REPUBLIC OF RWANDA

MINISTRY OF HEALTH

RWANDA STANDARD TREATMENT GUIDELINES

PEDIATRICS

Volume 2

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FOREWORD

I have the pleasure to preface the 2022 Rwanda Standards Treatment Guidelines and the Essential Medicines List (STGs/EML). This is the second edition after the 2013 STGs and 2015 EML.

The development of the STGs/EML is an essential part of the improvement of the quality of health care delivery especially at the primary healthcare level. Rwanda is committed to the attainment of the 2030 SDGs and especially goal 3 i.e. "good health and well-being" with one its target to "Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all"

To attain the above-mentioned goals, special packaging of policies and strategies aligned to the Global Strategy for Women's, Children's and Adolescent's Health were developed through the MNCH strategic plan 2018- 2024 ensuring coordinated action to address cross-cutting health needs of our future. These guidelines have therefore integrated this plan accordingly

Equally important, this 2022 STGs/EML integrates Rwanda global commitment to the implementation of the One Health Policy that set-up policies, implementation strategies to prevent and control zoonotic diseases, plant diseases, food safety and specifically antimicrobial resistance. Rwanda has therefore set up a One Health Multi-sectoral Coordination Mechanism (OH-MCM) that will allow antimicrobial resistance surveillance, guide and monitor the use of antibiotics in Rwanda. This policy is in line with our commitment to the WHO Global Action Plan on Antimicrobial Resistance (2018). We have therefore for the first time customized the WHO AWARE classification of antibiotics as well as the antibiotics prescription guidance. This will help not only reduce the current trend of antimicrobial resistance but importantly ensure better quality of healthcare of our population by reducing the negative impact of multi-drug resistance in Rwanda.

While the above global commitments inform our strategic choices, the STGs/EML are grounded first and foremost in our national diseases burden and specifically at the primary health care level. It is our hope that these guidelines will bring more evidence-based practice, more transparency in the care provision as well as access to efficient, affordable, and available medications in the country.

I would finally wish to acknowledge the strategic technical and financial contribution of the WHO that made this work possible despite the challenging environment due to Covid-19 pandemic.
This work would not have been possible without the active involvement of the professional medical/pharmacy societies/associations, that reviewed the literature, held numerous online discussions, peer-reviewed several drafts and came up with the most suitable guidelines.
Several other partners provided support to this project in one way or another and I wish to thank all of them for their usual support

Dr. NGAMIJE M. Daniel
Minister of Health

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The Ministry of Health wishes to acknowledge the support of various stakeholders in the making of the 2022 Standards Treatment Guidelines (STGs) and Essential Medicines List (EML). Without their contributions, it wouldn't have been possible to complete this work despite the restrictions made necessary by the Covid-19 Pandemics.

The World Health Organization availed the required financial and technical support throughout the project and was flexible to adjust to the challenges brought about by the stringent environment.

World AIDS Campaign International (WACI) Health made a significant financial input to allowing a smooth running of the project.

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Clinton health access initiative (CHAI) have been instrumental and played a major role especially in developing the Clinical guidelines for hypoxemia screening and oxygen therapy administration in Neonates, children and adults.

The Ministry wishes to thank specifically all Rwanda Health professionals and Pharmacy Societies and Associations for their self-less spirit and gave their time to patiently review and update the previous 2013 STGs and 2015 EML spending very long hours online very often late in the night.

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RESPIRATORY DISEASES

Rhinitis and rhinopharyngitis

Definition

Rhinitis and rhinopharyngitis are very common viral infections of the nasal or pharyngeal mucosa, which occur with seasonal variations under 5 year olds (more frequent in cold and rainy seasons).

Causes

- **Commonest virus:** Rhinoviruses
- **Other viruses:** Coronaviruses, respiratory syncytial viruses, human metapneumovirus, influenza viruses, para influenza viruses, adenoviruses, enteroviruses rarely
- **Other causes include** allergy (in case of recurrence), Iron deficiency, Passive tobacco smoke

Signs and symptoms:

- Nasal congestion
- Sore throat
- Sneezing
- Productive Cough
- Fever sometimes
- Watery red eyes
- Headache

Note: Suspect allergic rhinitis in case of recurrent signs of rhinitis with itching of nose, eyes, ears and palate.

Complications

- Otitis media
- Sinusitis (over 6 year old age)
- Tonsillitis
- Exacerbation of asthma

Management

At health centre

Investigations

- Malaria test and FBC/ Hb if fever is present

Treatment

- No specific treatment
- Nasal irrigation with 0.9% sodium chloride, 4 to 6 times/ day to clear the airway.
- Patients with fever give paracetamol as follow 10 to 15 mg/kg/dose 4-6 hourly (maximum dose 60mg/kg/day),
- Air humidification using nebulization with 0.9% sodium chloride may help open the airways, thin secretions, and loosen mucus in the lungs, making it easier to cough up or clear
- For allergic rhinitis only, give an antihistamine: Desloratadine for 3 to 5 days as follow:
  - From 2 to 5 years: 1.25mg once a day
  - Children from 6 to 12 years: 2.5 mg Once a day
  - Children >12 years: 5 mg Once a day
  - Avoiding the allergen

At district hospital level (Same as above)

Recommendation:

- Antibiotics are not indicated in viral rhinitis and rhinopharyngitis except in case of evident super-infection

Pneumonia

Definition

Pneumonia is infection of the lung parenchyma characterized by inflammation and consolidation of lung tissue.

Causes

- Bacterial:
  - Streptococcus pneumonia (most common at all ages)
  - Chlamydia pneumonia
  - Mycoplasma pneumonia (over 5 year old age)
  - Chlamydia trachomatis (infant)
  - Staphylococcus aureus
  - Haemophilus influenza (in case of no vaccination)
  - Pseudomonas aeruginosa (in immunocompromised patients)
  - Klebsiella pneumonia …

- Viral:
  - Respiratory syncytial Virus
  - Adenovirus
  - Influenzae A and B
  - Parainfluenzae types 1 and 3
  - Metapneumovirus

- Fungal Cryptococcus neoformans, Aspergillus spp,…
- Mycobacterial: Mycobacterium tuberculosis, Mycobacterium avium, Mycobacterium intracellulare
- Parasites: Pneumocystis Jirovecii (in HIV infected children)

Signs and symptoms

- Fever
- Tachypnea
- Respiratory distress (inter-costal, sub-costal recession)
- Nasal flaring
- Use of accessory muscles
- Cyanosis and respiratory fatigue (in severe case especially for infant)
- Crackles and wheezing on auscultation
- Bronchial breathing

Table 1. Clinical staging of pneumonia

Type	Signs	Symptoms
Very severe pneumonia	Cyanosis Inability to drink/breastfeed AVPU = V, P or U Grunting Head bobbing	History of cough or difficulty of breathing Fever Abdominal/chest pain (sometimes)
Severe pneumonia	Lower chest indrawing Nasal flaring Grunting	
Non severe Pneumonia	Fast breathing Presence or absence of crackles	

Investigations

- FBC
- Chest x-ray
- Blood culture
- HIV test

Complications of pneumonia:

- Pneumothorax
- Pleural effusion/pleuritis
- Sepsis/ Meningitis / Arthritis
- Empyema
- Respiratory failure
- Bronchiectasis

Management:

At health centre (Follow IMCI guideline)

- For very severe and severe pneumonia
    - Give first dose of an appropriate antibiotic. (Ampicillin 25mg/kg stat dose and Gentamycin 5mg/kg stat)
    - Treat to prevent hypoglycaemia
    - Refer URGENTLY to hospital
- For Non-severe pneumonia
    - Give an appropriate oral antibiotic for 5 days. (Amoxycillin 40mg/kg/day in 3 divided doses)
    - Soothe the throat and relieve the cough with a safe remedy.
    - Advice mother when to return immediately.
    - Follow-up in 2 days

Factors for admission of children with pneumonia:

- Age < 6 months
- Sickle cell anaemia with acute chest syndrome

- Multiple lobe involvement
- Immunocompromised state
- Toxic appearance
- Very severe or severe pneumonia (clinical staging)
- Severe respiratory distress:
  - Supplemental oxygen
  - Dehydration
  - Vomiting
  - No response to appropriate oral antibiotic therapy

At district hospital level (Follow ETAT+ guideline)

Table 2. Management summary of pneumonia

Type	Management	Comments
Very severe pneumonia	Hospitalization, Oxygen, Correct shock, hypoglycaemia and dehydration, Fluid maintenance Ampicillin 200mg/kg Q6hr ***or*** Benzyl penicillin 50,000 units/kg IM/IV Q6hr **Plus** Gentamycin IV 7.5mg/kg IV over 3-5 minutes Q24hr ***OR*** Cefotaxime 50mg/kg/dose Q8hr **(second line)**	Duration 10 days Switch to oral treatment with amoxicillin 45mg/kg/dose Q12hr if improvement in clinical symptoms
Severe pneumonia	Hospitalization Oxygen Correct hypoglycaemia and dehydration Fluid maintenance Ampicillin 200mg /kg/day (50mg/kg/ dose Q6h)	Duration 7 days Switch to oral treatment with amoxicillin 45mg/kg/dose Q12hr if improvement in clinical symptoms
Non severe Pneumonia	Amoxycillin 25mg/kg/dose Q12hr	Duration 5 days

Note: *If pneumonia due to staphylococcus is suspected give Cloxacillin 100mg/kg/day for in 3doses and Gentamycin 7.5mg/kg. Use vancomycin as second line therapy if no response*

Complications:

Recurrent/persistent pneumonia:
In case of persistent pneumonia (abnormal X-ray more than 30 days after treatment) the patient should be referred for investigations (CT scan, bronchoscopy) to exclude:

- Foreign body
- Tuberculosis
- Congenital malformation (adenomatosis)
- Immotile cilia syndrome

Likewise, in case of recurrent pneumonia, an underlying cause should be suspected and the child referred for further investigations.

