to exceed 20 mg in 24 hours
    OR

    Clopixol acuphase 100 mg once daily for 3 days (not to exceed 400 mg in 96 hours)
  - Add diazepam 10 mg IV stat to calm the patient, then give diazepam 0.1 mg/kg by mouth daily.
    OR

    Give clonazepam 1 mg by mouth at night for 2 weeks.

When acute symptoms subside

- Give:
  - Haloperidol 0.05 mg/kg by mouth once daily
    OR

    Risperidone to a child of 5–18 years: 0.25 mg every 12 hours then increase gradually by 0.25 mg weekly to a maximum of 1 mg every 12 hours per day
- OR

  Give olanzapine:
  - Child 12–18 years: 10 mg once per day

Failure to adhere to daily medication

- Give:
  - Fluphenazine decanoate (modecate) only to a child over 12 years: 12.5–25 mg monthly
    OR
    Clopixol depo 200 mg IM monthly

For patients with psychotic and depressive symptoms

- Give flupenthixol decanoate 20 mg monthly.

Note:

- For the drugs above, start with low dose and increase gradually; observe the therapeutic response and the side effects.
- Avoid risperidone in patient with autism and in acute porphyria.
- Avoid olanzapine in a patient with diabetes mellitus—there is a risk of exacerbation of ketoacidosis. It is not indicated in a child under 12 years.

If there is concurrent mood disorder

- Give carbamazepine by mouth dose as above.

Note: Refer to the next-level facility for adequate expertise and facilities.

Autism spectrum disorders

These are disorders arising during the first years of life that disrupt various developmental processes. They are characterized by impairment in social interaction skills, communication skills, and presence of stereotyped behaviour, interests, and activities.

Diagnostic criteria

- Deficits in social communication and social interaction
- Restricted repetitive behaviours, interests, and activities
- Communication impairment
  - Delay in development of spoken language

- Unusual and repetitive language: repetition of what others say—echolalia
- Difficulty initiating and sustaining a conversation with others
- Several types of language skills, which may or may not be impaired; structural language
- Social or pragmatic language (the ability to use language in an everyday, social context by using certain skills, such as inference, recognizing sarcasm [mockery], recognizing double meanings, etc.)
- Social language also includes the nonverbal forms of communication, body language, facial expression, gestures, etc., and individuals with autism spectrum disorders have difficulty picking up the meaning of these cues

- Delays in social interaction
  - Avoid eye contact
  - Prefer to be alone
  - Not intended to share enjoyment or interests with others by showing or pointing out things
- Restricted repetitive behaviour, interest, and activities
  - Repeating one or just a few activities
  - Rigidly followed routines
  - Having unusual movement, such as flapping hands, rocking, and spinning

Pharmacological treatment

- Give methylphenidate (Ritalin) dose as above.

Note: Refer to the next-level facility for adequate expertise and facilities.

Early onset psychosis (schizophrenia)

This is a brain disorder that affects how people think, feel, and perceive; it is usually accompanied by emotions that are inappropriate or blunted.

Diagnostic criteria

Patient must have experienced at least two of the following symptoms; at least one of the symptoms must be the presence of delusions, hallucinations, or disorganized speech:

- Delusions
- Hallucinations
- Disorganized speech
- Disorganized or catatonic behaviour
- Negative symptoms (decrease in emotional range, poverty of speech, and loss of interests and drive; the person with schizophrenia has tremendous inertia)

For acute cases

- Admit.
- Give:
  - Haloperidol 5 mg IM stat, THEN every half-hour, not to exceed 20 mg in 24 hours
    OR

    Clopixol acuphase 100 mg once daily for 3 days (not to exceed 400 mg in 96 hours)
  - Add diazepam 10 mg IV stat to calm the patient, then give diazepam 0.1 mg/kg by mouth daily.
    OR

    Give clonazepam 1 mg by mouth at night for 2 weeks.

When acute symptoms subside

- Give:
  - Haloperidol 0.05 mg/kg by mouth once daily
    OR

    Risperidone to a child of 5–18 years: 0.25 mg every 12 hours, then increase gradually by 0.25 mg weekly to a maximum of 1 mg every 12 hours per day
    OR

    Olanzapine to a child 12–18 years 10 mg once per day

Failure to adhere to daily medication

- Give:
  - Fluphenazine decanoate (modecate) only to a child over 12 years 12.5–25 mg monthly

    OR

    Clopixol depo 200 mg IM monthly

For patients with psychotic and depressive symptoms

- Give flupenthixol decanoate 20 mg monthly.

If there is concurrent mood disorder

- Give carbamazepine by mouth dose as above.

Note: Refer to the next-level facility for adequate expertise and facilities.

21.5. SPECIFIC DEVELOPMENTAL DISORDERS

Learning difficulties/scholastic disorder/dyslexia

Learning difficulty affects ability to read or deal with numbers, irrespective of intelligence. Child may have problems with concentration, perception, memory, verbal skills, abstract reasoning, social adjustment (low self-esteem), poor grades, and underachievement.

Diagnostic criteria

- Difficulties with copying, spelling, writing, and understanding
- Difficulties to understand instructions, numbers, and mathematics
- Reading and behaviour problems

Investigation

- Audiogram
- Specific investigations depend on the suspected causes

Pharmacological treatment

- Medication has no major role unless there are associated disorders, like seizure disorders, or organic cause.

Note: Refer to the next-level facility for adequate expertise and facilities.

21.6. ELIMINATION DISORDERS

These are disorders that are characterized by developmentally inappropriate control of urination and defecation. These include enuresis and encopresis.

Enuresis

Enuresis is the persistent inability to control urination that is not consistent with one's developmental age.

Diagnostic criteria

- Repeated voiding of urine into bed or clothes (whether involuntary or intentional)
- Presence of clinically significant distress in social and academic impairment in a child
- The behaviour is not due to underlying medical condition or medication (e.g., furosemide)

Behaviour must be clinically significant as manifested by either a frequency of twice a week for at least 3 consecutive months in a child whose developmental age is at least 5 years.

Investigations

- Urinalysis
- Specific investigations depending on the suspected causes

Pharmacological treatment

- For children ≥ 5 years, give:
  - Oxybutynin 5 mg by mouth every 12 hours
    OR
    Imipramine by mouth dose as above
    OR
    Amitriptyline by mouth dose as above

Note: Refer to the next-level facility for adequate expertise and facilities.

Encopresis

This is the involuntary repeated passing of stool in the clothing, which is usually associated with emotional disturbance. This is commonly caused by chronic constipation.

Diagnostic criteria

- Repeated passage of faeces in inappropriate places, whether involuntary or intentional (0ne such event occurs each month for at least 3 months)
- The behaviour is not attributable to the physiologic effects of a substance or another medical condition in a child whose developmental age is at least 4 years

Investigations

- No specific investigation

Treatment

Pharmacological treatment

- Give polyethylene glycol 0.5 g/kg by mouth every 12 hours

  OR

  Give lactulose 2 mL/kg by mouth every 12 hours (not to exceed 60 mL/day).

Note: Refer to the next-level facility for adequate expertise and facilities.

21.7. EATING/DIETING DISORDERS

Dieting disorders include anorexia nervosa and bulimia nervosa, both of which involve serious psychiatric and physical disturbances.

Bulimia nervosa

This is an emotional disorder characterized by distortion of body image and an obsessive desire to lose weight, in which bouts of extreme overeating are followed by depression and self-induced vomiting, purging, or fasting.

Diagnostic criteria

- Eating in a discrete period of time an amount of food that is definitely larger than most people would eat
- A sense of lack of control over eating during the episode
- Recurrent, inappropriate compensatory behaviour to prevent weight gain (such as self-induced vomiting, misuse of laxatives, diuretics, or other medications, fasting, or excessive exercise)

Symptoms should present at least once a week for at least 3 months.

Pharmacological treatment

- If associated with depression, for children over 8 years, give fluoxetine 10 mg by mouth once daily.

Note: Refer to the next-level facility for adequate expertise and facilities.

Anorexia nervosa

This is an emotional disorder characterized by excessive desire to lose weight by refusing to eat.

Diagnostic criteria

- Persistent restriction of energy intake, leading to significant weight loss
- Intense fear of gaining weight or persistent behaviour that interferes with weight gain
- Disturbance in the self-perception of body weight or shape

Pharmacological treatment

- If associated with depression, for children over 8 years:
  - Give fluoxetine 10 mg by mouth once daily.
    OR

Give amitriptyline by mouth (dose as above).
OR
Give imipramine by mouth (dose as above).

Note: Refer to the next-level facility for adequate expertise and facilities.

21.8. SUBSTANCES/DRUG AND ALCOHOL ABUSE DISORDERS

These are overindulgences in or dependencies on an addictive substance, especially alcohol or drugs, leading to functional impairment. They may be associated with other mental disorders or be the precipitant factor of other mental disorders, like depression, anxiety disorders, and psychotic disorders.

Diagnostic criteria

A minimum of two to three criteria is required for a mild substance use disorder diagnostic, while four to five is moderate and six to seven is severe.

- Taking the opioid in larger amounts and for longer than intended
- Wanting to cut down or quit, but not being able to do it
- Spending a lot of time obtaining the opioid
- Craving or a strong desire to use opioids
- Repeatedly unable to carry out major obligations at work, school, or home due to opioid use
- Continued use, despite persistent or recurring social or interpersonal problems caused or made worse by opioid use
- Stopping or reducing important social, occupational, or recreational activities due to opioid use
- Recurrent use of opioids in physically hazardous situations
- Consistent use of opioids, despite acknowledgment of persistent or recurrent physical or psychological difficulties from using opioids

Note: Refer to the next-level facility for adequate expertise and facilities.

21.9. CHILD ABUSE AND NEGLECT

This is any mistreatment or neglect of a child, resulting in noncoincidental harm or injury that cannot be reasonably explained.

Diagnostic criteria

Signs of physical harm:

- Multiple superficial injuries (e.g. bruises, abrasions, cuts, cigarette burns, etc.), fractures, and retinal and subdural haemorrhages in nonambulant children
- Failure to thrive and short stature, poisoning, asphyxiation, delayed immunization, untreated medical condition, sexually transmitted diseases

Signs of psychological harm:

- Depression, anxiety, and fear
- Inability to trust or love others, low self-esteem
- Fear of entering into new relationships or activities
- Conduct or oppositional defiant behaviour, deliberate self-harm
- Sexualized behaviour inappropriate to age and stage of development
- Substance misuse, sleep problems, flashbacks, nightmares
- Educational underachievement, social isolation

Investigations

Depends on the associated complications:

- FBP
- ESR
- Urethral swab and high vaginal swab for gram staining, culture, and sensitivity
- Urinalysis
- X-rays
- HIV test
- Pregnancy test

Pharmacological treatment

- Treatment depends on the nature and sequel of maltreatment.

- Consider post-exposure prophylaxis of antiretrovirals for those who are abused sexually and are HIV-negative.

Note: Refer to the next-level facility for adequate expertise and facilities.

21.10. PSYCHOSOCIAL TREATMENT

Psychosocial treatment includes individual psychotherapy, behavioural therapy, and parental counselling.

Individual psychotherapy

- Helps the child gain a sense of mastery over the trauma and helps the child to feel safe again (reassurance).
- Education and counselling of parents, particularly on the level of expectations of child, depending on the severity of intellectual deficit.
- Activities should be broken into smaller parts.
- Use stimulation and the use of rewards and praise when the child succeeds in any activity.

Parental involvement

- Parents should not overprotect the child.
- Parents should be involved in child's social activities.
- Child can continue to learn, depending on the severity.

Family therapy

- Can help parents understand the need for consistent support and love.
- Uses social skills intervention and teaches the adolescent problem-solving techniques to cope with stress: stress management and relaxation techniques.
- Appropriate psychotherapies are based on the identified psychosocial predisposing, precipitating, and maintaining factors.
- Family and school teachers need to be educated and involved in the process of managing the teachers' education for support.
- Educate and support parents on dealing with the child's functioning in social skills training, parenting and family support, physical therapy,

speech/language therapy, music/art therapy, occupational therapy, vocational training, and daily living skills.

- Emphasize rehabilitation, with greater stress on academic education to maximize the child's future level of functioning; praise the child for all achievements, both nonacademic and academic.
- Attend to immediate medical and psychological needs.
- Prepare a comprehensive treatment plan, including help for the child, the nonabusing caregiver, siblings, and the abuser.
- Appropriate counselling depends on the nature the consequences of abuse.
- Assess the suicide risk and fill the suicidal caution card.

CHAPTER 22. COMMON PROBLEMS IN ADOLESCENTS

22.1. INTRODUCTION

The WHO defines adolescents as young people aged 10–19 years. The stages of adolescent development include:

- Physical and sexual maturation
- Emotional development
- Cognitive development
- How adolescents relate to the opposite sex, peers, family, authority figures, and their environment

The most common health problems in adolescents include:

- Growth and developmental problems
- Mental health disorders such as mood disorders and schizophrenia.
- Problem with sexual identity
- Sexually transmitted infections
- Adolescent pregnancies

However, for the sake of this guideline, only sexually transmitted infections will be discussed.

22.2. MANAGEMENT OF SEXUALLY TRANSMITTED INFECTIONS/REPRODUCTIVE TRACT INFECTIONS

These are infections transmitted sexually. If not treated and identified early, may lead to infertility.

Syndromic approach to the management of sexually transmitted infections/reproductive tract infections

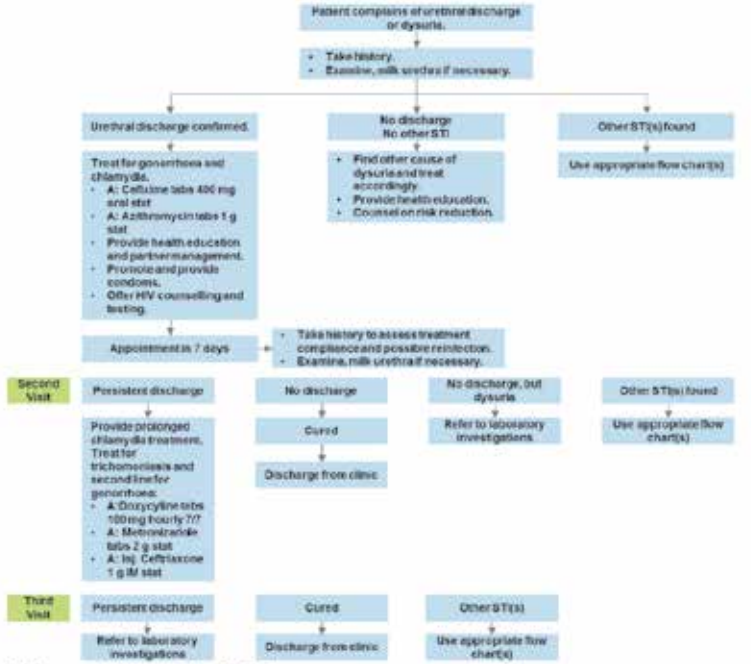
Urethral discharge syndrome

Urethral discharge syndrome refers to the presence of abnormal secretions in the distal portion of the urethra, leading to infertility.