Pleural effusion:
In case of pleural effusion, think of *Staphylococcus aureus, streptococcus pneumonia, mycoplasma pneumonia, tuberculosis*

Exclude Tuberculosis

Ultrasound to measure the volume of liquid and aspiration for culture, GeneXpert
Drainage of fluid is urgent to relieve the respiratory distress

Table 3. Treatment failure definition and the appropriate action to take

Treatment failure definition	**Action**
Any time. Progression of pneumonia to severe (development of cyanosis or inability to drink in a child with pneumonia without these signs on first contact.	**Admit child** • Change treatment from amoxicillin • to Ampicillin and gentamicin to cover for Gram negative pneumonia
Obvious cavitation on CXR	❖ Treat with Cloxacillin and gentamicin iv for Staph. Aureus and Gram-negative pneumonia. ❖ **Investigate for TB**
48 hours	
Severe pneumonia child getting worse, reassess thoroughly, get chest X ray if not already done (looking for empyema /effusion, Cavitation, Pneumothorax etc).	❖ Switch to Ceftriaxone / Cefotaxime unless suspect Staphylococcal pneumonia then use Cloxacillin and Gentamycin ❖ Suspect PCP especially if <12 months, an HIV test must be done - treat for Pneumocystis if HIV positive.
Severe pneumonia without improvement in at least one of: • Respiratory rate, • Severity of indrawing, • Fever, • Eating / drinking	❖ Admit child ❖ Change treatment from amoxicillin to Ampicillin and gentamicin
5 Days (or earlier if continued signs of worsening)	**Consider transfer to higher level hospital**
At least three of: ❖ Fever, temp >38 0C ❖ Respiratory rate >60 bpm ❖ Still cyanosed or saturation <90% and no better than admission. ❖ Chest in drawing persistent ❖ Worsening CXR	Re-evaluate and consider; ❖ If still on amoxicillin, admit the child and change to Ampicillin and Gentamycin ❖ If on Ampicillin and gentamicin change to ceftriaxone or Cefotaxime. ❖ Suspect PCP, an HIV test must be done - treat for Pneumocystis if HIV positive.
After 1 week	
Persistent fever and respiratory distress.	❖ Consider TB, perform mantoux and follow TB treatment guidelines

Wheezing child: bronchiolitis

Definition

A wheeze is a musical and continuous sound that originates from oscillations in narrowed airways. Wheezing is heard mostly in expiration as a result of critical airway obstruction.

Causes/ differential diagnosis:

- Bronchiolitis
- Asthma
- Oesophageal foreign bodies
- Aspiration syndrome (gastro-oesophageal reflux diseases)

Definition: Bronchiolitis is an inflammation of the small airways due to acute viral infection affecting children below 2 years of age. It occurs with seasonal variations and may lead to fatal respiratory distress. Recurrent episodes of wheeze associated with bronchiolitis may occur, and some of these children may develop asthma.

Causes

- Respiratory Syncytial Virus is the most common (>50% cases)
- Other agents: parainfluenza, adenovirus, Mycoplasma, and, occasionally, other viruses especially Human metapneumovirus

Clinical signs

- Mild Bronchiolitis
  - Cough and fast breathing (tachypnoea).
- Moderate Bronchiolitis: As above plus one of the following:
  - Lower chest wall in-drawing;
  - Nasal flaring;
  - Grunting
- Severe Bronchiolitis: As above plus at least one of the following:
  - Central cyanosis, oxygen saturation < 90% in room air;
  - Inability to feed;
  - Convulsions, lethargy or decreased level of consciousness;
  - Severe respiratory distress (e.g. very severe chest wall in-drawing).
  - Silent chest on auscultation (corresponding to an intense bronchospasm

Risk factors for severe bronchiolitis:

- Age less than 3 months
- Ex-preterm infants
- Chronic lung disease
- Congenital heart disease

Diagnosis: Is on clinical basis

- Prodrome of viral infection: irritability and rhinorrhoea.
- A wheeze that is slowly responsive or non-responsive to bronchodilators.
- Crepitations and signs of hyperinflation of the chest.
- Chest X-ray should be reserved for clinically severe or complicated cases
- Tachypnoea: age dependent:

Investigations

- FBC
- CRP (Less contributory as viral infection)
- Chest X-ray: (Not mandatory) show hyperinflated lungs with patchy atelectasis

Complications:

- Bacterial secondary infection
- Atelectasis
- Apnoea especially in neonatal and infant period
- ARDS

Management: In Bronchiolitis treatment is symptomatic

At health centre level:

Outpatient management

- Nasal irrigation with 0.9% NaCl before each feed
- Small, frequent feedings to reduce vomiting triggered by bouts of coughing.
- Increased fluids if fever and/or significant secretions are present.
- Treat fever with paracetamol 10-15mg/kg/dose 6 hourly
- Counsel the care giver and advise to come back if the child deteriorates or does not improve.
- Transfer all children with one of the following criteria to hospital:
    - Presence of any sign of severity
    - Pre-existing pathology (cardiac, Respiratory, malnutrition, HIV, etc.)
    - Associated acute pathology (viral gastro-enteritis, bacterial infection, etc.)
    - Age less than 3 months

At district hospital level

Hospitalize children if signs of serious illness

- Administer high humidified oxygen at 8L/min in 30 to 40 % oxygen
- Maintenance IV fluid
- Tube feeding when the respiratory distress improves
- In case of respiratory failure, use non-invasive naso CPAP or mechanical ventilation

Recommendation

- Antibiotic treatment only indicated for children with secondary infection according to severity of clinical signs, high fever > 39°C, purulent sputum, aggravation of respiratory symptoms.
- Give oral or parenteral antibiotics for 5 days based on severity and/or condition of the patient as follow:
    - Amoxicillin 25mg per dose/kg/day Q12hr PO *OR*
    - Ampicillin IVI: 100 mg/kg/day in 3 divided doses

Alternative treatment:

- Erythromycin 30-50 mg per dose/kg/day x3/day/7-10days

Note: Treatment of bronchospasm:

Data does not support routine use of bronchodilators, steroids or antibiotics. If bronchodilators are to be used, closely monitor effect as it might worsen the respiratory distress.

Asthma

Definition

Asthma is a chronic inflammatory condition of the lung airways resulting in episodic airflow obstruction.

Causes: unknown but the following factors have been identified:

- Allergens (e.g., house dust, perfumes, food, animal airs, mites),
- Medicines (e.g., propranolol and aspirin),
- Environmental (e.g., change of weather, polluants), Infections (viral or bacterial),
- Emotions,
- Family history (genetic factors),
- Gastro-esophageal reflux

Clinical signs and symptoms

- Breathlessness
- Wheezing/ prolonged expiratory
- Cough (chronic nocturnal cough)
- Exercise induced cough
- Chest tightness
- Sputum production

Table 4. Normal rates of breathing in awake children

< 2 months	< 60/min
2-12 months	< 50/min
1-5 years	< 40/min
6-8 years	< 30/min

Table 5. Guide to limits of normal pulse rate in children

Infants	2-12 months	< 160/min
Preschool	1-2 years	< 120/min
School age	2-8 years	< 110/min

Severity of Asthma Exacerbations				
Parameter	**Mild**	**Moderate**	**Severe**	**Respiratory arrest imminent**
Breathless	Walking Can lie down	Talking Infant - softer, shorter cry; difficulty feeding Prefers sitting	At rest Infant stops feeding Hunched forward	
Talks in	Sentences	Phrases	Words	
Alertness	May be agitated	Usually agitated	Usually agitated	Drowsy or confused
Respiratory rate	Increased	Increased	Very Increased	
Accessory muscles and suprasternal retractions	Usually not	Usually	Usually	Paradoxical thoraco-abdominal movement
Wheeze	Moderate, often only expiratory	Loud	Usually loud	Absence of wheeze
Pulse/min.	<100	100 - 120	>120	Bradycardia
Pulsus paradoxus	Absent < 10 mm Hg	May be present 10 - 25 mm Hg	Often present> 25 mm Hg (adult) 20 - 40 mm Hg (children)	Absence suggests respiratory muscle fatigue
PEF after initial bronchodilator % predicted or % personal best	Over 80%	Approx. 60-80%	< 60% predicted or personal best or response lasts < 2 hrs	
SaO2% (on air)	>95%	91 - 95%	<90%	

Diagnosis:

Asthma is diagnosed on the basis of a patient's symptoms and medical history.

Presence of any of these signs and symptoms should increase the suspicion of asthma:

- Wheezing: high-pitched whistling sounds when breathing out-especially in children. (A normal chest examination does not exclude asthma.)
- History of any of the following:
  - Cough, worse particularly at night
  - Recurrent wheeze
  - Recurrent difficulty in breathing
  - Recurrent chest tightness
- Symptoms occur or worsen at night, awakening the patient.
- Symptoms occur or worsen in a seasonal pattern.
- The patient also has eczema, hay fever, or a family history of asthma or atopic diseases.
- Symptoms occur or worsen in the presence of:
  - Strong emotional expression Animals with fur
  - Aerosol chemicals
  - Changes in temperature

- Domestic dust mites
- Drugs (aspirin, beta blockers)
- Exercise
- Pollen
- Respiratory (viral) infections
- Smoke

- Symptoms respond to anti-asthma therapy
- Patients colds "go to the chest" or take more than 10 days to clear up

Investigations:

- FBC for exclusion of super-infection
- Chest X-ray (where available for differential diagnosis and i
- Additional diagnostic tests:
- Lung function to confirm diagnosis and assess severity (where available)
- Peak expiratory flow rate can help diagnosis and follow up

Complication:

- Uncontrolled/poorly controlled asthma can lead to severe lung damage
- Severe asthma exacerbation can cause respiratory failure and death

Management:

Asthma exacerbation (asthma attacks) are episodes of a progressive increase in shortness of breath, cough, wheezing or chest tightness or a combination of these symptoms.

- Asthma attacks require prompt treatment
- Categorize severity of attach and treat as per ETAT+ guidelines below

Very Severe Asthma

Any one with;

- Oxygen saturation <90%
- Central cyanosis
- Silent chest
- Inability to drink / breast feed
- AVPU= "V", "P" or "U" or
- Inability to talk/complete sentences
- Pulse rate >200 bpm (0-3 years) and >180 bpm (4-5yrs)

Immediate Management

ADMIT

- Oxygen
- Nebulize 2.5 mg salbutamol or 6 puffs of Inhaler with spacer and mask give every 20 minutes up to 3 doses if needed
- Prednisolone 2mg/kg OR
- IVI Hydrocortisone 4mg/kg if unable to take orally

Alternative treatment:

- Ipratropium bromide (if available): nebulization increases effect of salbutamol or Combivent (Ipratropium bromide and albuterol sulfate)
- Adrenaline in case of anaphylaxis but not indicated for asthma attack (10µg/kg IM then infusion 0.1µg/kg/min)

Moderate to Severe asthmatic attack:

- Wheeze
- Lower chest wall indrawing

Immediate Management

- Oxygen if obvious use of accessory muscles, measure oxygen saturation.
- Salbutamol by nebulizer or
- Inhaler + spacer + mask repeated up to 10 puffs in 30min min (shake inhaler every 2 puffs)
- Start oral prednisolone at 2mg/kg for 3-5 days. Max dose of 20mg/day for < 2 years and 30mg/day for 2-5 years.

Reassess after 30-60 min and reclassify severity – if now:

- Very severe
  - Continue oxygen, 1-4 hourly salbutamol, early review, antibiotics as for very severe pneumonia
- Severe
  - 4 hourly salbutamol, antibiotics as for severe pneumonia
- Mild:
  - 4 hourly salbutamol, oral antibiotics aim for discharge in 24 hr

Mild asthmatic attack:

- Wheeze PLUS
- Fast breathing (RR 50 aged 2-11 months RR 40 aged 12-59 months)

Management of mild asthmatic attack

- Salbutamol by inhaler, spacer + mask
- Reassess respiratory rate after 20-30 minutes, if persistently elevated consider oral antibiotic
- Counsel caregiver on signs of deterioration and schedule review within 48 hours
- Give education on use of inhaler, spacer + mask
- Discharge on salbutamol inhaler 4-6 hourly for no more than 5 days

NOTE:

- In recurrence of asthma symptoms consider inhaled corticosteroid (ICS) therapy or adjust the doses if already on ICS and look out for other comorbidities
- Demonstrate MDI and spacer use to the caregiver before discharge
- Preferably use spacer with face masks for <3 years for 4-5 years use facemask or mouthpiece.
- Advise on regular follow up

Maintenance treatment: see tables below

Clinical initial check- up

- Check risk factors
- Patient education: Discuss the management plan, importance of adherence to treatment
- Medication: inhaled corticosteroids. Example: start with Beclomethasone inhaled 250µg, once to twice a day with inhalation chamber then step up or step down according to the evolution (close follow up after discharge)
- Treatment of co-morbid conditions (Rhinitis, sinusitis, gastroesophageal reflux)

EAR NOSE AND THROAT CONDITIONS

Otitis externa

Definition

Inflammation of the external ear. Common precipitants of otitis externa are maceration, trauma of the ear canal or presence of a foreign body or dermatologic diseases (such as eczema, psoriasis).

Clinical features

May be one of the following:

- Diffuse: An infection of the ear canal, often due to Gram negative bacilli especially P Aeruginosa
    - Pain on chewing and movement of the tragus or pinna
    - Lining of the canal is inflamed or swollen with dry or moist debris with or without discharge.
    - If visible, the tympanic membrane is normal
- Furuncular: Usually caused by *Staphylococcus aureus*.
    - A painful localized swelling seen at the entrance to the ear canal

General measures

- Rule out chronic otitis media before treatment.
- Most cases recover after thorough cleansing and drying of the ear.
- Keep the ear clean and dry.
- Do not leave pieces of cotton wool, etc. in the ear.

Medical treatment

Diffuse

- Does not usually require an antibiotic.
- Clean and dry the ear using a dry cotton bud or a small piece of dry cotton wool.
- Consider ear irrigation only if the tympanic membrane is intact
    - Acetic acid 2% in alcohol, 3–4 drops into the ear every 6 hours for 5 days.
      OR
    - Apply **ciprofloxacin** ear drops: 3 drops 12 hourly in the affected ear(s) for 7 days

Furuncular-

- Cefadroxil, oral, 15 mg/kg/dose 12 hourly for 5 days.
- OR
- Flucloxacillin, oral, 12–25 mg/kg/dose 6 hourly for 5 days.

Otitis media

Definition

It is the inflammation of the middle ear cavities

Causes:

- Bacterial (*Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis etc*)
- Viral

Predisposing factors include poor living conditions, adenoids, sinusitis, allergic rhinitis, tonsillitis, asthma etc

Signs/symptoms

- Fever
- Retroauricular pain
- Crying with ear scrubbing
- Gastro intestinal signs
- Otalgia
- Cervical lymphadenopathy
- Otorrhea (if tympanic membrane perforated)
- Impaired hearing
- Redness of eardrum
- Sometimes bulging of the eardrum

Diagnosis:

- Clinical including otoscopy
- FBC and CRP if signs of sepsis

Complications:

- Secretory otitis media (ear glue)
- Chronic otitis media with perforation
- Acute mastoiditis sometimes with periosteal abscess
- Intracranial (meningitis, brain abscess, subdural abscess, etc)
- Facial paralysis
- Labyrinthitis

Management:

- General measures: Elimination of risk factors
- Medical
- Surgical: Myringotomy if necessary

Treatment of first choice

- Amoxicillin, Po 30mg/kg/dose P.O. Q8h for 7-10 days
- When associated with rhinitis add Xylometazoline (Otrivine) 0.05% nose drops or simple argyrol drops 1% , 0.05%
- Paracetamol 10-15mg/kg/dose Q6hr if high fever or pain

Alternative treatment:

- Amoxyclav: 50mg/kg/day P.O , Q8h for 7 -10 days;

OR

- Cefadroxil: 25mg/kg/dose Q12h for 7 days
- Cefuroxime: 15mg/kg /dose Q12h for 7 days
- Azithromycine 5mg/kg/dose Q24h for 3 days
- Erythromycine 20 mg/kg/dose Q8h for 10 days

Recommendations:

- Avoid getting in the inside of the wet ear

Chronic Suppurative Otitis Media

Definition

It is a chronic inflammation of the middle ear with recurrent ear discharges or otorrhoea through a tympanic perforation for more than 2 weeks.

Predisposing risk factors:

- Inadequate management of otitis media
- Frequent upper respiratory tract infections
- Anatomic factor: Short Eustachian tube
- Poor living conditions, poor housing, hygiene and poor nutrition
- Immunosupression (ex: HIV infection)

Causes

- H. Influenza
- P. aeruginosa
- S.pneumoniae
- Staphyllococcus aureus
- Tuberculosis

Signs and symptoms:

- Recurrent pus ear discharge
- Large perforation of the eardrum on examination
- Progressive hypoacousia with Impaired hearing
- Buzzing (acouphene)
- History of recurrent otitis media
- Loss of transparency of tympanic membrane

Diagnosis:

- Clinical including Otoscopy
- Investigations :
  - Bacterial Cultures
  - Search for predisposing factors
  - Audiogram
  - CT-scan

Complications:

- Subperiosteal abscesses
- Facial nerve paralysis
- Lateral sinus thrombophlebitis
- Suppurative labyrinthitis
- Brain abscess
- Meningitis
- Mastoiditis
- Extradural and subdural Empyema
- Otitic hydrocephalus
- Hearing impairment
- Deafness

Management

Non pharmacological management

- Dry mopping
- Aural toilet by medicines' droppers (with Hydrogen peroxide or polyvidone iodine saline solutions)
- Avoid getting the inside of the ear wet. E.g.: bathing and swimming

Pharmacological management

- Topical quinolones (Ciprofloxacin ear drops Q12h for 7 days)
- Systemic treatment: Ceftazidime IV or IM 50mg/kg/dose Q8h (max:6gr/day) for 7 days
- In case of mastoiditis: Refer to ENT surgeon for possible mastoidectomy

Recommendations:

- Proper management of acute otitis media
- Avoid getting the inside of the ear wet. E.g: bathing and swimming
- Refer to the tertiary health facility for further management

Tonsillitis

Definition

It is an inflammation of the tonsils

Causes:

- Bacterial infection (*Group A β-hemolytic streptococcal, staphylococcal...*)
- Viral infection (Rhinoviruses, influenza...)
- Fungal infection

Signs/symptoms

- Difficult and painful swallowing (Dysphagia)
- Refusal of breastfeeding
- Fever, chills
- Headache
- Vomiting
- Sore throat - lasts longer than 48 hours and may be severe
- Enlarged and tender submandibular lymph nodes
- Swollen red tonsils with white spots

Diagnosis os clinical

- It is not possible to distinguish clinically between viral and bacterial tonsillitis
- Investigations:
    - Swab for laboratory analysis where possible
    - Complete blood count
    - Streptococcal screen ASOT/ASLO

Complications:

- Rheumatic heart disease
- Acute glomerulonephritis
- middle ear infections
- Peritonsillar abscess (quinsy)
- Abscess of the pharynx
- Sinusitis

- Septicaemia
- Bronchitis or pneumonia
- Airway obstruction

Management:

- Ensure enough fluids to avoid dehydration
- Medical treatment: antibiotics, analgesics, anti-inflammatory
- Surgery

Treatment of first choice:

- Amoxicillin 15-30 mg/kg/dose Q8h for 10 days

OR

- Penicillin V tabs: 15mg/kg/dose Q12h for 10days
    - In case of allergy to penicillins use:
- Erythromycin 15-20mg/kg/dose Q8h for 10 days
- *OR* Azithromycin 5mg/kg/dose Q24h for 3 days
- *If fever or pain, give* Ibuprofen: 2-3mg/kg/dose Q8h or Paracetamol 10-15mg/kg Q6h, max 60mg/kg/day

If no response with the first choice,

- Amoxi-clav (Augmentin) 15-20mg/kg/dose P.O , Q8h 7 -10 days;

OR

- Cefuroxime (Zinat): *15mg/kg /dose* Q8h for 7 days

Surgical treatment:

- Tonsillectomy indicated in:
    - Chronic repetitive tonsillitis
    - Obstructive tonsils
    - Peritonsilar abscess

Recommendations:

- Systematically give Antibiotherapy for children > 3 years in order to prevent rheumatic heart disease
- For chronic and obstructive tonsillitis refer to the ENT specialist

Acute mastoiditis

Definition

Acute mastoiditis is sudden onset bacterial infections of the mastoid bone

Causes:

Spread of pathogens causing acute otitis media to the mastoid bone

Signs/symptoms

- Fever
- Pain,tenderness, discomfort and swelling behind the ear
- In some instances, the ear on the affected side seems pushed out and quite prominent. This is caused by a high concentration of pus in the mastoid
- Sometimes associated suppurative otitis media
- Tympanic membrane is usually perforated with otorrhoea
- Occasionally, pus breaks through the mastoid tip and forms an abscess in the neck (Bezold's abscess)