Diagnostic criteria

- Urethral discharge
- Burning or painful micturition
- Itchy urethra and increased frequency and urgency of micturition

Figure 22.1. Management of urethral discharge syndrome



STI = sexually transmitted infection

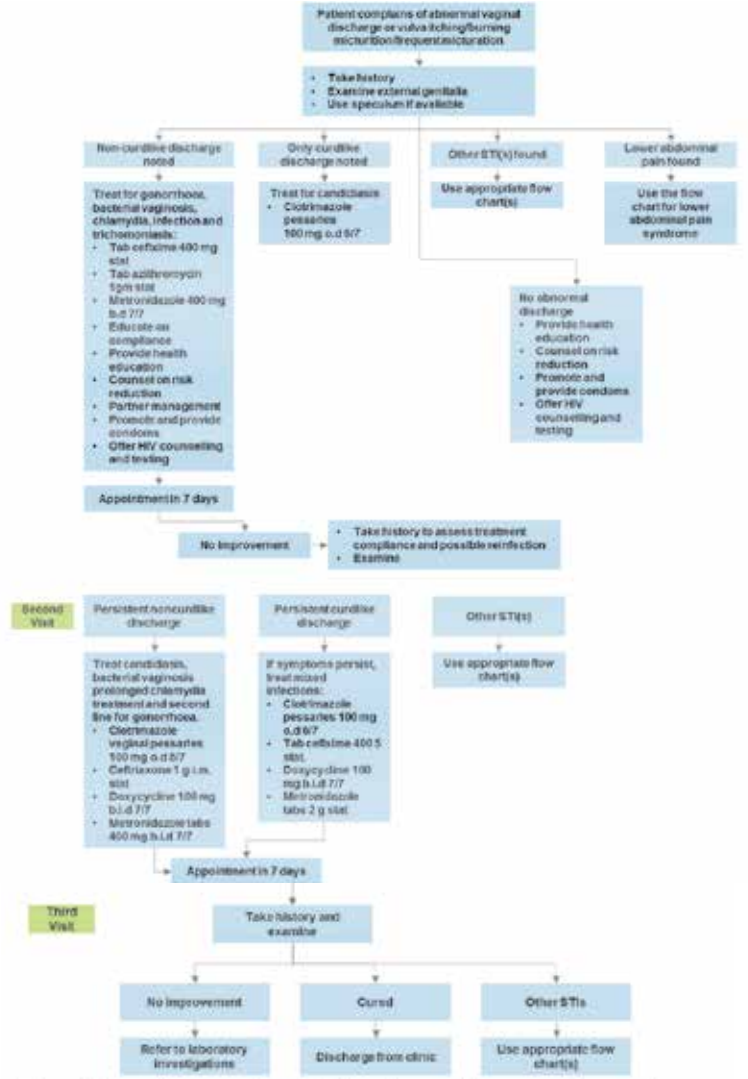
Vaginal discharge syndrome

This is an abnormal discharge caused by microorganisms that infect the female reproductive tract.

Diagnostic criteria

- Abnormal vaginal discharge
- Burning or painful micturition
- Itchy vulva
- Increased frequency and urgency of micturition and/or painful coitus

Figure 22.2. Management of vaginal discharge syndrome



Note: Do not give metronidazole in first trimester of pregnancy. Do not give doxycycline or ciprofloxacin in pregnancy or to lactating mother; substitute with erythromycin 500 mg every 12 hours 7 days and ceftriaxone 250 mg IM stat.

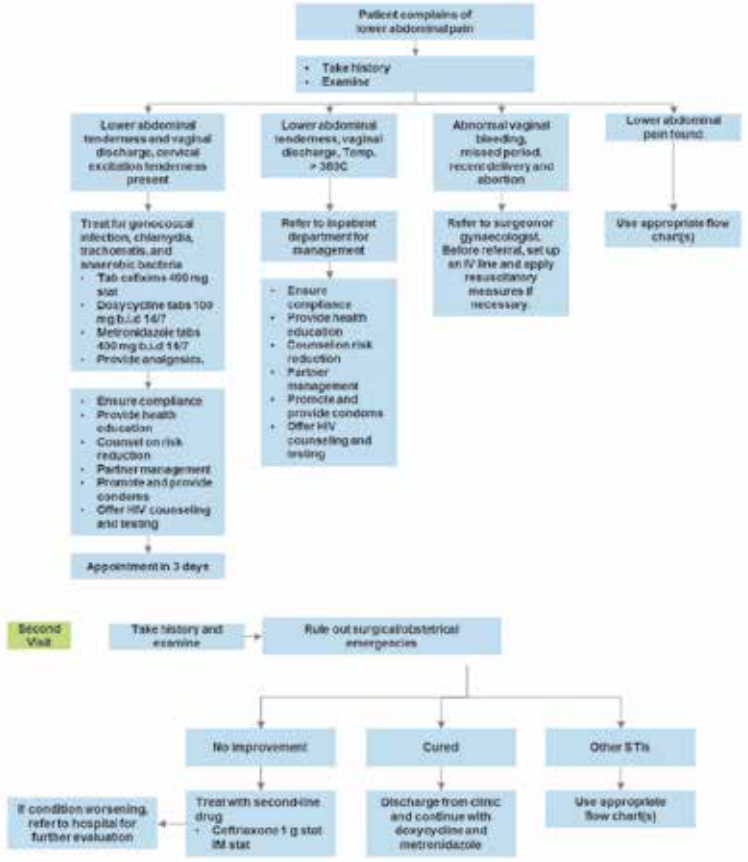
Lower abdominal pain syndrome or pelvic inflammatory disease

This is the inflammation of the uterus, fallopian tubes, ovaries, and pelvic peritoneum leading to long-term complication, such as abortion, ectopic pregnancy, and infertility, if not effectively treated.

Diagnostic criteria

- Lower abdominal pain and tenderness
- Painful micturition
- Painful coitus
- Abnormal vaginal discharge
- Menometrorrhagia

Figure 22.3. Management of lower abdominal pain syndrome (pelvic inflammatory disease)



Inpatient treatment of pelvic inflammatory disease

Note: All adolescents with pelvic inflammatory disease who have temperature ≥ 38^{0}C should be admitted for closer care.

The recommended inpatient treatment options for pelvic inflammatory disease are as follows:

Regimen 1:

- Cefixime 400 mg IM or spectinomycin 1 g IM every 6 hours daily and doxycycline 100 mg IV/by mouth every 12 hours
  OR

  Tetracycline 500 mg by mouth every 6 hours and metronidazole 400–500 mg IV/by mouth every 12 hours daily.

Regimen 2:

- Ceftriaxone 1 g IM once daily and doxycycline 100 mg IV/by mouth every 12 hours daily
  OR

  Tetracycline 500 mg by mouth every 6 hours daily and metronidazole 400 mg by mouth or 500 mg IV every 12 hours daily

Regimen 3:

- Clindamycin 900 mg IV every 8 hours and gentamicin 1.5 mg/kg IV every 8 hours

Note:

- For all three regimens, therapy should be continued until at least 2 days after the patient has improved (fever has subsided) and should then be followed by either doxycycline 100 mg by mouth every 12 hours for 14 days or tetracycline 500 mg by mouth every 6 hours for 14 days.
- Patients taking metronidazole should be cautioned to avoid alcohol.
- Tetracyclines are contraindicated in pregnancy.

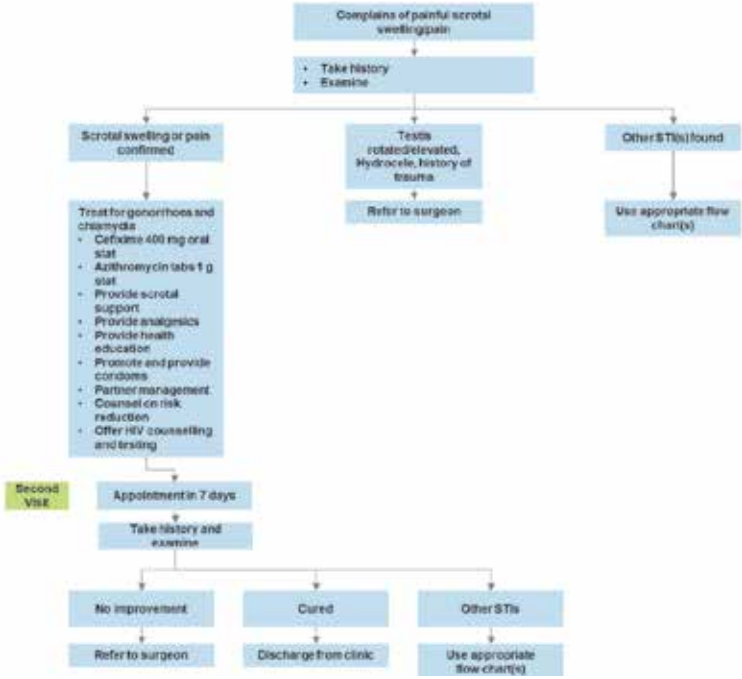
Painful scrotal swelling (epididymorchitis)

Painful scrotal swelling is the inflammation of the epididymis and testis, leading to infertility and scrotal abscess if not effectively treated.

Diagnostic criteria

- Scrotal pain
- Scrotal swelling and tenderness
- Scrotal oedema
- Fever

Figure 22.4. Management of painful scrotal swelling



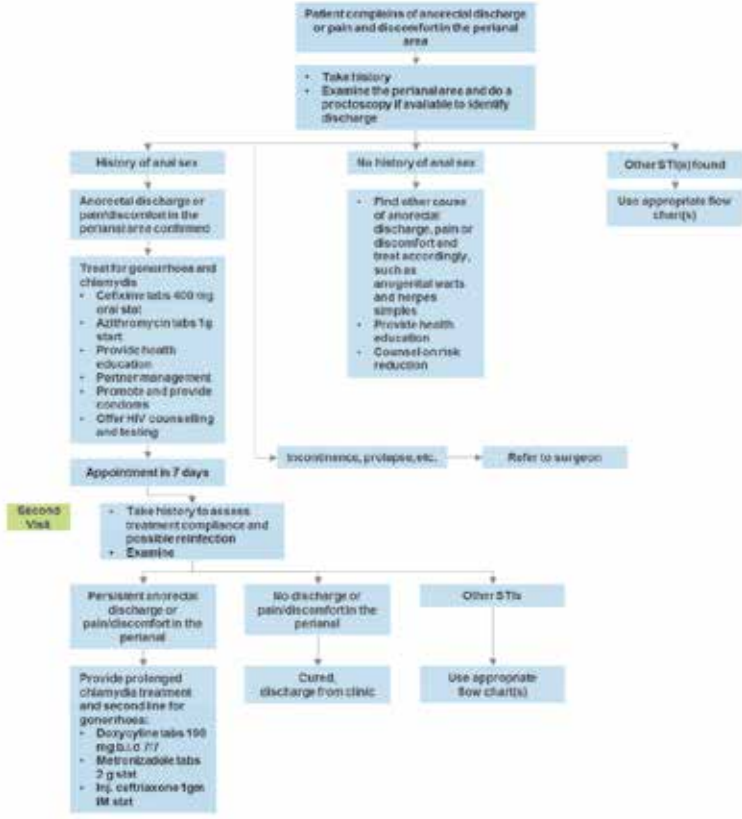
Anorectal syndrome

This is a syndrome resulting from inflammation of the anus and rectum, which can sometimes lead to diarrhoea.

Diagnostic criteria

- Soreness
- Burning
- Itching of the rectum with
- Redness in the area of anus
- Rectal discharge

Figure 22.5. Management of anorectal syndrome



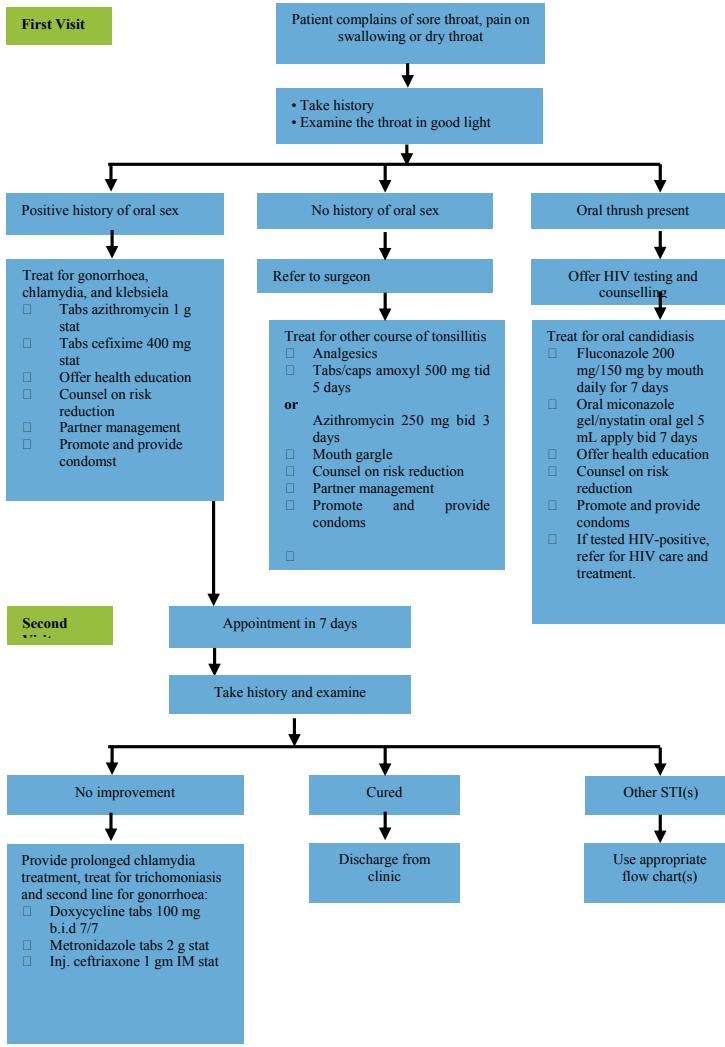
Oropharyngeal sexually transmitted infections

These are oral sex-related infections of the buccal cavity extending to the pharynx, which can lead to chronic oropharyngeal ulcers and cancers.

Diagnostic criteria

- Sores in the mouth—painless/painful
- Red painful throat
- Difficult in swallowing
- Tonsillitis
- Redness with white spots resembling strep throat
- Whitish or yellowish discharge

Figure 22.6. Management of oropharyngeal syndrome



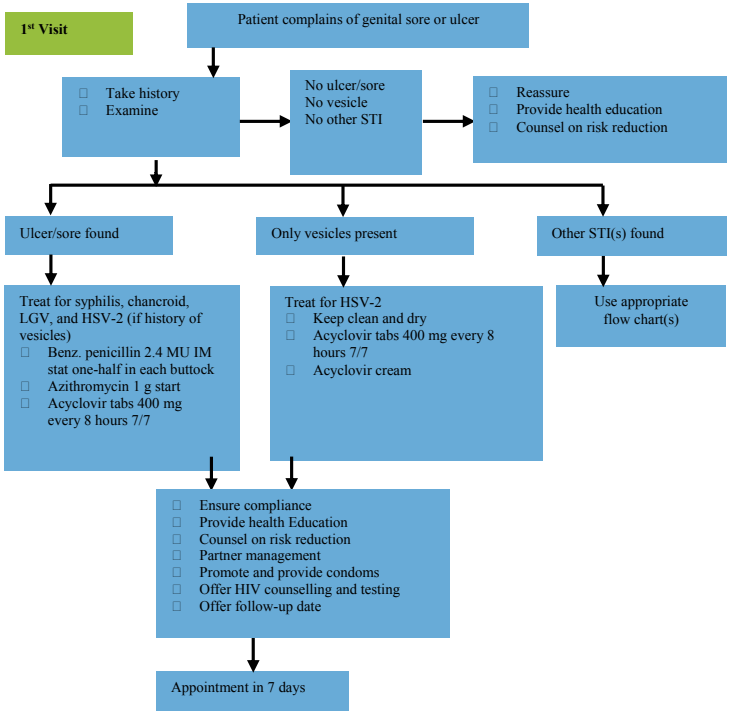
GENITAL ULCER SYNDROME

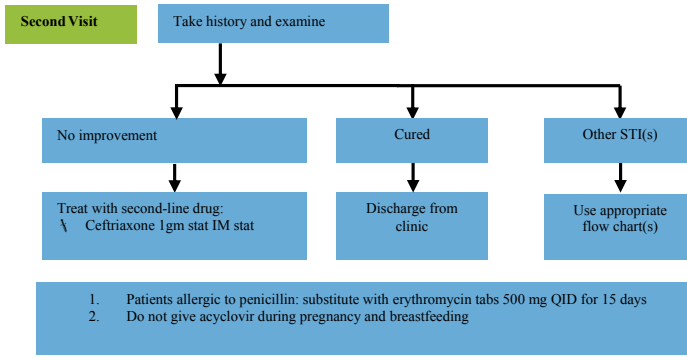
This is an ulcerative, erosive pustule or vesicular genital lesions with or without regional lymphadenopathy caused by syphilis, chancroid, or chlamydia.

Diagnostic criteria

- Evidence of genital sores or genital ulcer
- Painful/painless vesicular lesions with or without lymphadenopathy.

Figure 22.7. Management of genital ulcer syndrome





Lymphogranuloma venereum (inguinal bubo)

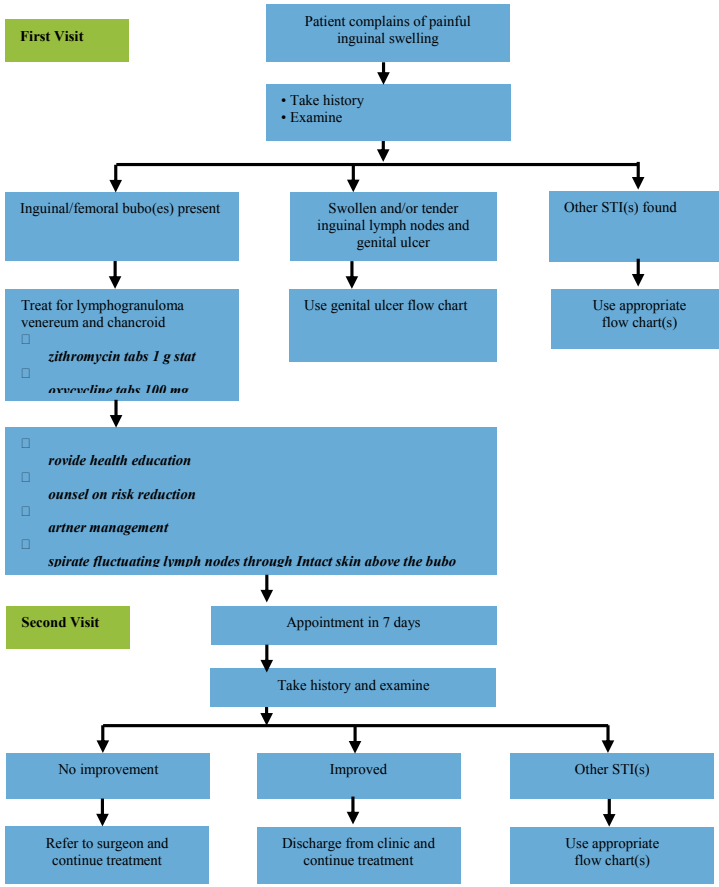
"Inguino and femoral bubos are localized enlargements of the lymph nodes in the groin area, which are painful and may be fluctuant."[2]

Diagnostic criteria

- Swelling in the groin which often fluctuant and tenders
- Associated with pain and fever

2 World Health Organization (WHO). 2004. *Guidelines for the Management of Sexually Transmitted Infections*. Geneva: WHO.

Figure 22.8. Management of inguinal buboes



Note: Do not incise the bubo.

Genital warts (venereal warts)

These are painless, cauliflowerlike fungating masses occurring in the genitalia.

Diagnostic criteria

- Soft fungate mass, itching with or without tenderness
- Bleeding

Treatment

- Give podophllotoxin 10–25% solution or gel twice daily for 3 days, followed by 4 days of no treatment, and the cycle repeated up to four times.

  OR

  Give imiquimod 5% cream applied with a finger at bedtime, left on overnight, three times a week for as long as 16 weeks.

  OR

  Apply trichloroacetic acid (80–90%) to the warts, avoiding normal tissue, followed by powdering of the treated area with talc or sodium bicarbonate (baking soda) to remove unreacted acid. Repeat application at weekly intervals.

Definitive treatment

- Laser ablation
- Cryotherapy
- Electrosurgery

CHAPTER 23. MANAGEMENT OF COMMON POISONING AND DROWNING IN CHILDREN

Common poisoning in children can be caused by organophosphate ingestion, hydrocarbons inhalation (e.g., kerosene), and snake/insect bites.

23.1. PRINCIPLES FOR MANAGEMENT OF INGESTED POISONS

Perform emergency assessment and treatment (ABCD concept):

- Identify the specific agent and remove or adsorb it as soon as possible (if ingested within 3 hours).
- Give specific antidote when the ingested poison is beyond 3 hours with evidence of target organ toxicity.
- Keep the child under observation up to 24 hours; if the child is stable, discharge.

Note: Refer the child to next-level facility:

- Where appropriate management of poisoning can be done safely
- If the child is unconscious or has deteriorating conscious level
- Has burns to mouth and throat
- Has severe respiratory distress, cyanosis, or is in heart failure
- If services for 24 hours of observation are not available

Gastrointestinal decontamination

- Ensure that the airway is protected. **Do not induce vomiting** in a child who has swallowed alkaline, acids, kerosene, petrol, or petrol-based products (most pesticides are in petrol-based solvents), or if the child's mouth and throat have been burned; give water by mouth.

Note: Never use salt as an emetic, as this can be fatal.

Gastric lavage

- Perform gastric lavage within 1 hour of ingestion.

- Place the child in the left lateral/head-down position.
- Insert an NGT.
- Perform lavage with 10 mL/kg of warm normal saline.

- The volume of lavage fluid returned should approximate to the amount of fluid given.
- Lavage should be continued until the recovered lavage solution is clear of particulate matter.
- Tracheal intubation may be required to reduce risk of aspiration.

Activated charcoal

- Give activated charcoal under the following conditions:
  - When a child has ingested a toxin that can be absorbed
  - After a gastric lavage to absorb any remaining toxins
- Measure proper amount of activated charcoal per dose (mix the charcoal in eight to 10 times the amount of water [e.g., 5 g in 40 mL of water]).
- Give activated charcoal orally or via NGT according to the table below.

Table 23.1. Dosage of activated charcoal

Age	Dosage
Up to 1 year	1 g/kg
1 to less than 12 years	25–50 g
Adolescents and adults	25–100 g

- Give the whole amount at once within 1 hour.
- If the child has difficulty tolerating it, the charcoal dose can be divided in two to threw doses.
- If gastric lavage and activated charcoal are not available, then induce vomiting (for nonpetrol-based poisons) only if the child is conscious by rubbing the back of the child's throat with a spatula or spoon handle.

23.2. PRINCIPLES FOR MANAGEMENT OF POISONS IN CONTACT WITH SKIN OR EYES

Poisons that are potentially harmful to the skin, such as alkaline, acids, bleaches, and disinfectants, must be decontaminated.

Measures for skin decontamination

- Remove all clothing and personal effects, and thoroughly flush all contaminated areas of the patient with copious amount of water.
- Use soap and water for oily substances, like petroleum products and herbicides.
- Removed clothing and personal effects should be stored safely in a transparent plastic bag that can be sealed for later cleansing or disposal.

Measures for eye decontamination

- Rinse the eye for 20 minutes with clean running water or saline, taking care that the runoff does not enter the other eye.
- Give an anaesthetic eye drops to assist irrigation.
- Evert the eyelids and ensure that all surfaces are rinsed.
- Refer to an ophthalmologist if services for fluorescence examination are not available or there is significant conjunctival or corneal damage.

23.3. MEASURES FOR MANAGEMENT OF INHALED POISONS

- Remove from the source of exposure.
- Give oxygen 2–4 L/min if there are signs of respiratory distress.
- Consider intubation and ventilation when there are signs of severe respiratory distress.

23.4. ANTIDOTE FOR SPECIFIC POISONS

- In a serious ingestion where activated charcoal cannot be given, consider careful aspiration of stomach contents by NGT (the airway should be protected).
- If the child has signs of excess parasympathetic activation:
  - Give atropine 15–50 mcg/kg (i.e., 0.015–0.05 mg/kg) IM/IV over 15 minutes.
  - The main aim is to reduce bronchial secretions while avoiding atropine toxicity.

- Auscultate the chest for signs of respiratory secretions and monitor respiratory rate, heart rate, and coma score (if appropriate).
- Repeat atropine dose every 15 minutes until no chest signs of secretions, and pulse and respiratory rate returns to normal.

- Check for hypoxaemia if giving atropine, as it can cause heart irregularities (ventricular arrhythmias).
  - In hypoxic children, give oxygen if oxygen saturation is less than 90%.
- Give pralidoxime (cholinesterase reactivator) 25–50 mg/kg diluted with 15 mL water IV over 30 minutes, repeated once or twice, or followed by 10 to 20 mg/kg IV per hour, as necessary.

23.5. MANAGEMENT OF PARACETAMOL POISONING

- If within 1 hour of ingestion, give activated charcoal, if available, OR induce vomiting UNLESS an oral antidote may be required (see below).
- Decide if antidote is required to prevent liver damage.
  - Ingestion of 150 mg/kg or more OR 4 hour toxic paracetamol level measurement where this is available
  - Antidote is more often required for older children who deliberately ingest paracetamol or when parents overdose children by mistake.
- If within 8 hours of ingestion:
  - Give methionine by mouth OR acetylcysteine IV.
  - Methionine can be used if the child is conscious and not vomiting.
    - < 6 years: 4 doses of 1 g every 4 hours
    - > 6 years: 4 doses of 2.5 g every 4 hours
- If more than 8 hours after ingestion or the child cannot take oral treatment:
  - Give acetylcysteine IV.
    - For children < 20 kg, give the loading dose of 150 mg/kg in 3 mL/kg of 5% glucose over 15 minutes, followed by 50 mg/kg in 7 mL/kg of 5% glucose over 4 hours, and then 100 mg/kg IV in 14 mL/kg of 5% glucose over 16 hours.

Note: Fluid volumes used in the standard regimen are too large for young children.

23.6. MANAGEMENT OF ASPIRIN AND OTHER SALICYLATES POISONING

This can be very serious in young children because they rapidly become acidotic and are, consequently, more likely to suffer the severe CNS effects of toxicity. Salicylate overdose can cause acidotic like breathing, vomiting, and tinnitus.

- Give activated charcoal if available. Salicylate tablets tend to form a concretion in the stomach, leading to delayed absorption, so it is worthwhile giving several doses of charcoal.
- If charcoal is not available and a severely toxic dose has been given, then perform gastric lavage or induce vomiting as described above.
- If available, check the ABG analysis and serum electrolytes.
- To correct acidosis, to raise the pH of the urine to above 7.5 and to increase salicylate excretion:
  - Give sodium bicarbonate 1 mmol/kg IV over 4 hours.
  - Monitor urine pH hourly.
- Give IV fluids at maintenance requirements unless child shows signs of dehydration, in which case give adequate rehydration.
- Monitor blood glucose every 6 hours and correct as necessary.
- Give vitamin K IM or IV.
  - Infants and children: 0.5–2 mg
  - Adolescents: 2.5–10 mg 10 mg

23.7. MANAGEMENT OF IRON POISONING

Clinical features of iron poisoning include: nausea, vomiting, abdominal pain, and diarrhoea. The vomitus and stools are often grey or black. In severe poisoning, there may be gastrointestinal haemorrhage, hypotension, drowsiness, convulsions, and metabolic acidosis. Gastrointestinal features usually appear in the first 6 hours, and a child who has remained asymptomatic for this time probably does not require antidote treatment.

- Do gastric lavage if potentially toxic amounts of iron were taken.
- Decide whether to give antidote treatment. Since this can have side effects, it should only be used if there is clinical evidence of poisoning (see above).
- Give deferoxamine 50 mg/kg (to a maximum of 1 g) by deep IM repeated every 12 hours; if very ill, give 15 mg/kg IV per hour (to a maximum of 80 mg/kg) in 24 hours.

23.8. MANAGEMENT OF MORPHINE AND OTHER OPIATES POISONING

Clinical features include reduced consciousness, vomiting or nausea, respiratory depression (slowing or absence of breathing), slow response time, and pinpoint pupils. Clear the airway; if necessary, assist breathing with a bag-valve-mask and provide oxygen.

- Give naloxone 10 mcg/kg IV; if no response, give another dose of 10 mcg/kg. Further doses repeated every 3 minutes until reversal is achieved or to the maximum of 10 mg in total may be required. If the IV route is not feasible, give IM, but the action will be slower.

23.9 MANAGEMENT OF CARBON MONOXIDE POISONING

- Give 100% oxygen to accelerate removal of carbon monoxide (patient can look pink but still be hypoxaemic) until signs of hypoxia disappear.
- Monitor with pulse oximeter, but be aware that these can give falsely high readings. If in doubt, be guided by presence or absence of clinical signs of hypoxaemia.
- Check ABG analysis and serum electrolyte.

23.10. PREVENTION OF POISONING

- Counsel the parents to keep medicines and poisons in proper containers and out of reach of children.
- Advise parents on first aid if this happens again in the future.
- Do not induce vomiting if child has swallowed kerosene, petrol, or petrol-based products, or if child's mouth and throat have been burned, or if the child is drowsy.
- Try to make the child vomit if other medicines or poison have been taken by stimulating the back of the throat.
- Do not keep chemicals and kerosene in beverage bottles.
- Take the child to a health facility as soon as possible, together with information about the substance concerned (e.g., the container, label, sample of tablets, berries, etc.).

23.11. ENVENOMING

Snake bite

Snake bites should be considered in any 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.

Diagnostic criteria

- Shock
- Vomiting
- Headache

Examination

Examine the bite for signs such as:

- Local necrosis
- Bleeding
- Tender local lymph node enlargement
- Specific signs depend on the venom and its effects. These include:
  - Shock, local swelling that may gradually extend up the bitten limb
  - Bleeding: external from gums, wounds, or sores
- Internal, especially intracranial signs, of neurotoxicity:
  - Respiratory difficulty or paralysis
  - Ptosis
  - Bulbar palsy (difficulty swallowing and talking)
  - Limb weakness and signs of muscle breakdown (muscle pains and black urine)

Treatment

- First aid: Splint the limb to reduce movement and absorption of venom.
- If the bite was likely to have come from a snake with neurotoxic venom, apply a firm bandage to affected limb from fingers or toes to proximal of site of bite.
- Clean the wound.

- If any of the above signs, transport to hospital that has ant venom as soon as possible. If snake has already been killed, take this with child to hospital.
- Avoid cutting the wound or applying tourniquet.

Hospital care

- Treat shock if present.
- Paralysis of respiratory muscles can last for days and requires intubation and mechanical ventilation or manual ventilation.