- Headache
- Hearing loss

Diagnosis: Clinical basis

- X-Ray of the mastoid bone

  In selected cases,
- CT-scan of the middle ear
- Culture of the pus from the mastoid bone
- Blood culture
- LP if signs of meningitis

Complications:

- Facial paralysis
- Brain abscess
- Meningitis
- Neck abscess
- Extradural abscess
- Septicaemia
- Subdural abscess

Management: Should be managed in collaboration with ENT surgeon

- Pharmacological

Treatment of first choice:

- Ceftriaxone iv 100mg/kg/dose Q24h for 14 days+ Vancomycin are the recommended treatment until culture and sensitivity results are available

If 3rd ***generation cephalosporin not available,***

- Amoxiclav, for 14 days and Gentamycin iv 5mg/kg/dose Q24h 5 days
- If fever *or pain, give* Ibuprofen: 2-3mg/kg/dose Q8h or Paracetamol 10-15mg/kg Q6h, max 60mg/kg/day

Surgical

- Mastoidectomy
- Incision of abscess
- When anaerobic infection is suspected : Add metronidazole IV 15-20 mg/kg/dose Q8h and culture sensitivity where possible

Epistaxis

Definition

Epistaxis is nose bleeding_

Causes:

- Local (trauma, inflammation, foreign bodies, tumours of the nose and rhinopharynx, chronic use of nasal steroids, intra nasal growth like polyps,..)
- Systemic (cardiovascular diseases, blood diseases, liver diseases, kidney diseases, febrile diseases)
- Upper respiratory disease (sinusitis, allergic rhinitis)
- Juvenile nasopharyngeal angiofibroma if profuse unilateral epistaxis associated with a nasal mass in adolescent boy
- Idiopathic (causes not known)

Signs/symptoms:

- Blood coming from the nose or the rhinopharynx
- History of recurrent nasal bleeding

Diagnosis:

- Clinical: exploratory clinical examination, ENT and general examination
- Investigations in complicated or recurrent cases
    - *Full blood count, clotting time, bleeding time, prothrombin time*
    - *CT scan and MRI if* **Juvenile nasopharyngeal angiofibroma**
    - *Other investigations should be requested based on general examination findings*

Complications

- Hypovolemic shock
- Anaemia

Management:

Non pharmaceutical treatment:

- Sit the patient up to avoid aspiration
- Cleaning of blood clots from the nose
- Direct pressure applied by pinching the soft fleshy part of the nose applied for at least five minutes and up to 20 minutes
- Application of cold compresses on the nose
- Room humidifier
- Pack with ribbon gauze impregnated with topical ointments (Vaseline…) and remove it after 12-24 hours.

Pharmaceutical treatment:

- Application of a topical antibiotics ointment to the nasal mucosa has been shown to be an effective treatment for recurrent epistaxis
- Topical vasoconstrictor: xylometazoline spray (otrivine) 0.5mg/ml
- Cauterization of the bleeding site with silver nitrate or 20% of solution trichloracetic acid under topical anesthesia
- Electro coagulation
- If severe bleeding with shock/or anemia, immediate blood transfusion is recommended

Recommendations:

- Investigate for underlying causes
- Refer cases of severe and recurrent epistaxis
- Refer to ENT specialist for otolaryngologic evaluation if bilateral bleeding or hemorrhage that not arise from Kiesselback plexus

Laryngotracheobronchitis

Definition

Inflammation of the vocal cords and structures inferior to the cords. It is the common cause of stridor in children aged between 6 months and 2 years leading to potentially life-threatening airway obstruction.

Causes:

- Viral respiratory tract infection: Parainfluenza Virus Type 1 and 2, Rhinoviruses, Syncytial Viruses, adenoviruses, measles and herpes simplex….)

Signs and Symptoms:

- Progressive shortness of breath following upper respiratory tract infection in a previously well child, followed by a barking cough and stridor
- Stridor becomes softer as airway obstruction becomes more severe
- There may be a sore throat
- Mild fever may be present
- Erythema and oedema of larynx

The following features suggest a different diagnosis:

- Acute onset of obstruction without prodromal features (foreign body or angioneurotic oedema)
- incomplete immunisation and a membrane in the upper airway (diphtheria),
- High fever, dysphagia, drooling or sitting position (epiglottitis, retropharyngeal abscess, bacterial tracheitis)
- Recurrent upper airways obstruction (laryngeal papilloma).

Assessment of severity of airway obstruction in LTB

- Grade 1: Inspiratory stridor
- Grade 2 : Inspiratory and Expiratory stridor and passive expiration
- Grade 3 : Inspiratory and Expiratory stridor + pulsus paradoxus and active expiration
- Grade 4 : cyanosis, apathy, marked retractions, impending cardiorespiratory arrest

Diagnosis:

- Clinical signs as above
- Investigations:
  - FBC + CRP
  - Lateral Neck X-ray (not mandatory)

Management:

Leave child in carer's arms as much as possible
(except if near respiratory arrest) as you manage the child

Supportive measures

- Humidified O2 therapy
- Monitor oxygen saturation, heart rate and respiratory rate
- Maintenance fluids and nutrition
- Avoid unnecessary stimulation
- Depending on severity, admit child to high care or intensive care ward.

Medical treatment:

Grade 1 obstruction

- Prednisone, oral, 2 mg/kg as a single dose. OR
- Dexamethasone, IV/IM, 0.5 mg/kg as a single dose.

Note: Avoid steroids in patients with measles or herpes infection.

Grade 2 obstruction

- As above PLUS
- Adrenaline (epinephrine), 1:1000, nebulise with oxygen, every 15–30 minutes until expiratory obstruction is abolished.
    - 1 mL adrenaline (epinephrine) 1:1 000 diluted in 1 mL sodium chloride 0.9%.

Grade 3 obstruction

- As above:
- If improvement, treat as in grade 2 but reduce frequency of adrenaline (epinephrine) nebulization with time,
- If no improvement within 1 hour, intubate, preferably under general anaesthesia
- If unable to intubate, bag and mask ventilate and refer urgently.

Grade 4 obstruction

As above and:

- Continue steroids
- Continue with adrenaline (epinephrine) nebulization with 100% warm humidified oxygen
- Intubate, preferably under general anaesthesia
- If unable to intubate, bag and mask ventilate and refer urgently

For suspected herpes:

- Acyclovir IV, 10–15 mg/kg/dose 8 hourly for 5–7 days.

For suspected bacterial infection in children < 20 kg:

- Ampicillin, IV, 12.5–25 mg/kg/dose 6 hourly for 5–10 days.

For suspected bacterial infection in children > 20 kg:

- Ampicillin, IV, 250–500 mg, 6 hourly for 7 days.

If bacterial tracheitis is suspected:

- Cloxacillin, IV, 50 mg/kg/dose 6 hourly for 7 days.

Epiglottitis

Definition

Acute epiglottitis is a life-threatening emergency due to respiratory obstruction. It is due to intense swelling of epiglottis and surrounding tissues with septic signs.

Cause

It is caused by Haemophilus influenza type b. Since systematic vaccination, this condition has become very rare.

Table 8. Presentation

Signs/symptoms:	Croup (laryngitis)	Epiglottitis
Onset	Over days	Over hours

Preceding coryza	Yes	No
Cough	Severe, barking	Absent or slight
Able to drink	Yes	No
Drooling saliva	No	Yes
Appearance	Unwell	Toxic, very ill
Fever	<38,5°C	>38,5°C
Stridor	Harsh, rasping	Soft, whispering
Voice, cry	Hoarse	Muffled, reluctant to speak

Management:
Urgent hospital admission and treatment
Move the child only when ready for intubation under anesthaesia
Intubation by senior anesthaesist, paediatrician and ENT in theatre room
Urgent tracheostomy if intubation impossible
Antibiotic treatment: Cefotaxime iv 30-50 mg/kg/dose Q8h for 7-10 days
or
Ceftriaxone iv 100mg/kg/dose Q24h for 7-10 days

Sinusitis

Definition

Sinusitis is the inflammation of one or more sinus cavities.

Causes:

- Rhinitis (most common cause)
- Trauma with open sinuses
- Bacterial infections (Bacteria: S.pneumoniae, H. Influenza, Moraxella catarrhalis, staphylococcus Aureus, anaerobies)
- Viral
- Common predisposing factors include: abscess and tooth extraction, chemical irritants, nasal polyp, deviation of nasal septum, perfumes or paint fumes, and changes in the weather

Signs/symptoms:

- Non specific complaints
- Purulent nasal discharge (unilateral or bilateral)
- Fever and cough
- Nasal obstruction and congestion
- Frontal headache and heaviness of the head exaggerated on bending the head
- Persistant symptoms of upper respiratory tract infection
- On clinical examination, pressure on frontal and maxillary sinuses causes pain
- Decreased sense of smell
- Periorbital oedema
- Anterior rhinoscopy shows pus coming through the middle meatus

Diagnosis:

- Clinical
- Investigations:

- Paranasal X-ray (shows opacification with air-fluid level)
- CT scan

Complications:

- Local: Osteomylitis, orbital cellulitis, orbital abscess
- Descending infections: pharyngitis, tonsillitis, bronchitis, pneumonia
- Systemic: septicemia, meningitis, brain abscess, thrombophlebitis of cavernous sinus, subdural empyema

Management:

- Medical treatment consists of nasal decongestants and antibiotics

Treatment of first choice:

- Amoxicillin, Po 15-20mg/kg/dose Q8h 7-10 days
- Paracetamol 10-15mg/kg/dose Q6hr

Alternative treatment:

- Amoxicillin-clavulanate (amoxi-clav, augmentin®) 15-20 mg/kg/dose PO, Q8h 7 -10 days
- Add Xylometazoline (Otrivine) 0.05% nose drops or simple argyrol drops 0.1% , 0.05%
- OR
- Cefadroxyl (Oracefal): 25mg/kg/dose Q12h for 7 days
- Cefuroxime (Zinat): tabs 15mg/kg/dose Q12h for 7 days
- Azithromycin 5mg/kg/dose Q24h for 3 days
- Erythromycin 15-20 mg/kg/dose Q8h for 10 days
- Rovamycine 3MI units: 50000-100000 UI/kg/dose Q8h for 10 days
- Argyrol-ephedrin nasal drops 2% 3 drop x3/day/7 days

Recommendations:

- Do not use nasal decongestants taking a monoamine oxidase inhibitor in hypertensive patient

Pertussis (whooping cough)

Definition

This is a highly infectious form of bronchitis caused by bordetella pertussis. It has become rare since vaccination but it is endemic with epidemics every 3-4 years. Particular attention to young infants (before complete vaccination), adults (weaning effect of vaccine) and unvaccinated.