Antivenom

- If there are systemic signs or severe local signs, give antivenom, if available.
- Prepare adrenaline IM and be ready if allergic reaction occurs (see below).
- Give monovalent antivenom if the species of snake is known or polyvalent antivenom if the species is not known (follow the directions given on the antivenom preparation).
- Dilute the antivenom in two to three volumes of 0.9% saline and give IV over 1 hour. Give more slowly initially and monitor closely for anaphylaxis or other serious adverse reactions.
- If itching/urticarial rash, restlessness, fever, cough, or difficult breathing develop, then stop antivenom and give adrenaline 0.01 mL/kg of 1/1,000 or 0.1 mL/kg of 1/10,000 solution SC.
- When the child is stable, restart antivenom infusion slowly.
- More antivenom should be given after 6 hours if there is recurrence of blood incoagulability or after 1–2 hours if the patient is continuing to bleed briskly or has deteriorating neurotoxic or cardiovascular signs.
- If there is no response to antivenom infusion, this should be repeated.

Other treatment

- Surgical interventions: if there is severe swelling in a limb, it is pulseless or painful or there is local necrosis. Surgical care will include:
  - Excision of dead tissue from wound
  - Incision of fascial membranes to relieve pressure in limb compartments if necessary

- Skin grafting, if extensive necrosis
- Tracheostomy (or endotracheal intubation) if paralysis of muscles involved in swallowing occurs

Supportive care

- Give fluids by mouth or by NGT according to daily requirements.
- Keep a close record of fluid intake and output.
- Provide adequate pain relief.
- Elevate limb if swollen.
- Give antitetanus prophylaxis
- Antibiotic treatment is not required unless there is tissue necrosis at wound site.
- Monitor very closely immediately after admission, then hourly for at least 24 hours as envenoming can develop rapidly.

Management of scorpion sting

Systemic effects of venom are much more common in children than adults.

Diagnostic criteria

Signs of envenoming can develop within minutes and are due to autonomic nervous system activation. They include:

Shock

- High or low BP
- Fast and/or irregular pulse
- Breathing difficulty (due to heart failure) or respiratory failure
- Nausea, vomiting, abdominal pain
- Muscle twitches and spasms

Treatment

- Antivenom: If signs of severe envenoming, give scorpion antivenom (as for snake antivenom infusion).

Other treatment

- Treat heart failure, if present.
- If there is pulmonary oedema, consider use of prazosin by mouth.
  - For children 1 month to 12 years: 10–15 mg/kg 6–every 12 hours
  - For children 12–18 years: 500 mg every 8–12 hours

For pain

- Give paracetamol 15 mg/kg by mouth every 8 hours.
  OR

  Give morphine 0.05–0.1 mg/kg IV every 2–4 hours given slowly over 10 minutes.
  OR

  Give morphine by mouth:
  - For children 1 to 12 months: 0.1 mg/kg every 4 hours
  - For children 1 to 12 years: 0.2–0.5 mg/kg

If very severe, infiltrate site with 1% lignocaine, without epinephrine.

23.12. DROWNING

This is a process resulting in primary respiratory impairment from submersion in a liquid medium. A liquid-air interface is present at the entrance to the victim's airways, which prevents the individual from breathing oxygen.

Investigation

- ABG analysis
- RBG
- FBP
- Serum electrolytes
- Serum lactate
- Liver enzymes
- Serum creatinine and BUN

- prothrombin time, partial thromboplastin time, and international normalized ratio if indicated
- Urine for urinalysis, if indicated

Management

- Initial assessment should include ensuring adequate airway patency, breathing, circulation, and consciousness (the ABCs).
- Check if there are any injuries, especially after diving or an accidental fall. Facial, head, and cervical spine injuries are common. Protect the cervical spine until injury is excluded.
- Give oxygen and ensure adequate oxygenation.
- Remove all wet clothes.
- Use an NGT to remove swallowed water and debris from the stomach and when necessary, bronchoscopy to remove foreign material, such as aspirated debris or vomitus plugs, from the airway.
- Warm the child externally if the core temperature is > 32°C by using radiant heaters or warmed dry blankets; if the core temperature is < 32°C, use warmed IV fluid (39°C) or conduct gastric lavage with warmed 0.9% saline.
- Give antibiotics for possible infection if there are pulmonary signs.

CHAPTER 24. NOTIFIABLE INFECTIONS

Notifiable infections are associated with epidemics. When suspected or detected, they should be reported to the responsible national surveillance unit for notifiable diseases.

24.1. VIRAL INFECTIONS

Measles (rubeola)

This is a systemic infection caused by single-stranded RNA virus of family Paramixoviridae. Most affected systems are respiratory, gastrointestinal tract, CNS, and skin.

It can present in two forms: nonsevere and severe complicated measles.

Diagnostic criteria

- Fever
- Generalized maculopapular rash with any of the following:
  - Cough
  - Runny nose
  - Conjunctivitis

Features of severe complicated measles include general danger signs, dehydration, corneal clouding, deep or extensive mouth ulcers, stridor, and severe malnutrition.

Figure 24.1. Child with maculopapular rashes

Photo by MOHCDGEC/MUHAS Dermatology Unit

Investigations

- No specific investigations are required for uncomplicated measles infection.

Treatment of uncomplicated measles

Nonpharmacological treatment

- Treat as an outpatient.
- Encourage breastfeeding and counsel on adequate nutrition.

Pharmacological treatment

- Give vitamin A drops once:
  - 50,000 IU if < 6months
  - 100,000 IU if 6–11 months
  - 200,000 IU if 12 months or older
- If fever is above 38.5°C, give paracetamol 15 mg/kg by mouth every 8 hours.

Treatment of severe complicated measles

Nonpharmacological treatment

- Admit patient.

- Isolate patient for at least 4 days from the onset of rash.
- If child is severely malnourished, isolate for entire duration of illness.
- Encourage breastfeeding, and ensure adequate fluid and calorie intake.

Pharmacological treatment

- Give vitamin A drops on day 1:
  - 50,000 IU if < 6 months
  - 100,000 IU if 6–11 months
  - 200,000 IU if 12 months or older
- If fever is above 38.5°C, give paracetamol 15 mg/kg every 8 hours.

Note:

- If the child shows any eye signs of vitamin A deficiency or is severely malnourished, give second and third doses of vitamin A on second and 14th day.
- Give measles vaccine to all other children > 6 months seen at the facility in the week after the measles patient (including those seen as out patients and HIV-positive children).

Treatment of conjunctivitis

- If there is pus discharge, clean the eyes using cotton, wool, or clean cloth dipped in normal saline or boiled cooled water.
- Give tetracycline or chloramphenicol eye ointment every 8 hours for 7 days. (If eye drops, apply every 2 to 3 hours.)

Note:

- Do not use preparations containing steroids.
- Use protective eye pad to prevent infection.
- If there is no improvement, refer child to a health facility with eye services.

Treatment of mouth ulcers

- Insert NGT for feeding if unable to feed.

- Clean the mouth with salted water (a pinch of salt in a cup of water) at least four times a day.
- Apply 0.25% gentian violet to the sores in the mouth after cleaning.
- If mouth ulcers are severe and/or smelly:
  - Give erythromycin 12.5 mg/kg by mouth every 6 hours for 5 days.
    OR
  - Give azithromycin 10 mg/kg by mouth once daily for 3 days.

Rabies

Rabies is an acute viral infection of the CNS that affects all mammals and is transmitted to humans by animal bites via infected secretions, usually saliva.

Diagnostic criteria

- Early clinical features: apprehensiveness, restlessness, fever, malaise,e and headache
- Late features: excessive motor activity and agitation, confusion, hallucinations, excessive salivation, convulsions, and hydrophobia

Note: Treat the person immediately after the animal bite, before onset of symptoms.

Pharmacological treatment

- Local wound therapy: Wash wound thoroughly with running water and soap for 10 minutes, and repeat process with:
  - A: 10% povidone iodine to prevent secondary bacterial infection

Active immunization

- Human diploid cell vaccine—either ID or IM
- A: Antirabies vaccines (2–3 IU/dose)
  - IM: 1 mL on days 0, 3, 7, 14, 28 (5 doses)
  - ID: 0.2 mL by dividing 0.1 mL on left shoulder and 0.1 mL on right shoulder—on days 0, 3, 7, and 28 (4 doses)
  - ID is mostly advised.

In addition, patients should receive rabies immune globulin with the first dose (day 0).

Passive immunization

- **B:** Antirabies human immunoglobulin 20 IU/kg, one-half of the dose given parenterally and the other half injected into and around the wound
- Tetanus toxoid-containing vaccine *(see section on tetanus)*

24.2. VIRAL HAEMORRHAGIC FEVERS

These are a group of illnesses caused by four families of viruses: *Filoviridae* (Ebola virus), *Flaviviridae* (dengue virus), *Arenaviridae* (Lassa virus), and *Bunyaviridae*. Each causes a systemic infection that damages blood vessels and affects the body's ability to control haemostasis. In this guideline, we focus on dengue and Ebola virus haemorrhagic fevers.

Dengue fever

Dengue is a mosquito-borne viral infection caused by the dengue fever virus.

Diagnostic criteria

Dengue febrile illness

- Retroorbital or ocular pain, headache, rash, myalgia, arthralgia
- Haemorrhagic manifestations (e.g., positive tourniquet test, petechiae; purpura/ecchymosis; epistaxis; gum bleeding; blood in vomitus, urine, or stool; or vaginal bleeding)
- Anorexia, nausea, abdominal pain, and persistent vomiting may also occur but are not case-defining criteria

Dengue haemorrhagic fever

- Persistent high-grade fever lasting from 2–7 days
- Spontaneous bleeding
- Retroorbital pain
- Joint, muscle, and abdominal pain

- Macular or confluent blanching rash (noted during recovery period)
- Thrombocytopenia (> 100,000 cells per mm^3)

Dengue shock syndrome

- All criteria for dengue haemorrhagic fever, plus circulatory failure as evidenced by rapid and weak pulse and narrow pulse pressure (< 20 mmhg)
- Age-specific hypotension; cold, clammy skin; and restlessness

Investigations

- Elisa for dengue NS1 antigen
- Serological tests: dengue immunoglobulin M and G Rapid Strip Test
- FBP

Nonpharmacological treatment

- No specific treatment is available for dengue fever.
- Encourage breastfeeding and ensure adequate fluid and calorie intake.
- Give oxygen and manage hypoglycaemia if present.
- Transfuse blood and blood products if needed.
- Give maintenance fluid (RL, normal saline) intravenously if child cannot take enough orally. (Refer to Chapter 1.)

Pharmacological treatment

- Give paracetamol 15 mg/kg by mouth every 8 hours for 3 days.

Note:

- No antibiotics are of proven value.
- Children under 12 years old require close monitoring for dangerous form.
- Avoid aspirin and other NSAIDs, such as ibuprofen, since such drugs may aggravate bleeding.
- Steroids should not be used.

Ebola and Marburg haemorrhagic fevers

Ebola is caused by virus belonging to the *Filoviridiae* family.

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
- Breastfeeding
- Sexual contact

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, or injection of infectious material.

Diagnostic criteria

- High-grade fever and one or more of the following:
  - Headache, body ache, abdominal pain, diarrhoea, skin rash
  - Unexplained haemorrhage may be present or not

Investigations

- Polymerase chain reaction to detect viral RNA
- ELISA to detect Ebola antibodies

Note: Do not take specimen before wearing appropriate personal protective equipment and ensuring the patient is in an isolation ward/centre.

Treatment

Nonpharmacological treatment

There is no specific treatment for Ebola and Marburg haemorrhagic fever.

- Mechanical ventilation, renal dialysis, and antiseizure therapy may be required.
- Management of complications symptomatically:
  - Maintaining oxygen status: Give oxygen and manage hypoglycaemia if present.

- Maintain blood pressure.
- Ensure fluid and electrolyte balance.
  - Give sodium lactate compound (RL), normal saline intravenously if cannot take fluids orally.

Pharmacological treatment

- Give paracetamol 15 mg/kg by mouth every 8 hours for 3 days.
- Treat for any complicating infection and co-morbid condition.
- Psychological support is given to patient and family.

1. Isolate the patient.
2. Notify relevant authority.
3. Follow protocol for protective measures.

24.3. CHOLERA

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

Note: When a case of cholera is suspected at home, rehydrate the patient using oral rehydration solution, if available, while preparing to take a patient to the nearest health facility or cholera treatment centre.

Diagnostic criteria

- A sudden onset of painless watery diarrhoea that may quickly become severe with profuse watery stools, vomiting, severe dehydration, and muscular cramps, leading to hypovolemic shock and death
- The stool has a characteristic "rice water" appearance (nonbilious, grey, slightly cloudy fluid with flecks of mucus, no blood, and inoffensive odour)

Investigation

- Stool analysis
- Serum electrolytes

- Laboratory evidence of dark field microscopic isolation of motile-curved bacillus on a wet mount of fresh stool specimen
  OR

  Isolation of bacteria through stool culture on thiosulfate-citrate-bile salts-sucrose agar

Note:

- For confirmation at the beginning of an outbreak, rectal swab or stool specimen should be taken from first five to 10 suspected cases. If any are positive, every 10th 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.

Treatment

Nonpharmacological treatment

- Isolate/quarantine the patient and report to the surveillance team in your area immediately.
- **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 according to the Treatment Plan A (No Dehydration), Plan B (Moderate Dehydration), and Plan C (Severe Dehydration).
- Give RL or normal saline 20 mL/kg IV as a bolus, then manage according to the degree of dehydration.
- Administer oral rehydration solution (about 5 mL/kg/h) as soon as the patient can drink, in addition to giving IV fluid.
- If the patient can drink, begin giving oral rehydration solution by mouth while the drip is being set up; it can provide the potassium, bicarbonate, and glucose that saline solution lacks.

Pharmacological treatment

Give an oral antibiotic to patients with severe dehydration as follows:

- For children, give:
  - Erythromycin syrup 12.5 mg/kg by mouth every 6 hours for 3 days
    OR

Co-trimoxazole 48 mg/kg/ by mouth daily for 3 days

- For adolescents, give:
  - Co-trimoxazole 48 mg/kg by mouth twice a day for 3 days
    OR

    Ciprofloxacin 12 mg/kg by mouth twice a day for 3 days
    OR

    Doxycycline 300 mg by mouth as single dose or 5 mg/kg single dose

  AND

  - Folic acid 2.5 mg by mouth once daily for children < 6 months, or 5 mg once daily for children > 6 months for the duration of the treatment

  AND

  - Zinc 10 mg by mouth once daily for children under 6 months or 20 mg once daily for children > 6 months for duration of 10 days

Note:

- Ciprofloxacin was previously contraindicated to children under 12 years of age. Recent studies by the WHO have shown that it is safe for use in children.
- Start feeding 3–4 hours after oral rehydration begins. Preferably, give antibiotics with food to minimize vomiting.
- Prophylaxis of cholera contacts is not recommended. Routine treatment of a community with antibiotics, or mass chemoprophylaxis, has no effect on the spread of cholera—it can have adverse effects by increasing antimicrobial resistance and providing a false sense of security.

Management of Contacts

- Contacts should be counselled about disease transmission, appropriate personal hygiene, and contact precautions.
- Persons who shared food and drink with a confirmed cholera case should be asked to report any diarrhoeal symptoms.

ANNEX I. LIST OF ESSENTIAL MEDICINES FOR CHILDREN

LEVELS OF MEDICINES USE
A Medicines used at dispensary level
B Medicines used at health centre level
C Medicines used at council hospital level
D Medicines used at regional referral hospital and referral hospitals **at regional levels**
S Medicines used at zonal referral, national, and specialized hospitals

Table 1: List of Essential Medicines for Children and Adolescents

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
1. ANAESTHETICS			
1.1 General Anaesthetics and Oxygen			
1	Halothane	Liquid for inhalation, bottle 250 mL	B
2	Servoflurane	liquid for inhalation, bottle	S
3	Nitrous Oxide	Inhalation	C
4	Oxygen	Inhalation (Medicinal gas)	B
5	Ketamine	Injection: 50 mg (as hydrochloride)/mL in 10 mL vial	B
6	Thiopental	powder for injection 0.5 g, 1 g (sodium salt vial	C
7	Propofol	Injection: 10 mg/mL; 20 mg/mL	D
1.2 Local Anaesthetics			
8	Bupivacaine	Injection for spinal anaesthesia: 2. 5 mg/mL (0.25%), 5 mg/mL (0.5%) (hydrochloride) in 4 mL ampoule to be mixed with 7.5% glucose solution.	C
9	Levobupivacaine	Injection: 2.5 mg/mL, 5 mg/mL	D
10	Lidocaine	Injection: 1%; 2% (hydrochloride) in Vial. Injection for spinal anaesthesia: 5% (hydrochloride) in 2 mL ampoule to be mixed with 7.5% glucose solution. Topical	A

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
		forms: 2% to 4% (hydrochloride)	
11	Lidocaine + epinephrine	Dental cartridge: 2% (hydrochloride) + epinephrine (Adrenaline) 1:80, 000 Injection: 1%; 2% (hydrochloride or sulfate) + epinephrine 1:200, 000 in vial.	B
1.3 Preoperative and Perioperative Medication and Sedatives			
12	Atropine	Injection: 1 mg (sulfate) in 1-mL ampoule.	A
13	Midazolam	Injection: 1 mg/mL; 5 mg/mL, Oral liquid: 2 mg/mL, Tablet: 7.5 mg; 15 mg.	D
14	Chlorohydrate	Crystals Solution: 500 mg/5 mL Elixir: 200 mg/5mL	D
15	Glycopyrrolate	Injection: 0.1 mg, 0.2 mg/mL (Glycopyrronium bromide)	S
2. MUSCLE RELAXANTS (PERIPHERALLY ACTING) AND CHOLINESTERASE INHIBITORS			
16	Neostigmine	Injection: 500 mcg in 1 mL ampoule; 2.5 mg (metilsulfate) in 1-mL ampoule. Tablet: 15 mg (bromide)	C
17	Suxamethonium	Injection: 50 mg (chloride)/mL in 2 mL ampoule. Powder for injection: (chloride), in vial	B
18	Baclofen	Oral solution: 5 mg/5 mL, Tablets: 10 mg, 20 mg	D
19	Atracurium	Injection: 5 mg/mL, 10 mg/mL (as besilate)	S
20	Vecuronium	Powder for injection: 10 mg (bromide) in vial	S
3. ANALGESICS, ANTIPYRETICS, NONSTEROIDAL ANTI-INFLAMMATORY MEDICINES (NSAIMs) AND ANTIRHEUMATIC DISEASE MODIFYING AGENTS			
3.1 Nonopioids and Nonsteroidal Anti-inflammatory Medicines (NSAIMs)			
21	Paracetamol	Oral liquid: 125 mg/5 mL. Tablet: 500 mg	A
22	Paracetamol	Suppository: 100 mg Injection: 1 g/100 mL	B B

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
23	Ibuprofen	Oral liquid: 40 mg/mL; Tablet: 200 mg	B
24	Ibuprofen	Solution for injection: 5 mg/mL	C
3.2 Opioid Analgesics			
25	Morphine	Injection: 10 mg (hydrochloride or sulfate) in 1 mL ampoule. Powder (modified release) (to mix with water): 20 mg, 30 mg, 60 mg, 100 mg, 200 mg	C
26	Fentanyl	Injection: 50 mcg/mL in 2 mL, 10 mL ampoule (as citrate)	S
27	Pethidine	Injection: 50 mg/mL (Pethidine hydrochloride) 1 mL, 2 mL	C
28	Codeine	Syrup: 25 mg/5 mL; Tablets: 15 mg, 30 mg	C
3.3 Disease Modifying Antirheumatic Drugs (DMARDs)			
29	Methotrexate	Solid oral dosage form: 2.5 mg Injection: 2.5 mg/mL (as sodium salt)	S
4. SPECIFIC MEDICINES FOR NEONATAL CARE			
30	Dexamethasone	Injection: 4 mg/mL in 1 mL ampoule (as disodium phosphate salt)	B
5. ANTIALLERGICS AND MEDICINES USED IN ANAPHYLAXIS			
5.1 Adrenal Hormones and Synthetic Substitutes			
31	Dexamethasone	Injection: 4 mg/mL in 1 mL ampoule (as disodium phosphate salt)	B
32	Epinephrine (adrenaline)	Injection: 1 mg (as hydrochloride or hydrogen tartrate) in 1 mL ampoule	B
33	Prednisolone	Tablet: 5 mg; syrup 5 mg/5 mL	A
34	Methylprednisolone	Injection: 40 mg/mL (as sodium succinate)	D
35	Hydrocortisone	Powder for injection: 100 mg (as sodium succinate) in vial	B
36	Hydrocortisone	Tablet: 5 mg	D
5.2 Antihistamines			

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
37	Cetrizine	Tablet 10 mg (as hydrochloride) Oral liquid: 5 mg/5 mL	A
38	Chlorpheniramine	Tablet: 4 mg (hydrogen maleate).	A
39	Chlorpheniramine	Injection: 10 mg (hydrogen maleate) in 1-mL ampoule	A
40	Promethazine	Injection: 25 mg/mL (as hydrochloride) in 2 mL Syrup: 5 mg/5 mL Tablet: 25 mg	A
41	Desloratadine	Tablet: 5 mg Syrup: 2.5 mg/5 mL	B
6. ANTIDOTES AND OTHER SUBSTANCES USED IN POISONINGS			
6.1 Nonspecific			
42	Charcoal, activated	Powder or tablet 50 g	A
6.2 Specific			
43	Acetylcysteine	Injection: 200 mg/mL in 10 mL ampoule. Oral liquid: 10%; 20%	C
44	Atropine	Injection: 600 mcg/mL in 1 ml ampoule	A
45	Calcium gluconate	Injection: 400 mcg (hydrochloride) in 1-mL ampoule.	A
46	Flumazenil	Injection: 100 mcg/mL	D
47	Naloxone	Injection: 400 mcg (hydrochloride) in 1-mL ampoule.	C
48	Deferoxamine	Powder for injection: 500 mg (mesilate) in vial	D
7. ANTI-INFECTIVE MEDICINES			
7.1 Anthelminthics			
7.1.1 Intestinal Anthelminthics			
49	Albendazole	Tablet (chewable): 400 mg, 200mg	A
50	Mebendazole	Tablet (chewable): 100 mg, 500 mg	A
7.1.2 Antifilarials			
51	Thiabendazole	Tablet: 500 mg chewable	A
52	10% Thiabendazole	Paste	A
7.1.3 Antischistosomals and Other Antitrematode Medicines			
53	Praziquantel	Tablets 600 mg	A

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
7.2 ANTIBACTERIALS			
54	Amoxycillin	Dispersible Tablets: 250 mg	A
55	Amoxycillin + Clavulanic acid	Oral liquid: 125 mg amoxicillin + 31.5 mg clavulanic acid/5 mL. Tablet: 250 mg (as trihydrate) + 125 mg (as potassium salt), Powder for injection: 500 mg amoxicillin + 100 clavulanic acid	B
56	Ampicillin	Powder for injection: 250 mg (as sodium salt) in vial.	A
57	Benzathine Penicillin	Powder for injection: 1.44 g Benzylpenicillin (= 2.4 million IU) in 5-mL vial.	A
58	Cefalexin	Powder for reconstitution with water: 125 mg/5 mL; Solid oral dosage form: 250 mg as monohydrate	C
59	Ceftriaxone	Powder for injection: 250 mg; 1 g (as sodium salt) in vial	A
60	Cefipime	200mg tablets	S
61	Cloxacillin	Powder for injection: 500 mg in vial (as sodium salt)	B
62	Phenoxymethyl penicillin (Penicillin V)	Powder for oral liquid: 125 mg/5 mL (as potassium salt); tablet: 250 mg (as potassium salt)	A
63	Co-trimoxazole	Syrup: 240 mg/5 mL, Tablet: 480 mg	A
		Injection: 96 mg/mL	D
64	Azithromycin	Tablets: 250 mg; Oral liquid: 125 mg/5 mL	A
65	Chloramphenicol	Capsule: 250 mg; Oral liquid: 125 mg/5 mL(as palmitate) Powder for injection: 1 g (sodium succinate) in vial	B

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
66	Ciprofloxacin	Powder for reconstitution: 250 mg/5 mL (anhydrous) Tablet (scored): 250 mg, 500 mg (as hydrochloride) Solution for IV infusion: 2 mg/mL (as lactate) in 100 mL bottle.	A C
67	Doxycycline	Oral liquid: 50 mg/5 mL (anhydrous) Capsules: 100 mg (as hyclate) Tablet (dispersible, scored): 100 mg (as monohydrate)	A
68	Flucloxacillin	Capsule: 250 mg (as sodium salt) Oral solution: 125 mg/5 mL (as sodium salt)	C
69	Clarithromycin	Tablets: 250 mg Suspension: 125 mg/5 mL	D
70	Erythromycin	Powder for oral liquid: 125 mg/5 mL (as stearate or estolate or ethyl succinate) Solid oral dosage form: 250 mg (as stearate or estolate or ethyl succinate)	A
71	Gentamicin	Injection: 10 mg; 40 mg (as sulfate)/mL in 2-mL ampoule	A
72	Clindamycin	Capsule: 150 mg (as hydrochloride) Injection: 150 mg (as phosphate)/mL in 2 mL ampoule Oral liquid: 75 mg/5 mL (as palmitate)	S
73	Vancomycin	Powder for injection: 250 mg (as hydrochloride) in vial	S
	7.3 Antituberculosis Medicines		
74	Ethambutol	Oral liquid: 25 mg/mL (hydrochloride) Tablet: 100 mg; 400 mg	A
75	Isoniazid	Oral liquid: 50 mg/5 mL Tablet (scored): 50 mg Tablet: 100 mg to 300 mg	A

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
76	Pyrazinamide	Oral liquid: 30 mg/mL Tablet: 400 mg, 500 mg Tablet (scored, dispersible): 150mg	A
77	Rifampicin	Oral liquid: 20 mg/mL Solid oral dosage form: 150 mg, 300 mg	A
78	Streptomycin	Powder for injection: 1 g (as sulfate) in vial	A
79	Rifampicin, isoniazid, pyrazinamide, ethambutol	Rifampicin 150 mg + Isoniazid 75 mg + Pyrazinamide 400 mg + Ethambutol 275 mg	A
80	RHE	Rifampicin 150 mg + Isoniazid 75 mg + Ethambutol 275 mg	A
81	RH	Rifampicin 150 mg + Isoniazid 75 mg	A
7.3.1 Medicines for the Treatment of Multidrug-resistant Tuberculosis (MDRTB)			
82	Amikacin	Powder for injection: 100 mg, 500 mg, 1 g (as sulfate) in vial	D
7.4 Antifungal Medicines			
83	Fluconazole	Capsule: 50 mg, 150/200 mg Oral liquid: 50 mg/5 mL Injection: 2 mg/mL in 100 mL bottle	A
84	Griseofulvin	Tablet: 250 mg, 500mg	A
85	Nystatin	Oral liquid: 50 mg/5 mL, 100,000 IU/mL Tablet: 100,000 IU	A
86	Ketoconazole Shampoo Solution 100 mL		B
87	Miconazole	Oral gel: Miconazole 2%	C
88	Gentian Violet (GV)	Solution: Powder reconstituted to 0.5% with water	A
89	Amphotericin B	Powder for injection: 50 mg vial, (as sodium deoxycholate or liposomal complex)	D
7.5 Antiviral Medicines			
7.5.1 Antiherpes Medicines			
90	Acyclovir	Dispersible tablet: 200 mg, 400	B

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
		mg, Topical Cream: 5%	
91	Acyclovir	Powder for injection: 250 mg (as sodium salt) in vial	S
7.5.2 Antiretrovirals			
7.5.2.1 Nucleoside/Nucleotide Reverse Transcriptase Inhibitors			
92	Abacavir (ABC)	Oral liquid: 100 mg (as sulfate)/5 mL Tablet: 300 mg (as sulfate)	A
93	Emtricitabine (FTC)	Capsule: 200 mg Oral liquid: 10 mg/mL	A
94	Lamivudine (3TC)	Oral liquid: 50 mg/5 mL Tablet: 150 mg	A
95	Stavudine (d4T)	Capsule: 15 mg, 20 mg, 30 mg Powder for oral liquid: 5 mg/5 mL	A
96	Zidovudine (ZDV or AZT)	Capsule: 100 mg, 250 mg Oral liquid: 50 mg/5 mL Tablet: 300 mg Solution for IV infusion injection: 10 mg/mL in 20-mL vial	A
97	Tenofovir	Tablet: 300 mg	A
7.5.2.2 Nonnucleoside Reverse Transcriptase Inhibitors			
98	Efavirenz (EFV or EFZ)	Capsule: 50 mg, 100 mg, 200 mg Oral liquid: 150 mg/5 mL Tablet: 600 mg	A
99	Nevirapine (NVP)	Tablet: 200 mg Oral liquid: 50 mg/5 mL	A
7.5.2.3 Protease Inhibitors			
100	Nelfinavir	Tablets: 250 mg	A
101	Atazanavir	Solid oral dosage form: 100 mg, 150 mg, 300 mg (as sulfate)	C
102	Lopinavir + Ritonavir (LPV/r)	Capsule: 133.3 mg + 33.3 mg Oral liquid: 400 mg + 100 mg/5 mL Tablet (heat stable): 100 mg + 25 mg, 200 mg + 50 mg	C
103	Ritonavir	Oral liquid: 400 mg/5 mL Solid oral dosage form: 100 mg Tablet (heat stable): 25 mg, 100	C

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
		mg	
104	Indinavir	Capsule: 400 mg	A
105	Saquinavir (SQV)	Solid oral dosage form: 200 mg (as mesilate)	A
106	Lamivudine + Nevirapine + stavudine	Tablet: 150 mg + 200 mg Tablet (dispersible): 30 mg + 50 mg	A
107	Lamivudine + Nevirapine + Zidovudine	Tablet: 30 mg + 50 mg + 60 mg 150 mg + 200 mg + 300 mg	A
108	Tenofovir + Emtricitabine + Efavirenz	Tablet: 300 mg + 200 mg + 600 mg	A
109	Tenofovir + Emtricitabine	Tablet: 300 mg + 200 mg	A
110	Abacavir + Lamivudine	Tablet: 300 mg + 150 mg	A
111	Lamivudine + Zidovudine	Tablet: 30 mg + 60 mg, 150 mg + 300 mg	A
7.5.2.4 Third line ARVs			
112	Raltegravir (RAL)	Chewable tablets 25mg, 100 mg Granules of 100 mg/sachet	S
113	Darunavir boosted Ritonavir DRV/r	Syrup 100 mg/mL Tablet 75 mg	S
114	Dolutegravir (DTG)	Tablet 10 mg, 25 mg, and 50 mg	S
115	Etravirine (ETV)	Tablet 25 mg, 100mg, and 200mg	S
7.5.2.5 Other Antivirals			
116	Ribavirin	Injection for IV administration: 800 mg and 1 g in 10 mL phosphate buffer solution Solid oral dosage form: 200 mg, 400 mg, 600mg	S
7.6 Antiprotozoal Medicines			
7.6.1 Antiamoebic and Antigiardiasis Medicines			
117	Metronidazole	Injection: 500 mg in 100-mL vial Oral liquid: 200 mg (as benzoate)/5 mL Tablet: 200 mg	A
118	Tinidazole	Tablet: 500 mg	B
119	Secnidazole	Tablet: 500 mg	C