Cause: ***Bordetella pertussis***

Signs/symptoms:

After one week of coryza (catarrhal phase), the child develops a characteristic paroxysmal cough followed by characteristic inspiratory whoop (paroxysmal phase, 3-6 weeks). Worse at night and occasional vomiting. During paroxysm, the face goes red or blue and mucus flows from nose and mouth. May cause apnoea in young infants. The symptoms gradually decrease and may persists for months (convalescent phase)

Diagnosis:

Clinical symptoms and signs
Culture if available
FBC: marked lymphocytosis (>15 109/l)

Management:

- Admit to hospital if infant (risk of apnoea)
- Symptomatic treatment: O_2, gavage
- Erythromycine 15-20 mg/kg/dose Q8h for 14 days

Or

- Azithromycin
  - Infants aged <6 months: 10 mg/kg/dose Q24h for 5 days.
  - Infants and children aged ≥6 months: 10 mg/kg (maximum: 500 mg) on day 1, followed by 5 mg/kg/dose Q24h (maximum: 250 mg) on days 2-5.
- Prophylaxis for close contact (same)

Allergic Rhinitis

Definition

Recurrent inflammation of the mucous membranes of the nose and paranasal sinuses in response to an inhaled allergen e.g. pollen, house dust, grasses and animal hair. Overuse of nasal decongestants and viral infections may precipitate the symptoms

Signs/symptoms allergic rhinitis:

- Blocked stuffy nose/ Sensation of nasal obstruction
- Watery nasal discharge
- Frequent sneezing, often accompanied by nasopharyngeal itching and irritation
- Conjunctival itching and watering
- Oedematous pale nasal mucosa
- Mouth breathing
- Snoring at night
- Dry cough
- Headache
- Asthenia
- Thick, sticky mucus (after 3-days)

Diagnosis: Based on clinical signs
Investigations: Not indicated in our setting

Complications:

- Acute or chronic sinusitis.
- Otitis media.
- Sleep disturbance or apnoea.
- Dental problems (overbite): Caused by excessive breathing through the mouth.
- Palatal abnormalities.
- Eustachian tube dysfunction
- Sinusitis
- Pharyngitis
- Laryngo-bronchitis

Management:

- Avoid allergens
- There is no cure for allergic rhinitis; treatment is given for symptom relief
- Supportive care includes bed rest and drinking plenty of fluid

Treatment of first choice:

- 2-5 years : Desloratadine syrup: 1.25mg once a day for 5 days;
- 6-11years: /Desloratadine syrup: 2.5mg once a day for 5 days
- 12 years: Desloratadine tab 5 mg once a day for 5 days
- Nasal steroids, 1-2 spray/nostril/dose Q12-24h
- Avoid local nasal decongestants as they have long term side effects

Alternative treatment:

During periods of exacerbation of symptoms, a short course of antihistamine can help:

- Cetirizine, oral, as a single dose at night if the predominant symptoms are sneezing, nasal itching and rhinorrhoea:
  - Children 3–12 years: 5 mg
  - Children older than 12 years: 10 mg.mg.

If poorly controlled/severe:

- Corticosteroid aqueous nasal solution, e.g. Budesonide, 100 mcg, 1 spray into each nostril 12 hourly. OR Fluticasone nasal spray (Avamys) 27.5mcg 1 puff daily

GASTROINTESTINAL DISORDERS

Acute gastroenteritis

Definition

Gastroenteritis is an inflammation of the stomach and intestines that causes diarrhoea, vomiting, nausea and other symptoms of digestive upset.

Diarrhoea is the passage of three or more loose or watery stools per day. It can be watery, bloody or containing mucus.

Causes:

- ***Viral gastroenteritis*:** Rotavirus and enterovirus), are the most likely cause of infectious diarrhoea in children under age 5
- ***Bacterial gastroenteritis*:** *Campylobacter*, *Salmonella* or *E. coli*
- ***Intestinal parasites*:** *Giardia lamblia,*
- ***Others*** *causes include life threatening conditions including intussusception; appendicitis…may be initiated by diarrhoea.*

Signs/Symptoms:

Table 9. Clinical evaluation of dehydration

Mild dehydration : 3 - 5% **Plan A)**	**No signs of dehydration**
Moderate dehydration : 6-9% ***(Plan B)***	• Able to drink (drinks eagerly) plus 2 or more of: • Sunken Eyes • Skin pinch 1 - 2 secs • Restless / Irritable/Agitated
Severe dehydration : 10-15% ***(Plan C)***	• Pulse weak or rapid and unable to drink plus: • Sunken Eyes • Skin pinch ≥ 2 secs? • Lethargic or decreased level of consciousness unconscious • Kussmal (acidotic) breathing

Complications:

- ***Hypovolemic shock*** (Tachycardia, cold hands, weak or absent pulse, capillary refill > 2 sec, not alert)
- ***Electrolytes imbalance***: severe hyponatraemia (<130mmol/L), severe hypernatraemia (>150mmol/L), severe hypokalaemia (<3mmol/L), severe hyperkaelemia (>5.5).
- ***Cerebral œdema*** (headache, convulsions, vomiting, nausea, weakness) due to rapid rehydration with hypotonic solutions. Common in hypernatraemia
- ***Intracerebral haemorrhage*** *(due to severe dehydration in infants and young children)*

Investigations:

- Stool exam: direct/culture (if blood or pus in stool)
- FBC, CRP, blood culture if suspicion of bacterial blood stream.
- Electrolytes (Sodium and Potassium)
- Random blood sugar , Urea/creatinine if shock

Note: *Qualitative evaluation of dehydration (according to sodium level)*

- ***Isotonic dehydration*:** Na 130 to 150 mmol/L
- ***Hypertonic dehydration*:** Na > 150 mmol/L
- ***Hypotonic dehydration*** : Na < 130 mmol/L

Management:

At health centre level (Follow IMCI guidelines)

At district hospital level follow ETAT + guidelines

Admit the child: Absolute criteria of admission:

- Profuse diarrhoea (> 8 stools/24h) with vomiting
- Vomiting every feed
- Severe dehydration
- Failure of home oral rehydration

If dehydration and shock without signs of malnutrition, give appropriate treatment as follow:

- Consider ABCD
- 20ml/kg of normal saline (NS) or Ringers Lactate (RL) as quickly as possible IV or IO in 15 minutes (see table below for estimation of required volume for 20ml/kg):
- Repeat the bolus of NS or RL 3-4 times if persistence of signs of shock
- Treat as severe dehydration after correction of shock

If dehydration and shock with signs of malnutrition

AVPU<A, absent or weak pulses, prolonged capillary refilling (>3s) and cold periphery with temperature gradient

- 20 ml/kg over 2 hours of Ringer's Lactate (RL)/5% dextrose. – add 50mls 50% dextrose to 450mls Ringers (or 10% Dextrose/HSD if no Ringers).
- If severe anaemia start urgent blood transfusion not Ringers.

If severe dehydration without shock (Plan C);

Table 10. severe dehydration without shock

Normal Saline (If unavailable) Full Strength Ringer Lactate	***Age < 12 months***	***Age ≥ 12 months to 5 years***
Step 1	30 mls / kg over 1 hour	30 mls / kg over 30 mins
Step 2	70 mls / kg over 5 hours	70 mls / kg over 2.5 hours
Then re-assess child – if still signs of severe dehydration repeat step. If signs improving treat for moderate dehydration		

If moderate dehydration (Plan B);

- Best treated with ORS 75ml/kg 4 hours
- Give RL 75ml/kg during 4 hours in case of uncontrolled /severe diarrhoea and/or vomiting

After 4 hours

- Reassess the child and classify the child for dehydration.

Table 11. How to administer ORS

By bottle	Give 1/3 during 1st h, then 2/3 during 3 following hours. Example: 10 kg; dehydrated 7%. Should receive 75 ml/kg = 750 ml ORS in 4h Give 60 ml every 15 min during 1st hour Then 170 ml every h during 3 following hours
Spoon or syringe	Maybe effective if has severe vomiting Allows adequate volumes Ex: 5 ml every 1 to 2 min → 300 to 150 ml in 1 h!
Nasogastric tube	vomiting +++ fatigue +++

- Select the appropriate plan to continue treatment.
- Begin feeding the child in clinic.

NB ORS is

- Contra-indicated if ileus or decreased level of consciousness
- Able to correct the electrolyte imbalance (hypo and hypernatraemia)

If the mother must leave before completing treatment:

- Show her how to prepare ORS solution at home.
- Show her how much ORS to give to finish 4-hour treatment at home.
- Give her enough ORS packets to complete rehydration

Explain the 4 rules of home treatment

- Give extra fluid: Give to the child more to drink as he wants
- Give zinc supplements for 10–14 days:
  - Up to 6 months: 1/2 tablet (10 mg) per day, 6 months and more 1 tablet (20 mg) per day
- Continue feeding: initial 4-hour rehydration period, breastfed children should continue to breastfeed frequently throughout
- When the child has to be returned to the health facility:
  - Drinking poorly or unable to drink or breastfeed
  - Becomes more sick
  - Develops fever
  - Has blood in the stool

If no dehydration (Plan A)

- Treat the child as an outpatient; give ORS 10ml/kg after each watery stool
- Counsel the mother on the 4 rules of home treatment:
  - Give extra fluid,
  - Give zinc supplements
  - Continue feeding
  - Give advice on when to return for review

Table 12. Different forms of dehydration

Type	Intervention	Comment
Hyponatremia (Na < 130mmol/L)	Na Deficit = 0.6 x W in kg x (Na+d - Na+m) during 4 hours W= weight d = desired sodium m = measured sodium	Do not correct too quickly to avoid CNS complications
Hypernatremia (Na > 150mmol/L)	Slowly correct dehydration over 48 hours	Risk of convulsions/cerebral oedema in case of rapid correction
Hypokalemia	If Potassium< 2.5 mmol/L give KCl 30-40 mmol/L/24hours	Give KCl if urine output is adequate

Persistent diarrhoea

Definition

Persistent diarrhoea is a diarrhoea, with no signs of dehydration and severe malnutrition, with or without blood, which begins acutely and lasts ≥ 14 days.