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
7.6.2 Antimalarial Medicines			
120	Artemether	Oily injection: 80 mg/mL in 1-mL ampoule	C
121	Artemether/lumefantrine	Tablet: 20 mg + 120 mg	A
122	Artesunate	Injection: 60 mg vial of anhydrous artesunic acid with a separate ampoule of 5% sodium bicarbonate solution	A
123	Dihydroartemisinin + Piperaquine	Tablet: 20 mg/160 mg	B
124	Quinine	Injection: 300 mg/mL quinine hydrochloride in 2 mL ampoule Tablet: 300 mg	A
7.6.3 Antipneumocystosis and Antitoxoplasmosis Medicines			
125	Sulfamethoxazole + Trimethoprim	Injection: 80 mg + 16 mg/mL in 5 mL, 10 mL amp. Oral liquid: 200 mg + 40 mg/5 mL Tablet: 100 mg + 20 mg; 400 mg + 80mg	D
8. GASTROINTESTINAL MEDICINES			
8.1 Antiulcer Medicines			
126	Omeprazole	Tablet/capsule: 20 mg and 10 mg	A
127	Esomeprazole	Granules: 10 mg and 20mg Tablet: 20 mg and 40 mg	S
128	Ranitidine	Tablet: 75 mg, 150 mg, and 300 mg Capsule: 150 mg, 300 mg Injection: 25 mg, 50 mg Vial of 1 and 2 mL 25 mg/mL Oral solution: 10 mL, 15 mg/mL	D
8.2 Antiemetic Medicines			
129	Metoclopramide	Injection: 5 mg (hydrochloride)/mL in 2 mL ampoule Oral liquid: 5 mg/5 mL Tablet: 10 mg (hydrochloride) Tablets: 4 mg	C
130	Ondansetron	Injection: 2 mg base/mL in 2 mL ampoule (as hydrochloride) Oral liquid: 4 mg base/5 mL	S

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
		Tablet: 4 mg, 8 mg	
8.3 Medicines Used in Diarrhoea			
131	Oral Rehydration Salts		A
132	Zinc sulfate	Dispersible tablets: 20 mg	A
9. REHYDRATION SOLUTIONS AND THERAPEUTIC FEEDS			
9.1 Oral			
133	ReSoMal (Rehydration solution for malnutrition)	Powder: Delivered in sachets	A
134	Potassium Chloride	Tablets: 600 mg (8 mmol each of potassium and chloride) (equivalent to slow K)	C
135	Electrolyte/ mineral solution	Dose: 20mls	C
9.2 Parenteral			
136	Glucose (Dextrose)	IV infusion: 5% (isotonic), in 200 mL, 500 mL	A
137	Glucose (Dextrose)	IV infusion: 10% , 25%, 50% (hypertonic) in 100 mL	A
138	Glucose with sodium chloride (Dextrose saline)	IV infusion: in 200 ml with the following composition: 5% glucose + 0.9% sodium chloride (equivalent to 150 mmol/L each of Na+ and cl-) 5% glucose + 0.45% sodium chloride (equivalent to 75 mmol/L each of Na+ and cl-) 4% glucose + 0.18% sodium chloride (equivalent to 30 mmol/L each of Na+ and cl-)	A
139	Potassium chloride	Solution for dilution: in 5 mL and 10 mL Ampoule 7.4% (equivalent to potassium 1 mmol/mL and Chloride 1 mmol/mL); 15% (equivalent to potassium 2 mmol/mL and Chloride 2 mmol/mL)	C
140	Sodium chloride (Normal saline)	IV infusion: in 200 mL, 500 mL bottles containing: 0.9% (equivalent to 150 mmol/L each of Na+ and cl-)	A
141	Sodium chloride (Normal saline)	0.45% (equivalent to 75mmol/L each of Na+ and cl)	C

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
142	Sodium hydrogen-carbonate (Sodium Bicarbonate)	Injectable solution: 1.4% isotonic (equivalent to sodium 167 mmol/L, bicarbonate 167 mmol/L). Solution: 8.4% in 10-mL ampoule (equivalent to sodium 1,000 mmol/L, bicarbonate 1,000 mmol/L)	C
143	Sodium Lactate, compound (Ringer's/ Hartmann's solution)	IV infusion: 200 mL, 500 mL (Na+ 131 mmol, K+ 5 mmol, Ca++ 2 mmol, Cl- 111 mmol, HCO3 29 mmol)	A
144	NaCl 3%	250 mL solution	C
	9.3 Therapeutic Feeds for Severe Malnutrition		
145	F75, F100	Therapeutic Milk powder in sachets, each with a specific combination of the following ingredients: milk, Potassium Chloride (KCl), Tripotassium Citrate (C6 H5 K3 O7.H2O) Magnesium Chloride (MgCl2.6H2O) Zinc Acetate Zn(CH3COO)2.2H2O) Copper Sulfate (CuSO4.5H2O)	B
146	Ready-to-use-therapeutic-food	Prepacked therapeutic paste: containing 25% vegetable oils, proteins, sugar, skimmed milk, vitamins, and minerals	A
	9.4 Miscellaneous		
147	Water for Injection	For IV use: 2 mL, 5 mL, 10 mL ampoules	A
	10. MEDICINES FOR EAR, NOSE AND THROAT DISEASES		
	10.1 Medicines Acting on Respiratory Tract		
148	Budesonide	Inhalation (aerosol): 100 mcg/dose; 200 mcg/dose	B
149	Salbutamol	Injection: 50 mcg (as sulfate)/mL in 5-mL ampoule Metered dose inhaler (aerosol): 100 mcg (sulfate)/dose Respirator solution for use in nebulizers: 5 mg (as sulfate)/mL	A

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
150	Ipratropium bromide Oxymetazoline	Nebulizer: 250 mcg/mL 0.05% (as hydrochloride)	C B
	10.2 Ear Preparations		
151	Aluminium acetate	Ear drops: 3%	C
152	Ciprofloxacin	Ear drops: 0.3% (as hydrochloride)	C
153	Boric acid Oxymetazoline	Ear drops	C
	11. MEDICINES USED FOR EYE DISEASES		
	11.1 Anti-infective Eye Preparations		
154	Aciclovir	Ointment: 3%	C
155	Tetracyclin	Eye Ointment: 1% (hydrochloride)	A
156	Chloramphenical	Eye Ointment: 1% Eye Drops: 0.5%	A
157	Ciprofloxacin	Eye Drops: 0.3%	A
158	Natamycin	Eye Drops: 5%	C
159	Econazole	Eye Ointment: 1%	S
160	Tobramycin Oxtetracycline Gentamicin	Eye Drops 0.3% Ointment 3% Eye drops	D A
	11.2 Anti-inflammatory Eye Preparations		
161	Dexamethasone/ Neomycine	Eye Drops: 1%	C
162	Betamethasone/ Neomycine Dexamethasone/Chloramphenicol Dexamethasone/Gentamicin	Eye/ear drops: 0.5% Eye drops 0.1% , 0.5%	C C
163	Cromoglycate Prednisolone Triamcenolone Depomedron	Eye drops: 2–4% (as sodium) Eye drops 1% (as acetate) Injection 10 mg/mL, 40 mg/mL Injection 20 mg/mL	C D D S
	11.3 Local Anaesthetics Eye Preparations		
164	Amethocaine Tetracaine	Eye drops: 0.5%, 1% Eye drops 0.5%	D C
	11.4 Antiglaucoma, Mydriatics, and Miotics		

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
165	Atropine	Eye drops/ointment: 0.1%; 0.5%; 1% (sulfate)	B
166	Cyclopentolate	Eye drops: 0.5%, 1% (as hydrochloride)	C
167	Epinephrine (adrenaline)	Eye drops: 2% (as hydrochloride)	D
168	Timolol	Drops: 0.25%, 0.5% metered dose unit (as maleate)	C
169	Pilocarpine	Drops: 4% (as hydroxide)	C
170	Acetazolamide	Tablets: 250 mg Powder for reconstitution: 500 mg vial	C
171	Tropicamide	0.5%, 1%	D
172	Dorzolamide Timolol	2% Dorzolamide, 0.5% Timolol	D
	11.5 Miscellaneous Ophthalmic Preparations		
173	Povidone iodine	Eye drops: 2.5–5%	D
	12. MEDICINES USED FOR SKIN DISEASES		
	12.1 Antifungal Preparations		
174	Miconazole	Cream or ointment: 1%, 2% (nitrate)	C
175	Terbinafine	Cream or Ointment: 1% (as hydrochloride) Tablets: 250 mg	C
176	Clotrimazole	Topical cream: Clotrimazole 2%, Powder: 0.01 g/g	A
	12.2 Anti-infective Preparations		
177	Mupirocin	Cream: 2% (as mupirocin calcium) Ointment: 2%	C
178	Silver sulfadiazine	Cream: 1%	B
179	Potassium permanganate Solution 0.01%	Solution	A
180	Clindamycin	Lotion 1%	C
	12.3 Anti-inflammatory and Antipruritic Preparations		
181	Betamethasone	Cream or ointment: 0.1% (as	C

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
		valerate)	
182	Zinc oxide	Paste/Powder: 5%	A
183	Calamine	Lotion	A
184	Hydrocortisone	Cream or ointment: 0.5% (acetate)	B
185	Mupirocin + Dexamethasone	Cream	C
186	Tretinoin	Cream 0.025%	D
187	Clobetasol propionate Triamcinolone Tazarotene Calciprotriene	Cream, ointment 0.05% Cream 0.1% or 0.5% Aqueous gel 0.05% Cream 0.1% Cream 0.005% Ointment 0.005%	D C C C C C
12.4 Medicines Affecting Skin Differentiation and Proliferation			
188	Benzoyl peroxide	Cream or lotion: 5%, 2.5% and forte	A
189	Coal tar	Paint: 5%	C
190	Podophyllum resin	Solution: 10–25%	C
191	Tacrolimus	Ointment: 0.1%	S
192	Salicylic acid + Lactic Acid	Gel: Equivalent to 12% salicylic acid (Bazuka gel) and 4% lactic acid	D
193	Salicylic acid	Solution: 5%	A
194	Silver nitrate	Caustic pencil: 40%	C
195	Liquid nitrogen	freeze liquid gas	D
196	Tri-chloroacetic acid	Solution: 35–100%	D
12.5 Scabicides and Pediculicides			
197	Gama Benzene Hexachloride	Lotion/cream: 1% (Lindane)	A
198	Permethrin	Cream: 5%, Lotion: 1%	D
199	Benzyl Benzoate Emulsion	Lotion: 25%.	A
200	Malathion	Lotion: 0.5%.	A
13. ANTICONVULSANTS			
201	Diazepam	Tablets: 2 mg, 5 mg, Rectal	C

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
		solution: 2 mg/mL in 2.5 mg, 5 mg and 10 mg vials Injection: 5 mg/mL	
202	Carbamazepine	Tablet (chewable): 100 mg, Solution 100 mg/5mlL	A
203	Lorazepam	Injection: 2 mg/mL in 1-mL ampoule	C
204	Clonazepam	Tablet 0.25 mg, 0.5 mg, 1 mg	D
205	Phenobarbitone	Injection: 50 mg/mL Tablet: 30 mg (phenobarbital sodium).	A
206	Phenytoin	Injection: 50 mg/mL in 5-mL vial (sodium salt).	S
207	Valproic acid (sodium valproate)	Syrup: 200 mg/5 mL, Tablet (crushable): 100 mg, Tablet (enteric-coated): 200 mg	C
208	Levetiracetam	Tablet 250 mg, 500 mg	S
209	Topiramate	Tablet 25 mg, 100 mg	S
210	Clobazam	Tablet 10 mg, 20 mg, Oral suspension 2.5 mg/mL	S
211	Vigabatrin	Tablets: 250 mg, 500 mg,	S
212	Lamotrigine	Tablets: 5 mg, 25 mg, 50 mg, 100 mg, Dispersible tablet: 5 mg, 25 mg	D
213	Ethosuximide	Capsule: 250 mg, Syrup: 250 mg/5 mL	D
14. PSYCHOTHERAPEUTICS AND RELATED MEDICINES			
214	Imipramine	Tablets (coated): 25mg (as hydrochloride)	B
215	Amytriptiline	Tablets: 25mg	A
216	Fluoxetine	Tablets: 10mg, 20mg	S
217	Risperidone	Oral dispersible Tablets: 0.5 mg, 1 mg, 2 mg,	S
218			
219			
220	Olanzapine	Oral dispersible Tablets: 2.5 mg, 5 mg, 10mg	S
221	Benzhexol/Trihexypheni	Tablets: 1 mg, 2 mg, 5 mg	C

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
	dyl		
222	Fluphenazine	Injection: 25mg vial (as decanoate)	C
223	Haloperidol	Tablets: 0.5 mg, 1.5 mg, 5 mg Injection: 5 mg/mL in 1 mL ampoule	B
224	Chlorpromazine	Tablets: 25 mg Injection: 25 mg/mL	A
225	Methylphenidate	Tablets: 5 mg	S
226	Melatonin	Tablet: 3 mg, 6 mg	S
15. MEDICINES USED FOR CARDIOVASCULAR DISEASES			
15.1 Antihypertensive and Antiarrhythmic Medicines			
227	Captopril	Tablets: 12.5 mg, 25 mg	B
228	Enalapril	Tablet: 2.5 mg (as hydrogen maleate)	C
229	Nifedipine	Tablet:10 mg	C
230	Propranolol	Tablet: 10 mg (hydrochloride) Injection: 1 mg/mL	A
231	Atenolol	Tablets: 25 mg	C
232	Labetalol	Tablets: 50 mg (as hydrochloride), Injection: 5 mg/mL (hydrochloride)	C
233	Sodium nitroprusside	Powder for reconstitution: 10 mg/mL	D
234	Clonidine	Tablets (scored): 100 mcg (as hydrochloride) Injection: 150 mcg/mL	S
235	Diazoxide	Injection: 15 mg/mL	S
236	Prazosin	Tablets: 500 mcg, 1 mg (scored) (as hydrochloride)	S
237	Adenosine	Injection: 3 mg/mL in saline	D
238	Hydrallazine	Tablet: 25 mg (as hydrochloride), Injection: 25 mg/mL ampoule	C
239	Glyceryl trinitrate	Injection: 1 mg/mL, 5 mg/mL	S
240	Isoprenaline	Injection: 1 mg/mL	S
241	Noradrenaline	Injection; 2 mg/mL	D
242	Phenylephrine	Injection 10 mg/mL	S