Table 13. Causes of persistent diarrhoea

Age	Aetiologies
Infancy	• Post gastroenteritis mal-absorption syndrome • Cow's milk/soy protein intolerance • Secondary disaccharidase deficiencies • Cystic fibrosis
Childhood	• Secondary disaccharidase deficiencies • Giardiasis • Post gastroenteritis malabsorption syndrome • Celiac disease • Cystic fibrosis • HIV • Malnutrition
Adolescence	• Irritable bowel syndrome • HIV • Inflammatory bowel disease

Complications:

- Dehydration
- Failure to thrive, malnutrition
- Immunosuppression

Investigations: will vary according to the suspected etiology

- Stool examination:PH, White blood count, Fat, Ova, osmolality, Culture
- FBC, CRP, electrolytes, urea and creatinine
- Urine culture
- Sweat chloride if suspicion of cystic fibrosis
- Barium study
- Small bowel biopsy
- Endoscopy: Sigmoidoscopy or colonoscopy with biopsy

Management:

- Oral rehydration
- Treat the cause

Step-wise empiric protocol for management of diarrhoea

Day 1−2

- Continue full-strength feeds with additional ORS as required.

Day 3−7

- Change to lactose-free feeds if not breastfed.
- Continue additional oral rehydration as required.
- If diarrhoea resolves, discharge, but continue with lactose-free feeds for 2 weeks.

Day 8−13

- Semi-elemental formula: sucrose- and lactose-free, protein hydrolysate, medium chain triglyceride.
- Continue additional ORS as required.

Bloody diarrhoea (dysentry)

Definition

Frequent (>3/day) passage of blood and/or mucus in the stools

Cause:

- Bacterial infections (e.g. Shigella, salmonella...)
- Parasitic infestations (e.g. amoebic dysentery)
- Milk allergy
- Chronic inflammatory bowel disease

Signs and symptoms:

- Sudden onset
- Abdominal cramps
- Peritonism urgency, fever and diarrhoea with blood and mucus in the stools
- Meningism and convulsions may occur
- Exclude intussusceptions which present as:
  - pain or abdominal tenderness
  - bile-stained vomitus
  - red currant jelly-like mucus

Investigations

- Stool culture to confirm diagnosis of Shigellosis
- Stool microscopy reveals many polymorphs and blood
- Immediate microscopy of warm stool to diagnose amoebic dysentery

Treatment:

Non-pharmacological treatment:

- Ensure adequate nutrition and hydration

Pharmacological treatment

- Fluid and electrolyte replacement (see Acute Diarrhoea)
- Ciprofloxacin, oral, 15 mg/kg/dose 12 hourly for 3 days

OR

- Ceftriaxone, IV, 50 mg/kg as a single daily dose for 5 days (if hospitalised or if unable to take oral antibiotics)

Complications include:

- Dehydration
- Convulsions
- Shock
- Toxic megacolon
- Acidosis
- Rectal prolapse
- Renal failure
- Haemolytic uraemic syndrome

Recommendation:

- Refer patient to a paediatrician, if dysentery with complications, e.g. persistent shock, haemolytic uraemic syndrome and toxic megacolon

Amoebiasis

Definition

Amoebiasis is a parasitic infection due to the intestinal protozoa Entamoeba histolytic. Transmission is faecal-oral, by ingestion of amoebic cysts from food or water contaminated with faeces. Usually, ingested cysts release non-pathogenic amoebae and 90% of carriers are asymptomatic. In 10% of infected patients, pathogenic amoebae penetrate the mucous of the colon: this is the intestinal amoebiasis (amoebic dysentery). The clinical picture is similar to that of shigellosis, which is the principal cause of dysentery. Occasionally, the pathogenic amoebae migrate via the blood stream and form peripheral abscesses. Amoebic liver abscess is the most common form of extra-intestinal amoebiasis.

Clinical features

- Amoebic dysentery
  - Diarrhoea containing red blood and mucus
  - Abdominal pain, tenesmus
  - No fever or mild fever
  - Possibly signs of dehydration
- Amoebic liver abscess
  - Painful hepatomegaly; mild jaundice may be present
  - Anorexia, weight loss, nausea, vomiting
  - Intermittent fever, sweating, chills; change in overall condition

Laboratory

- Amoebic dysentery: identification of mobile trophozoites (E. histolytica) in fresh stool samples
- Amoebic liver abscess: indirect haemoagglutination and ELISA

Treatment for Amoebic dysentery

Tinidazole PO

- Children: 50 mg/kg once daily for 3 days (max. 2 g daily)
- Adolescents: 2 g once daily for 3 days OR

Metronidazole PO

- Children: 15 mg/kg 3 times daily for 5 days
- Adolescents: 500 mg 3 times daily for 5 days

Note:

- If there is no laboratory, first line treatment for dysentery is for shigellosis
- Treat for amoebiasis if correct treatment for shigellosis has been ineffective
- The presence of cysts alone should not lead to the treatment of amoebiasis.
- Amoebiasis is confirmed with a parasitological stool examination: mobile trophozoites in fresh stool

Constipation

Definition

Constipation is an acute or chronic condition in which bowel movements occur less often than usual or consist of hard, dry stools that are painful or difficult to pass.

Causes:

- Lack of exercise
- Certain medicines

- Metabolic, endocrine, neurogenic and lower bowel abnormalities
- Psychogenic disorders
- Chronic use of enemas
- Not drinking enough water
- Diet that does not include an adequate amount of fiber-rich foods
- Anal fissure (a tear or crack in the lining of the anus)
- Chronic kidney failure
- Hirschsprung disease
- Colon or rectal cancer
- Depression
- Hypercalcemia (abnormally high levels of calcium in the blood)
- Hypothyroidism (underactive thyroid gland)
- Illness requiring complete bed rest
- Irritable bowel syndrome
- Stress

Signs and Symptoms:

- A symptomatic bowel impaction
- Blood on the stools
- Changes in bowel patterns
- Abdominal pain, distension

Diagnosis: ***clinical based***

- Non-tender deformable faecal masses palpable on rectal examination

Investigations: Not always indicated

- Abdominal X-ray
- Barium enema - reveals blockage inside the intestine in particular cases
- Laboratory analysis of blood and stool samples for internal bleeding
- Sigmoidoscopy (examination of the sigmoid area of the colon with a flexible tube equipped with a magnifying lens), rarely indicated.

Complications:

- Bowel obstruction
- Chronic constipation
- Haemorrhoids
- Hernia
- Spastic colitis
- Laxative dependency

Treatment:

- Treatment involves 3 steps:
  - Initial clearance of stools
  - Prevent re-accumulation of hardened retained stool (Diet change with additional natural fibre from fruit, vegetables and bran).
  - Retraining of the gut to achieve regular toilet habits
- Management is long-term, and requires the active involvement of the parents

Pharmacological treatment:

- Enema twice daily for 3 days for faecal clearance if faecal loading
- Lactulose (Duphalac) for 1 week but if passes 3 stools/day stop it
- Bowel re-training

- In refractory cases:
  - Lactulose, oral, twice daily
    - < 1 year 2.5 mL
    - 1–6 years 5 mL
    - > 6 years 10 mL
  - Forlax (Macrogol 4000) 4g& 10g for childr4n above 8 years
  - Determine and treat the underlying cause

Recommendation:

- Refer patient to the specialist, if an organic cause e.g. constipation from birth in a breast-fed baby is suspected
- If faecal loading continues, maintenance therapy should be continued for months to years

Constipation-associated faecal incontinence: encopresis

Definition

Encopresis also known as faecal soiling is the involuntary leakage of small amounts of soft or watery stool in a child with chronic constipation

Causes

- Psycho social precipitants
- Functional (Incorrect Diet, lack of exercise, poor fluid intake)
- Metabolic or Neurological Abnormalities
- Endocrine abnormalities (Hypothyroidism)
- Chronic use of Laxatives
- Obstructive lesions (Acquired and congenital defects)

Signs and symptoms:

- Abdominal pain
- Most of the times associated with encopresis
- Infrequent defecation
- Pain or strain on defecation
- Hard stool
- Feeling of incomplete evacuation (Tenesmus)

Investigations

- Barium Enema
- Abdominal x-ray in suspected obstructive lesions
- Thyroid function tests when indicated
- Stool analysis
- Investigate other functional lesions

Complications

- Anal Fissure, ulcers and prolapse
- Over flow incontinence (Encopresis)
- Stasis syndrome with bacterial overgrowth

Management

Non-pharmacolocal management

- Rehydrate to increase fecal bulk and soften stool
- Education of patients/parents on Diet, exercise, etc.....
- Diet change with additional natural fibre from fruit and vegetables.
- Treatment involves 3 steps:
- Initial clearance of stools
- Prevent re-accumulation of hardened retained stool
- Retraining of the gut to achieve regular toilet habits

Pharmacological management:

- Glycerin Suppositories 1 suppository /dose according to occurrence of symptoms OR
- Lactulose syrup <1 yr: 5-10ml/24 hr PO OD; 1-6 Yrs 10-20 ml/24 hrs PO OD; 7-14 yrs 20-50ml/24 hrs PO OD OR
- Bisacodyl (Dulcolax) 0.3mg/kg/day PO OD maximum dose 30mg/24 hrs

Recommendation:

- Refer to tertiary health facility in cases of inadequate response to therapy for further investigations
- If continued constipation therapy should be continued for months to years

Upper git bleeding

Definition

Bleeding arising proximal to the ligament of Treitz in the distal duodenum commonly manifested by haematemesis and/or melena.

Causes

Neonates:

- False bleeding (maternal swallowed blood Vit K1 deficiency (Haemorrhagic disease of the newborn)
- Stress or gastric ulcer
- Coagulopathy (infection, liver failure, coagulation disorder.
- Haemangioma

Infants and toddlers:

- Malory Weiss syndrome
- Non steroid anti-inflammatory drugs
- Oesophagitis
- Caustic ingestions, iron poisoning
- Oesophageal varices bleeding

Old children and adolescent:

- Malory Weiss
- Peptic ulcer/gastritis
- Rendu Osler syndrome
- Gastric polyps
- Oesophageal varices

Clinical manifestations:

- Hematemesis
- Melena
- Other signs according to the causative agent

Assessment:

History: The clinical history should include information concerning:

- The ***time course of*** the bleeding episode
- Estimated blood loss, and any associated symptoms.
- Gastrointestinal symptoms including dyspepsia, heartburn, abdominal pain, dysphagia, and weight loss. In infants, these features may be reflected in poor feeding and irritability.
  The history should also include information about the following symptoms or signs which may provide clues to an underlying disorder:
- Recent onset of jaundice, easy bruising or change in stool color, which may suggest underlying liver disease
- Recent or recurrent epistaxis, to investigate the possibility of a nasopharyngeal source of bleeding
- History of easy bruising or bleeding, which suggests a disorder of coagulation, platelet dysfunction, or thrombocytopenia
- Personal or family history or liver, kidney or heart disease, or coagulation disorders
- A drug history is important to assess potential contributions from medications that may induce ulceration (such as NSAIDs and corticosteroids); Tetracyclines, may cause a pill esophagitis
- If the patient has been taking drugs or has a cardiac condition that affects homeostatic responses (such as beta-adrenergic antagonists), because these may mask tachycardia associated with life-threatening hypovolemia and shock.

Physical examination: The physical examination should include the following elements:

- The skin for cutaneous signs of generalized vascular malformations/disorders (cutaneous hemangiomas. mucocutaneous telangiectasia)
- Evidence of portal hypertension, (splenomegaly, prominent abdominal and haemorrhoid vessels)
- Inspection of the nasopharynx
- Check for hemodynamic failure (signs of shock?)

Nasogastric tube:

- Sometimes used to confirm the diagnosis and determine if the bleeding is ongoing.
- The lavage will also remove particulate matter, fresh blood, and clots to facilitate endoscopy and decrease the risk of aspiration.
- Ice water lavage (an older practice) does not slow bleeding and may induce iatrogenic hypothermia, *particularly in infants and small children, and is* ***not*** *recommended*

Differentials:

- Swallowed maternal blood during delivery or while nursing
- Ingested epistaxis – nasopharynx bleeding

Investigations:

Depending on suspected cause and magnitude of the blood loss, laboratory assessment should include:

- FBC, cross-match blood in case transfusion is required , LFTs, blood urea nitrogen, serum creatinine , Coagulation tests
- Upper digestive endoscopy (diagnosis and interventional).

Management:

Main objectives:

- Relieve or treat haemorrhagic shock if present
- Stop bleeding
- Treat the causative agent

Emergency treatment

- ABC (include Blood transfusion if necessary)
- Insert a nasogastric tube for aspiration and an IV line (big enough for age).
- If the haemodynamic state is stable (pulse and blood pressure are normal):
  - Hydrate (Ringer lactate), monitor vitals, keep NPO for 12 hours.
  - If there is no active haemorrhage, restart oral feeding after 12 hours
- Assess for possible causative agent and treat accordingly.
- If need of endoscopy, then refer to centre where it's available.

Most common causes according to age and treatment

- Neonates (Stress ulcers secondary to severe illness):
  - Cimetidine IV 5-20mg/kg divided in 2 doses OR Ranitidine IV 2mg/kg/24 divided in 2-3 doses
  - Omeprazole, PO 0.5–1 mg/kg, 12– 24 hourly
- Infants and toddlers (common cause is gastric ulcers and other causes can be evaluated after endoscopy)
  - Octreotide, IV bolus, 1–2 mcg then 1–5 mcg/kg/hour by infusion, initiated by the specialist in case of cases of variceal bleeding (difficult to control, to help control bleeding before endoscopy, or when endoscopy is unsuccessful, contraindicated, or unavailable)
  - Omeprazole, PO
    - 1 month–2 years 2.5mg, 12 hourly
    - 2–6 years 5 mg, 12 hourly initiated by the Specialist for post bleed prophylactic management
- Old children and adolescent (common cause is gastric ulcers and other causes can be evaluated after endoscopy)
  - Omeprazole, PO < 20 kg: 10 mg QD >20 kg : 20 mg QD

Note: *Endoscopy is recommended to be performed within 24 to 48 hours for infants and children presenting with upper GIT bleeding that is acute and severe, it can be performed for diagnosis and treatment (sclerotherapy in oesophageal variceal)*

Alternative treatment:

- Propranolol oral, 2–8 mg/kg/24 hours in 3 divided doses (to reduce the pulse rate by 25%)
- Surgical oversewing if endoscopy and sclerotherapy or banding have failed

Recommendations:

- Refer all cases to the specialist for appropriate diagnosis and treatment
- Refer all bleeding varices - after commencement of resuscitation and octreotide, if available

Peptic Ulcer Disease

Definition

This refers to ulceration of gastric or duodenal mucosa that tends to be chronic and/or recurrent. Peptic ulcers may be primary (e.g. Helicobacter pylori related) or secondary, (e.g. stress related or associated with NSAID use).

Signs and Symptoms:

- Peptic ulcers may present with dyspeptic or other gastrointestinal symptoms or may be completely asymptomatic, sometimes until complications such as haemorrhage or perforation occur. The symptoms associated with peptic ulcers are not sensitive or specific and the differential diagnosis is broad.
- Most common: Ulcer-like or acid dyspepsia (burning pain; epigastric hunger-like pain; relief with food, antacids, and/or anti-secretory agents)
- Food-provoked dyspepsia or indigestion (postprandial epigastric discomfort and fullness, belching, early satiety, nausea, and occasional vomiting) : food-stimulated acid secretion persists for three to five hours; thus, classic DU symptoms occur two to five hours after meals
- Reflux-like dyspepsia

Cause:

- Helicobacter pylori (H. pylori) -In developing nations, the majority of children are infected with H. pylori before the age of 10

Diagnosis:

***Clinical symptoms*:**

- Epigastric pain. Pain is often poorly localised in children, described as dull and aching and frequently does not respond to antacids
- Haematemesis or melena is a relatively common presentation in children (up to 50%).

Investigations

- Stool analysis for occult blood
- FBC
- For Helicobacter Pylori:
  - It is recommended that the initial diagnosis of *H. pylori* infection be based on positive histopathology plus positive rapid urease test, or positive culture.
  - A validated ELISA for detection of *H. pylori* antigen in stool is a reliable non-invasive test to determine whether *H. pylorus has* been eradicated.
  - **Tests based on the detection of antibodies (IgG, IgA) against *H. pylori* in serum, whole blood, urine and saliva are less reliable for use in the clinical setting.**

NB: specialists recommend: In children with refractory iron deficiency anaemia, where other causes have been ruled out, testing for H. pylori infection may be considered (Grade of evidence: low)

Complications:

The natural history of peptic ulcer ranges from resolution without intervention to development of complications : acute or Chronic blood loss or perforation

- Iron deficiency anaemia

Management:

- Avoid any foods that cause pain to the patient's (e.g. acid foods, cola drinks)
- Avoid gastric irritating drugs (NSAIDs)
- Give magnesium-based antacids or combined magnesium-aluminium

First line H pylori eradication regimens are:

- Triple therapy with a PPI + Amoxicillin + Imidazole;
- or PPI + Amoxicillin + Clarithromycin;
- or Bismuth salts + Amoxicillin + Imidazole;
- or Sequential *Therapy Triple therapy for eradication of H. pylori by;*
  - Omeprazole PO

- 15-30 kg: 10 mg twice daily
- >30 kg: 20 mg twice daily

Or

- cimetidine 20–40mg/kg/day
  +
- Clarithromycin : 500mg BID (15mg/Kg/24 BID)
  +
- Amoxicillin 1g twice daily
  Or
- metronidazole 500 mg (15–20mg/kg/day) BD

Duration: 10 – 14 days,

A reliable non-invasive test for eradication is recommended at least 4 to 8 weeks following completion of therapy

Recommendations:

- Refer to a specialist, if there is severe haemorrhage
- Stabilize the patient before transfer
- Infuse IV fluids/blood to maintain normal volume/pulse
- Ensure continuous assessment of further blood loss (Persistent tachycardia, postural hypotension, continuing haematemesis)
- Definitive treatment/Eradication of H. pylori

Gastroesophageal reflux

Definition

GER is the passage of gastric contents into the esophagus with or without regurgitation and vomiting. GER is a normal physiologic process occurring several times per day in healthy infants, children, and adults. Most episodes of GER in healthy individuals last <3 minutes, occur in the postprandial period, and cause few or no symptoms. In contrast, Gastroesophageal reflux disease GERD is present when the reflux of gastric contents causes troublesome symptoms and/ or complications.

Causes and risk factors:

- The cause is still unclear
- Anatomical abnormalities such as a hiatal hernia
- Long term use of nasal gastric tube
- Diet that stimulates gastric acid production
- Neurologic impairment (NI), obesity, certain genetic syndromes, esophageal atresia (EA), chronic lung diseases, and those with a history of premature birth

Diagnosis: Based os Signs and Symptoms:

In infants and toddlers, there is no symptom or symptom complex that is diagnostic of GERD or predicts response to therapy. In older children and adolescents, as in adult patients, history and physical examination may be sufficient to diagnose GERD if the symptoms are typical. The following suggestive:

- ***In newborn:***
  - Recurrent vomiting, stridor, apnoea
- ***In infant***:
  - Recurrent vomiting
  - Respiratory manifestations, (dry cough, recurrent wheeze or cough, chronic obstructive airway disease, recurrent aspiration pneumonia, stridor, apnoea

- ***In children /adolescent:***
  - Heartburn, Epigastric or chest pain.
  - Respiratory manifestations: dry cough, recurrent wheeze or cough, chronic obstructive airway disease,

Complications:

- Dysphagia (difficulty in swallowing)
- Odynophagia (pain on swallowing)
- Weight loss
- Anaemia
- Esophagitis
- Aspiration pneumonia
- Barrett's esophagus
- Abnormal posturing or opisthotonus (Sandifer syndrome)

Investigations: when GER is persisting despite basic management

- 24 hours esophageal PH monitoring
- Endoscopy with biopsy to rule out esophagitis
- Barium X-rays for severity of oesophageal stenosis
- FBC look for anaemia

Management:

Non-pharmacological management

- Postural treatment: prone and lateral positions are associated with an increased incidence of sudden infant death syndrome (SIDS). The risk of SIDS outweighs the benefit of prone or lateral sleep position on GER; therefore, in most infants from birth to 12 months of age, supine positioning during sleep is recommended.
- Dietary measures such as thickened food – if not breastfeeding, frequent small volume of solid foods

Pharmacological management

Less Severe or Non-Erosive;