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
243	Carvedilol	Tablets: 3.125 mg, 6.25mg	C
244	Digoxin	Injection: 250 mcg/mL in 2-mL ampoule. Oral liquid: 50 mcg/mL	C
245	Dopamine	Injection: 40 mg (hydrochloride) in 5-mL vial.	D
	16. DIURETICS		
246	Furosemide	Injection: 10 mg/mL in 2 mL ampoule. Tablet: 20 mg	B
247	Hydrochlorthiazide	Tablet (scored): 25 mg	A
248	Glycerol	Oral solution	C
249	Mannitol	Injectable solution: 10%, 20% in 50 mL bottle	C
250	Spironolactone	Oral liquid: 10 mg/5 mL, Tablet: 12.5 mg, 25 mg	C
	17. HORMONES AND OTHER ENDOCRINE MEDICINES		
	17.1 Insulins and Other Antidiabetic Medicines		
251	Glucagon	Injection: 1 mg/mL	C
252	Insulin (soluble)	Injection: 100 IU/mL in 10-mL vial	A
253	Long-acting insulin	Injection: 100 IU/mL in 10-mL vial (as compound insulin zinc suspension or isophane insulin).	A
	17.2 Thyroid Hormones and Antithyroid Medicines		
254	Iodine	Saturated solution: 130 mg total iodine/mL	B
255	Propylthiouracil	Tablet: 50 mg	D
256	Carbimazole	Tablets: 5 mg	C
257	L-Thyroxine	Oral solution 100 mcg per 5 mL	D
258	Adrenocorticotropic hormone (ACTH)	Injection, for IM or subcutaneous use 40 units/mL and 80 units/mL	S
	18. ANTINEOPLASTIC, IMMUNOSUPPRESSIVES AND MEDICINES USED IN PALLIATIVE CARE		
	18.1 Immunosuppressive Medicines		
259	Cyclosporine	Capsule:25 mg Concentrate for IV Injection: 50 mg/ mL in 1 mL	S

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
260	Antithymocyte (Immunoglobulin)	IV Infusion: Powder for IV reconstitution 25 mg vial	S
261	Immunoglobulin	250 mg, 750 mg vial	S
262	Corticotropin (ACTH)	Injection: 250 mcg/mL, 1 mg/mL	S
18.2 Cytotoxic Medicines—Medicines Listed Below Should Be Used According to Protocols for Treatment of the Diseases			
263	Asparaginase	Powder for injection: 10,000 IU in vial	S
264	Dexamethasone	Oral liquid: 2 mg/5 mL	A
265	Mercaptopurine	Tablet: 50 mg	D
266	Methotrexate	Powder for injection: 50 mg (as sodium salt) in vial, Tablet: 2.5 mg (as sodium salt)	S
267	Vincristine	Powder for injection: 1 mg; 5 mg, (sulfate) in vial.	S
268	Procarbazine	Solution 10 mg/mL; 5 mL vial, capsule 50mg	S
269	Cyclophosphamide	Powder for injection: 500 mg in vial	S
270	Cytarabine	Powder for injection: 100 mg in vial; Injection for IT: 20 mg/mL	S
271	Daunorubicin	Powder for injection: 50 mg (hydrochloride) in vial	S
272	Doxorubicin	Powder for injection: 10 mg; 50 mg (hydrochloride) in vial	S
273	Dactinomycin	Powder for injection: 500 mcg vial	S
274	Methotrexate	Powder for injection: 50 mg (as sodium salt) in vial; Injection for IT: 25 mg/mL	S
275	Ifosphamide	Solution for reconstitution 1gm and 3gm	
276	Vinblastine	Solution of 1 mg/mL; Vial of 10 mL	S
277	Cisplastin	Solution of 1 mg/mL; Vial of 10 mL, 50 mL, 100 mL	
278	Chlorambucil	Tablets 2 mg	S
279	Dacarbazine	Powder for reconstitution;	S

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
		Ampoule of 100mg, 200mg, 500mg and 1,000mg	
280	Actinomycin	Powder for injection: 500 mcg in vial	S
281	Etoposide	Capsule: 100 mg.	S
282	Etoposide	Injection: 20 mg/mL in 5-mL ampoule	S
283	Bleomycin	Powder for injection: 15 mg (as sulfate) in vial	S
18.3 Adjuvant Medicines			
284	Allopurinol	Tablets: 100 mg; 300 mg	B
285	Mesna	Injection: 100 mg/mL in 4 ml and 10 ml ampoules; Tablets: 400 mg; 600 mg	S
18.4 Medicines Used in Palliative Care			
286	Amitriptyline	Tablet: 10 mg; 25 mg	B
287	Cyclizine	Injection: 50 mg/mL. Tablet: 50 mg	D
288	Fluoxetine	Tab: 20 mg (as hydrochloride).	S
289	Senna	Oral liquid: 7.5 mg/5 mL	C
19. MEDICINES AFFECTING THE BLOOD AND BLOOD PRODUCTS			
19.1 Antianaemia Medicines			
290	Ferrous salt	Oral drops: Ferrous sulfate 125 mg (equivalent to 25 mg iron)/mL. Tablet: equivalent to 60 mg iron	A
291	Folic acid	Dispersible tablet: 1 mg; 5 mg	A
292	Hydroxycobalamin	Injection: 1 mg (as acetate, hydrochloride or as sulfate) in 1 mL ampoule	C
19.2 Medicines Affecting Coagulation			
293	Phytomenadione	Injection: 1 mg/mL in 0.2 mL amp; (vitamin K1) 10 mg/mL in 1 mL ampoule. Tablet: 10 mg.	A
294	Heparin sodium	Injection: 1,000 IU/mL; 5,000 IU/mL in 1-mL ampoule Tablet: 15 mg, 20 mg; Low	D

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
		molecular weight 12,500 units/mL	
295	Warfarin	Tablet: 0.5 mg; 1 mg; 2 mg; 5 mg (sodium salt).	C
296	Tranexamic acid	Tablets: 0.5 mg; Injection: 100 mg/mL	C
297	Desmopressin	Nasal spray: 10 mcg/metered spray (desmopressin acetate) Intranasal solution: 100 mcg/mL (desmopressin acetate)	D
	19.3 Other Medicines for Haemoglobinopathies		
298	Deferoxamine*	Powder for injection: 500 mg (mesilate) in vial	D
	19.4 Plasma Fractions for Specific Use		
299	Factor VIII	Concentrate Dried 500 IU	D
300	Factor IX complex	Dried 500 IU (coagulation factors, II, VII, IX, X) concentrate	D
301	Human normal immunoglobulin	IM administration: 16% protein solution.* I.V administration: 5%; 10% protein solution. ** Subcutaneous administration: 15%; 16% protein solution.*	S
302	Human albumin	5%, 20–25% solution 50 mL,100 mL	S
	20. VITAMINS		
303	Multivitamin	Tablets: Compound Drops/Syrup: 25 mL, 100 mL	B
304	Iodine	Capsule: 200 mg. Iodized oil: 1 mL (480 mg iodine); 0.5 mL (240 mg iodine) oral or injectable; 0.57 mL (308 mg iodine) in dispenser bottle	D
305	Pyridoxine (vitamin B6)	Tablet: 25 mg (hydrochloride)	B
306	Retinol (vitamin A)	Capsule: 50,000 IU; 100,000 IU (as palmitate). Oral oily solution: 100,000 IU (as palmitate)/mL in multidose dispenser. Tablet (sugar-coated): 10,000 IU, 50,000 IU (as palmitate). water-miscible Injection: 100,000 IU/mL (as	A

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
		palmitate)	
307	Riboflavin (vitamin B2)	Tablet: 50 mg;	D
308	Sodium fluoride*	Tablet: 1.1 mg (equivalent to fluoride 500 mcg); 2.2 mg (equivalent to fluoride 2.2 mg). *Fluorides not considered necessary below 6 months	D
309	Thiamine (vitamin B1)	Tablet: 50 mg (hydrochloride) Injection: 100 mg/mL in 1 ml ampoule	C
310	Folinic acid	Calcium Folinate Tablets 15 mg	S
21. IMMUNOLOGICAL PRODUCTS AND VACCINES			
21.1 Sera and Immunoglobulin			
311	Antitetanus	Injection: immunoglobulin 1,500 IU, 10,000 IU, 100,000 IU, 500,000 IU in a vial	A
312	Antivenom	Snake polyvalent antiserum immunoglobulin Injection: (Central African type)	A
313	Antirabies Immunoglobulin	Injection: 1,000 IU/5 mL ampoule	A
21.2 Vaccines			
314	BCG Vaccine (bacille Calmette Guerin)	Injection: 20 doses in 10 mL vial	A
315	Oral Polio Vaccine (Live attenuated)	Oral solution: 20 doses in container	A
316	DPT, HepB, Hib Vaccine (Diphtheria-Pertussis-Tetanus; + Hepatitis B + Haemophilus Influenza type B)	Injection: 10 dose	A
317	Measles-Rubella Vaccine (Live attenuated)	Injection: 10 doses in vial	A
318	Tetanus (toxoid) Vaccine	Injection: 20 doses in 10 mL vial	A
319	Pneumococcal Conjugate Vaccine (PCV13)	Injection: 1 dose/0.5 mL	A

SN	Name of Medicine	Preferred Dosage Form and Strength	Lowest Level of Use
320	Rota vaccines	Oral Suspension 1.5 mL	A
321	Human Papillomavirus Vaccines	Injection: 0.5 mL	A
322	Inactivated Polio Vaccines (IPV)	Injection: 5 dose	A
22. DISINFECTANTS AND ANTISEPTICS			
22.1 Antiseptics			
323	Chlorhexidine	Solution: 4% (digluconate, used for cord care)	A
324	Povidone iodine	Solution: 10% (equivalent to 1% available iodine)	A
325	Cetrimide	Solution: 15%	A
326	Ethanol (rectified)	Solution: 70–90%	A
327	Chloroxylenol	Solution: 4.9%	A
Oral Antiseptics			
328	Hydrogen Peroxide 3%	Solution 3%	A
22.2 Disinfectants			
329	Glutaraldehyde	Solution: 2%	C

ANNEX II. LIST OF MEMBERS WHO PARTICIPATED IN THE DEVELOPMENT AND FINALIZATION OF THE PAEDIATRICS STG AND EML

List of National Medicine and Therapeutic Committee (NMTC)			
S/N	**Name**	**Institution**	**Position**
1	Prof. Muhamaad Bakari kambi	MOHCDGEC	Chairman
2	Henry Irunde	MOHCDGEC-PSU	Secretary
3	George W. Mlavwasi	MOHCDGEC	Member
4	Dr. Baraka J. Nzobo	MOROGORO RRH	Member
5	Dominick J. Mfoi	PSU	Member
6	Regina J. Ruhano	orally-RALG	Member
7	Mary J. Masanja	TFDA	Member
8	Sylvester Maige	MSD	Member
9	Dr. Romwald Mbwana	DODOMA	Member
10	Edna S. Majaliwa	MNH	Member
11	Noel Mhadu	MOHCDGEC-PSU	Member
12	Dr. Doreen Mloka	MUHAS	Member
13	Salome Mwinga	MOHCDGEC-DNMS	Member
14	Jirabi Masige	MOHCDGEC-DCS	Member
15	Dr. Delfina Mhenda	MZRH	Member
16	Andrew Swai	TDA	Member
17	Dr. Azma Simba	MOHCDGEC	Member
18	Dr. Hamis Msengi	MOHCDGEC	Member
19	Siana G. Mapunjo	MOHCDGEC	Member
20	Emmanuel Mwera	NZEGA DC	Member
21	Dr. Mayani Alfred	ORCI	Member
22	Dr. Isabella Swai	MNH	Member
23	Dr. Edward Kija	MUHAS	Member
24	Dr. Felix Bundala	MOHCDGEC-RCHS	Member

List of Final Editors Committee				
S/N	**Name**	**Institution**	**Title**	**Position**
1	Dr. Felix Bundala	MoHCDGEC	Ag Program Manager-NCH	Organizer, Editor
2	Dr. John Rwegasha	MNH	Consultant Physician	Chairperson, Editor
3	Dr. Edward Kija	MUHAS	Paediatric Neurologist	Editor in Chief
4	Mr. George W. Mlavwasi	MoHCDGEC	Principal Pharmacist	Editor
5	Dr. Lulu Chirande	MUHAS	Paediatrician	Editor
6	Dr. Edna Majaliwa	MNH	Paediatrician	Editor
7	Dr. Isabella Swai	MNH	Paeditrician	Editor
8	Dr. Naibu Mkongwa	MoHCDGEC	Program Officer-NCH	Editor
9	Dr. Ignatus Mosten	Jhpiego	Paediatrician Manager	Editor

List of Members that Participated in the Development of pSTGc		
S/N	**Name**	**Organization**
1	Dr. Georgina Msemo	MOHCDGEC – RCHS
2	Dr. Mary Azayo	MOHCDGEC- RCHS
3	Mr. Joseph Muhume	MOHCDGEC – PSU
4	Ms. Anita Sillo	MOHCDGEC - PSU
5	Mr. Edger Basheka	MOHCDGEC – PSU
6	Sophia S. Mshana	MOHCDGEC – PSU
7	Aneth Wilbroad	MOHCDGEC - PSU
8	Majaliwa Mtoroki	MOHCDGEC – PSU
9	Dr. Paul J. Mwanyika	Mbeya Referral Hospital
10	Francis Modaha	Tanzania Food and Nutrition Centre
11	Sixbert Mkude	MOHCDGEC - NMCP
12	Emmanuel Yohana	MOHCDGEC - IVD
13	Dr. Victor Bakengesa	MOHCDGEC - RCHS
14	Dr. Abdallah S. Lusasi	NMCP
15	Dr. John Bosco Lindi	MOHCDGEC - NMCP
16	Mrs. Leah Chenya	Pharmacy Council
17	Mr. Hiiti Sillo	Tanzania Food and DrugAuthority

List of Members that Participated in the Development of pSTGc		
S/N	**Name**	**Organization**
18	Ms. Maria Msangi	Tanzania Food and Nutrition Centre
19	Dr. Fatma Abdallah	Tanzania Food and Nutrition Centre
20	Wessy P. Maghji	Tanzania Food and Nutrition Centre
21	Julieth Shine	Tanzania Food and Nutrition Centre
22	Ms. Rose Shija	WHO
23	Dr. Nemes Iriya	WHO
24	Dr. Sabrina Pestilli	UNICEF
25	Temina Mkumbwa	HELLEN KELLER INTER.
26	Dr. Festus Kalokola	URC
27	Florence Lucasi	MSD
28	Salome Mallamia	MSD
29	Marco Masala	MSD
30	Dr. Namala Patrick Mkopi	Paediatric Association of Tanzania
31	Dr. Theopista Jacob	Paediatric Assosiation of Tanzania
32	Dr. JesseA. Kitundu	MNH
33	Dr. Henry Swai	MNH
34	Dr. Petronilla Ngiloi	MNH
35	Dr. Higgins Massawe	MNH
36	Dr. Edna Majaliwa	MNH
37	Dr. Peter Swai	MNH
38	Dr. Hadija Mwamtemi	MNH
39	Dr. Kissah E. Mwambene	MNH
40	Dr. Juma Mfinanga	MNH
41	Dr. Victor Ringo	MNH
42	Dr. Judith Mwende	MNH
43	Dr. Henry Swai	MNH
44	Dr. Gabriel Mlay	MNH
45	Dr. Abdul Juma	MNH
46	Dr. Patricia Scanlan	MNH
47	Dr. Rachel Mhaville	MNH
48	Dr. Stellah Rwezaula	MNH
49	Dr. Nyaluke P. Peter	MNH
50	Dr. Fausta Philip	MNH
51	Dr. Herbert Msaigani	MNH

List of Members that Participated in the Development of pSTGc		
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52	Dr. Conrad Mselle	MNH
53	Dr. Rodrick Kisenge	MUHAS
54	Dr. Francis F. Furia	MUHAS
55	Dr. Edwin Lugazia	MUHAS
56	Dr. Maulid Fataki	MUHAS
57	Dr. Theopista Kazimoto	MUHAS
58	Dr. Juma Mwinula	Lugalo Military Hospital
59	Dr. Francis Mchomvu	Bombo Hospital
60	Dr. Fatma Mganga	MOHCDGEC -IVD
61	Ms. Judith Elisa	Mawenzi Regional Hospital
62	Dr. Delila Moshi	Mwananyamala Hospital
63	Dr. Joseph R. Lifa	Mwananyamala Hospital
64	Dr. Winne Ndembeka	Tanga City
65	Peter Dattani	Tumbi Hospital
66	Janet Cassian	Kibaha COTC
67	Dr. Loth E. Kilimba	Ludewa Hospital
68	Dr. Adili Haule	Mbeya AMOTC
69	Salla P. Salustian	Songea COTC
70	Rose L. Mwakapenda	Temeke Hospital

ANNEX III. REPORT OF SUSPECTED ADVERSE DRUG REACTIONS, INCLUDING BIRTH DEFECTS

Note: Identities of reporter, patients and institution will remain confidential

I. PARTICULARS OF PATIENTS

Patient Initials or Record No: _____ Sex: _____

Date of Birth (DD-MM-YYYY) or age: _____ Weight in kg: _____

II. DETAIL OF ADVERSE DRUG REACTION

☐ Headache ☐ Shock/anaphylaxis ☐ Skin rash Date Reaction started __/__/__

☐ Diarrhoea ☐ Nausea or vomiting ☐ Others Date Reaction stopped __/__/__

(If known)

Description of reaction (if possible) _____

III. DETAILS OF SUSPECTED DRUG (S) AND ALL OTHER DRUGS USED

Name of suspected drug(s) (Please specify brand and name if known)	Dosage	Frequency	Route	Therapy Date		Batch. No & Expiry date (If known)	Reason for use
				Start	Stop		
1							
2							
3							
Other drugs (including herbal medicines consumed at the same and or 1 month before)							
1							
2							
3							

IV. MANAGEMENT OF ADVERSE REACTION

Reaction subsided after stopping the suspected drug/reducing the dose: ☐ Yes ☐ No ☐ unknown

Reaction reappeared after reintroducing drug: ☐ Yes ☐ No ☐ Not applicable

Do you consider the reaction to be serious? ☐ Yes ☐ No

If yes, please indicate why the reaction is considered to be serious (please tick all that apply):

- ☐ Patient died due to reactions
- ☐ Is life threatening
- ☐ Causes a congenital anomaly
- ☐ Required or prolonged hospitalization
- ☐ Causes irreversible disability or incapacity
- ☐ Others, please give details

.....

.....

.....

Treatment of adverse reaction Yes ☐ ☐ No (If yes please specify).....

Outcome of reactions ☐ Not yet recovered ☐ Recovered ☐ Fatal (Date of death): __/__/__

V. PARTICULARS OF REPORTER (HEALTH CARE PROVIDERS)

Name: _____ Profession: _____ Name and Address of the health

Contact Phone No: _____ Email: _____ facility: _____

Signature_____ Date of this report __/__/__ _____

☐ Please tick if you wish to receive information about other local reports associated with the suspected drug(s)

Thank you for your cooperation	Submission of ADR case report does not discredit the competence of the report	Ref No. (For official use)

NOTE:-

One form to be submitted to the Tanzania Food and Drug Authority

ANNEX IV. VOLUME OF F-75 PER FEED FOR MALNOURISHED CHILDREN WITH NO OEDEMA, OEDEMA+ OR OEDEMA++ (130 ML/KG/DAY)

Child's weight (kg)	every 2 hours (mL/ feed)	every 3 hours (mL/ feed)	every 4 hours (mL/ feed)
2	20	30	45
2.2	25	35	50
2.4	25	40	55
2.6	30	45	55
2.8	30	45	60
3	35	50	65
3.2	35	55	70
3.4	35	55	75
3.6	40	60	80
3.8	40	60	85
4	45	65	90
4.2	45	70	90
4.4	50	70	95
4.6	50	75	100
4.8	55	80	105
5	55	80	110
5.2	55	85	115
5.4	60	90	120
5.6	60	90	125
5.8	65	95	130
6	65	100	130
6.2	70	100	135
6.4	70	105	140
6.6	75	110	145
6.8	75	110	150
7	75	115	155
7.2	80	120	160
7.4	80	120	160
7.6	85	125	165
7.8	85	130	170
8	90	130	175
8.2	90	135	180
8.4	90	140	185
8.6	95	140	190
8.8	95	145	195

Child's weight (kg)	every 2 hours (mL/ feed)	every 3 hours (mL/ feed)	every 4 hours (mL/ feed)
9	100	145	200
9.2	100	150	200
9.4	105	155	205
9.6	105	155	210
9.8	110	160	215
10	110	160	220

ANNEX V. VOLUME OF F-75 PER FEED FOR MALNOURISHED CHILDREN WITH OEDEMA+++ (100 ML/KG PER DAY)

Child's weight (kg)	every 2 hours (12 feeds)	every 3 hours (8 feeds)	every 4 hours (6 feeds)
3	25	40	50
3.2	25	40	55
3.4	30	45	60
3.6	30	45	60
3.8	30	50	65
4	35	50	65
4.2	35	55	70
4.4	35	55	75
4.6	40	60	75
4.8	40	60	80
5	40	65	85
5.2	45	65	85
5.4	45	70	90
5.6	45	70	93
5.8	50	75	95
6	50	75	100
6.2	50	80	105
6.4	55	80	105
6.6	55	85	110
6.8	55	85	115
7	60	90	115
7.2	60	90	120
7.4	60	95	125
7.6	65	95	125
7.8	65	100	130
8	65	100	135
8.2	70	105	135
8.4	70	105	140

Child's weight (kg)	every 2 hours (12 feeds)	every 3 hours (8 feeds)	every 4 hours (6 feeds)
8.6	70	110	145
8.8	75	110	145
9	75	115	150
9.2	75	115	155
9.4	80	120	155
9.6	80	120	160
9.8	80	125	165
10	85	125	165
10.2	85	130	170
10.4	85	130	175
10.6	90	135	175
10.8	90	135	180
11	90	140	185
11.2	95	140	185
11.4	95	145	190
11.6	95	145	195
11.8	100	150	195
12	100	150	200

ANNEX VI. TB SCORING CHART

Score if Sign or Symptom Present						
	0	1	2	3	4	Score
General Features						
Duration of illness	Less than 2 weeks	2-4 weeks		More than 4 weeks		
Failure to thrive or weight loss	Weight gain	No weight gain or weight faltering		Weight loss		
TB contact	None	Reported (but no documentation), reported smear negative or EPTB		Smear positive (with documentation)		
TST	Negative, not done			Positive		
Malnutrition not improved after 4 weeks therapy				Present		
Unexplained fever not responding to appropriate therapy**			Positive			
Local Features						
Painless, enlarged lymph nodes*		Any noncervical		Positive cervical lymph		

Score if Sign or Symptom Present						
	0	1	2	3	4	Score
		lymph nodes		nodes		
Swelling of bones or joints*}[p;'				Positive		
Unexplained ascites or abdominal mass*				Positive		
CNS findings: meningitis***, lethargy, irritability, and other behaviour changes				Positive		
Angle deformity of the spine					Positive	
TOTAL SCORE: A score of 7 or more indicates a high likelihood of TB. Refer the child for TB treatment.						

ANNEX VII. PAEDIATRIC ANTIRETROVIRAL DOSING CHART 1

Weight Range (Kg)	Abacavir/ 3TC Adult	Abacavir/ 3TC Baby	Combivir Adult	Combivir Baby	Duovir N Adult	Duovir Baby	TLE or Atripla	Truvada	Lamivudine (3TC)	Abacavir (ABC)	Efavirenz (EFV)	Nevirapine (NVP)	Weight Range (Kg)
	Dose is ONCE daily	Dose is TWICE daily	Dose is TWICE daily	Dose is TWICE daily	Dose is TWICE daily	Dose is TWICE daily	Dose is ONCE daily (TDF 208 mg/m2)	Dose is ONCE daily (TDF208 mg/m2)	4 mg/kg /dose TWICE daily	8 mg/kg/ dose TWICE daily	ONCE daily for children > 3 years	160-200 mg/m2/dose TWICE daily	
	600 mg ABC/300 mg 3TC tablet	60 mg ABC/ 30 mg 3TC tablet	300 mg AZT/ 150 mg 3TC tablet	60 mg AZT/ 30 mg 3TC tablet	300 mg AZT/ 150 mg 3TC/200 mg NVP tablet	60 mg AZT/ 30 mg 3TC/50 mg NVP tablet	300 mg TDF/ 200 mg FTC (used with NNRTI or PI)	300 mg TDF/300 mg 3TC (or 200 mg FTC)/600 mg EFV	150 mg tablets	300 mg tablets	50, 200, and 600 mg tablets	10 mg/mL syrup	
3-4.9		1 tab BD		1 tab BD		1 tab BD						5 mL BD	3-4.9

Weight Range (Kg)	Abacavir/ 3TC Adult	Abacavir/ 3TC Baby	Combivir Adult	Combivir Baby	Duovir N Adult	Duovir Baby	TLE or Atripla	Truvada	Lamivudin e (3TC)	Abacavir (ABC)	Efavirenz (EFV)	Nevirapin e (NVP)	Weight Range (Kg)
5-5.9		1 tab BD		1 tab BD		1 tab BD						6 mL BD	5-5.9
6-6.9		1.5 tab BD		1.5 tab BD		1.5 tab BD						7 mL BD	6-6.9
7-7.9		1.5 tab BD		1.5 tab BD		1.5 tab BD						8 mL BD	7-7.9
8-8.9		1.5 tab BD		1.5 tab BD		1.5 tab BD						9 mL BD	8-8.9
9-9.9		1.5 tab BD		1.5 tab BD		1.5 tab BD						9 mL BD	9-9.9
10-10.9		2 tab BD		2 tab BD		2 tab BD					200 mg OD	10 mL BD	10-10.9
11-11.9		2 tab BD		2 tab BD		2 tab BD				0.5 tab BD	200 mg OD	10 mL BD	11-11.9
12-13.9		2 tab BD		2 tab BD		2 tab BD			0.5 tab BD	0.5 tab BD	200 mg OD	11 mL BD	12-13.9
14-16.9		2.5 tab BD	0.5 tab BD	2.5 tab BD		2.5 tab BD			0.5 tab BD	0.5 tab BD	200 mg + 50 mg OD		14-16.9

Weight Range (Kg)	Abacavir/ 3TC Adult	Abacavir/ 3TC Baby	Combivir Adult	Combivir Baby	Duovir N Adult	Duovir Baby	TLE or Atripla	Truvada	Lamivudine (3TC)	Abacavir (ABC)	Efavirenz (EFV)	Nevirapine (NVP)	Weight Range (Kg)
17-19.9		2.5 tab BD	0.5 tab BD	2.5 tab BD		2.5 tab BD			0.5 tab BD	0.5 tab BD	200 mg + 50 mg OD		17-19.9
20-24.9		3 tab BD	1 tab AM, 0.5 tab PM	3 tab BD		3 tab BD			1 tab AM, 0.5 tab PM	1 tab AM, 0.5 tab PM	300 mg OD		20-24.9
25-29.9	1 tab OD		1 tab AM, 0.5 tab PM		1 tab BD				1 tab BD	1 tab BD	300 mg + 50 mg OD		25-29.9
30-34.9	1 tab OD		1 tab BD		1 tab BD				1 tab BD	1 tab BD	400 mg (200 mg x 2) OD		30-34.9
35-39.9	1 tab OD		1 tab BD		1 tab BD		1 tab OD	1 tab OD	1 tab BD	1 tab BD	400 mg (200 mg x 2) OD		35-39.9

ANNEX VIII. DOSAGES OF ANTIRETROVIRAL DRUGS FOR ADULTS AND ADOLESCENTS

Generic Name	Strength and Dose
Nucleoside reverse transcriptase inhibitors (nrtis)	
Abacavir (ABC)	300 mg twice daily or 600 mg once daily
Zidovudine (AZT)	300 mg twice daily
Emtricitabine (FTC)	200mg once daily
Lamivudine (3TC)	150 gm twice daily or 300mg once daily
Nucleotide reverse transcriptase inhibitors (ntrtis)	
Tenofovir (TDF)	300 mg once daily
Non – nucleoside reverse transcriptase inhibitors (nnrtis)	
Efavirenz (EFV)	400 - 600 mg once daily
Nevirapine (NVP)	200 mg once daily for 14 days, followed by200 mg twice daily
Etravirine (ETV)	200 mg twice daily
Proteases inhibitors (pis)	
Atazanavir + ritonavir (ATV/r	300 mg + 100 mg once daily
Lopinavir/ritonavir (LPV/r)	400 mg/100 mg twice daily
	Considerations for individuals receiving TB therapy In the presence of rifabutin, no dose adjustment required. In the presence of rifampicin, adjusted dose of LPV/r: (LPV 800 mg + RTV 200 mg twice daily or LPV 400 mg + RTV 400 mg twice daily) with close monitoring.
Darunavir + ritonavir (DRV/r)	800 mg + 100 mg once dailya or 600 mg + 100 mg twice dailyb
Integrase strand transfer inhibitors (instis)	
Dolutegravir (DTG)	50 mg once daily
Raltegravir (RAL)	400 mg twice daily

A For individuals with no previous use of protease inhibitors.
b For individuals with previous use of protease inhibitors

ANNEX IX. THIRD-LINE PAEDIATRIC FORMULATION DOSING

Drug	Paediatric Formulation	Number of Tablets by Weight-band Morning and Evening (Kg)										Adult Formulation	Adult Tablets	
		3-5.9		6-9.9		10-13.9		14-19.9 kg		20-24.9			25-34.9	
		am	pm	am	pm	am	pm	am	pm	am	pm		am	pm
RAL	Chewable tablet 25 mg					3	3	4	4	6	6	400 mg	1	1
	Chewable tablet 100 mg							1	1	1.5	1.5	400 mg	1	1
	Granules 100 mg/sachet	0.25	0.25	0.5	0.5							400 mg	1	1
DRV/r [a]	Tablet 75 mg					3	3	5	5	5	5	600 mg + 100 mg ritonivir	1	1
	Syrup 100 mg/mL					2.5 mL	2.5 mL	3.5 mL	3.5 mL			600 mg + 100 mg ritonivir	1	1
DTG[b]	50 mg												1	
ETV[c]	Tablet 25 mg, 100 mg, 200mg							100 mg[d]	100 mg[d]	125 mg	125 mg	200 mg	200 mg[e]	200 mg[e]

aDRV/r must be administered with 0.5 mL of RTV mg/mL oral suspension if the child weighs less than 15 kg and with RTF 50 mg solid formulation for children weighing 15-30 mg. DRV/r should not be used in children younger than 3 years of age
bDTG is currently approved for patients 12 years and above.
cETV is not recommended in patients less than 6 years of age or less than 16 kg. Dosing reference for ETV comes from Etravirine. In Lexicomp Online Database in Up To Date. Hudson (OH): Lexicomp Inc.: 2017.
dDose of ETV for 16 kg to < 20 kg is 100 mg twice daily
eDose of ETV for 25 kg to < 30 mg: 150 mg twice daily; > 30 kg is 200 mg twice daily