- Anti-acids
  - Sodium alginate (Gaviscon Enfant)/antacid combination
  - 1-2 months 1.5 mls after each meal
  - 2-4 months 2mls after each meal
- Aluminium and Magnesium hydroxide (Maalox) Syrup 0.5 ml/kg/dose PO QID
- H2 Antagonists: Cimetidine IV/syrup/tab
  - Neonates 5-20mg/kg/24 hr divided in 2 doses
  - Infants 10-20 mg/kg/24hrs divided in 2 doses
  - Children 20-40mg/kg/24hr divided in 2 doses

Severe or Erosive

- Omeprazole, oral;
  - Neonate 0.5–1 mg/kg, 12– 24 hourly
  - Children 1- 16 years :
    - 5 kg to <10 kg: 5 mg once daily
    - 10 kg to ≤20 kg: 10 mg once daily
    - >20 kg: 20 mg once daily

  Alternate dosing: 1 mg/kg/dose once or twice daily; Higher doses may be necessary in children between 1-6 years

ADD

- Pro-Kinetics: Domperidone (Motilium) 0.3 – 0.6 mg/kg/24hrs PO Divided in 3 doses (TDS). Maximum 30mg/24hrs

AND

- Metoclopramide IV/IM/PO 0.1-0.2mg/kg/dose TDS. Maximum dose 0.5mg/kg/24hr

Recommendation

- Refer to tertiary level gastro-oesophageal reflux not responding to treatment
- Education Parents/guardians on patient diet
- Eat small, frequent meals

Tropical splenomegaly (hyperreactive malarious splenomegaly)

Definition

It is a massive enlargement of the spleen resulting from abnormal immune response to repeated attacks of malaria

Signs and symptoms:

- Chronic abdominal distension and pain.
- Weight loss
- Intermittent fever

Some patients present with Anaemia, generalized weakness, cough, dyspnea, epistaxis, headache, increased skin and respiratory infection

Diagnosis: is based on clinical signs

- Splenomegaly of at least 10cms
- Regression of the spleen by at least 40% by 6 months on antimalarial therapy.

Investigations:

- Blood smear
- Complete blood count (for Hb, Platelets)
- Serum levels of IgM (at least 2SD above normal limit)

Complications:

- Hypersplenism leading to anaemia, leukopenia and thrombocytopenia, bleeding
- Splenic lymphoma
- Death

Management:

Pharmacological treatment:

- Doxycycline tabs /day for 6 months
  - Children >8 years (<45 kg): 5 mg/kg/day OD
  - Children >8 years (>45 kg): treat as adults

OR

- Mefloquine 5mg/kg weekly without exceeding 250mg/week of adult dose for 6 months

NB: Generally, splenectomy in the management of HMS is not recommended as mortality is high from sepsis and thrombocytosis **UNLESS** there is a splenic rupture.

Herpes gingivostomatitis

Definition

Inflammation of the mouth structures with ulcers (which may be of various numbers and sizes), caused by Herpes simplex virus infection. The normal course of the disease is 7–10 days.

Diagnosis Based on clinical symptoms and signs

- General inflammation of the mouth with multiple small ulcers on the buccal mucosa, palate, anterior tonsillar pillars, tongue, inner lips and gingival margins.
- Fever, malaise and dysphagia.
- Tender, enlarged cervical lymph nodes.

Management

General and supportive measures

- Maintain adequate nutrition and hydration by encouraging fluid and food intake – use foods and fluids that cause less pain ripe bananas, porridge, yoghurt, Milk.
- If oral nutrition cannot be maintained use oral/nasogastric and/or IV fluids, if necessary.

Medical treatment

- Chlorhexidine 0.2%, 10 mL as a mouthwash or gargle, 12 hourly. Do not swallow.
- For pain: Paracetamol, oral, 15 mg/kg/dose 6 hourly.

OR

- Ibuprofen, oral, 5–10 mg/kg/dose 6 hourly after meals.

If more than minor fever blisters:

- Acyclovir, oral
    - If > 1month to 1 year old: 12.5 mg/kg/dose.
    - If > 1 year to 6 years old: 10 mg/kg/dose.
    - If > 6 years to 12 years old: 6 mg/kg/dose.

If very severe infection, consider:

- Acyclovir, IV, same dosage

For very painful oral herpes in children > 2 years:

- Lidocaine (lignocaine) 2% gel applied every 3 to 4 hours. Apply a thin layer on the affected areas only. Do not exceed 3 mg/kg dose, i.e. maximum 0.15 mL/kg of 2% gel.

Referral

- Herpes gingivostomatitis not responding to therapy.
- Disseminating disease, especially if associated with encephalopathy or increasing liver span.

CARDIOVASCULAR DISEASES

Definition

Cardiovascular diseases (CVD) are the disorders of heart and blood vessels. Most cardiac diseases in young children are congenital, while those in older children may be acquired or congenital.

Heart failure (congestive cardiac failure)

Definition

It is a clinical syndrome reflecting the inability of the myocardium to meet the oxygen and nutritional/ metabolic requirements of the body.

Causes:

***In normal heart* anatomy;**

- Severe anaemia
- Infection/sepsis
- Volume overload
- Arrhythmia
- Cardiomyopathies/Myocarditis
- Hypertension
- Renal failure
- Acquired valvulopathies
- Hypothyroidism
- Kawasaki disease

***In* Congenital heart disease:**

- Left to Right shunt (Ventricular Septal Defect, Patent Ductus Arteriosus…)
- Aortic coarctation
- Aortic valvular stenosis
- Supra valvular aortic stenosis
- Mitral stenosis, mitral regurgitation
- Pulmonary veins stensosis
- Single ventricle

Signs and Symptoms:

- Cough
- Sweating
- Excessive weight gain/oedema
- Poor feeding/ failure to thrive
- Pallor
- Weak pulses
- Cold extremities
- Prolonged capillary refill > 2seconds
- Hypotension
- Tachycardia
- Gallop rhythm with or without heart murmur
- Tachypnea/dyspnoea

- Crepitations (in old children) / wheezing
- Hepatomegaly with or without increased jugular vein pressure
- Oliguria

Diagnosis: Based on the above clinical symptoms and signs

Investigations

- FBC, Electrolytes, Urea and Creatinine, Blood Gas if available.
- Chest X-ray
- ECG
- Echocardiogram

Management: Monitoring of vital signs: RR, HR, BP, O2 saturation, urine output is critical

Non pharmacological treatment

- Oxygen therapy
- Semi- Sitting position (cardiac bed)
- Restrict fluids to 2/3 of maintenance (aim at urine output of 2ml/kg/h)
- Strict bed rest
- Low sodium diet
- Ensure adequate nutrition
- Recognize and treat the underlying conditions e.g. fluid overload, hypertension, infection

Pharmacological treatment

- Frusemide IV 1-4mg/kg divided in 2 doses (to be increased progressively)
- Digoxin per os 0.01mg/kg/day (no loading dose!!)
- Captopril 1-4mg/kg/day divided in 3 doses if normal creatinine (to be increased progressively, beware hypotension)
- Carvedilol for stable older children > 30 kg: initiate with 3.125mg BID, increase every 15 days if good tolerance. Maximum dose: 12.5mg BID

Recommendation:

- If isolated Right sided heart failure: use furosemide (see dosage above) and aldactone 2mg/kg/day divided in 2 doses.
- Administration of carvedilol and aldactone should be discussed with the cardiologist.
- ***Any patient with heart failure due to heart disease must be referred to the cardiologist***

— | Cardiogenic shock

Definition

It is a dramatic syndrome characterized by inadequate circulatory provision of oxygen due to cardiac pump failure secondary to poor myocardial function, so that the metabolic demands of vital organs and tissues are not met. The patient is often a known case of heart disease with signs of heart failure but may be a new case with heart failure.

Signs and symptoms:

- Hypotension
- Tachycardia
- Gallop rhythm
- Hepatomegaly
- Crackles/wheezes
- Weak and fast pulses (or absent)

- Cold extremities/ pallor
- Capillary refill > 2 seconds
- Oliguria/anuria

Management:

Non pharmacological management:

- Avoid excessive IV fluids, the patient is fluid overloaded in this case, give 2/3 of maintenance (aim at urine output of 2ml/kg/h)
- Oxygen therapy: 10-15l/min with mask and reservoir bag
- Semi- Sitting position (cardiac bed)
- Low sodium diet
- Strict bed rest
- Ensure adequate nutrition
- Correct hypoglycemia with 3-5ml/kg IV of Dextrose 10%

Pharmaceutical treatment

- Dopamine IV 5-10 microgram/kg/min, may increase to 20 microgram/kg/min OR
- Dobutamine IV 2 to 20 microgram/kg/min
- If tissue perfusion and blood pressure do not improve satisfactorily on adequate fluid volume replacement and inotropic support, consider: Epinephrine (adrenaline), IV infusion, 0.01–1 mcg/kg/minute.
- Furosemide IV 2mg/kg/dose if adequate peripheral perfusion. Repeat the dose according to estimated fluid overload up to 8mg/kg/day. This is done after discussion with a cardiologist or paediatrician
- Correct arrhythmia if present with digoxin 0.04mg/kg/day in 3 devided doses(maintenance: 0.01mg/kg/day)
- Monitor: Heart rate, Respiratory rate, BP, Urine output, Pulse Oximetry for oxygen saturation

-- | Pulmonary oedema

Definition

Pulmonary oedema is accumulation of fluid in the alveoli due to an increase in pulmonary capillary venous pressure resulting from acute left ventricular failure.

Causes:

- Heart not removing fluid from lung circulation properly (cardiogenic pulmonary oedema)
- A direct injury to the lung parenchyma

Signs and symptoms:

- Breathlessness/ Respiratory distress
- Sweating
- Cyanosis (decreased oxygen saturation)
- Frothy blood-tinged sputum
- Ronchi, and crepitations/wheezes

Diagnosis: Mainly clinical: history, symptoms and signs

Investigations:

- Chest x-ray shows loss of distinct vascular margins, Kerley B lines, diffuse haziness of lung fields, pleural effusion.
- ECG
- Echocardiography
- Blood Gas if possible

Management:

- Maintain patient in a semi sitting position
- Oxygen by facial mask with reservoir bag if available
- IV furosemide 2mg/kg/dose, maximum 8mg/kg/day.
- Inotropic support with dopamine or dobutamine if signs of shock
- Transfer to paediatrician/cardiologist for further management.

Congenital heart diseases

Definition

Structural abnormalities of the heart or great vessels present at birth. They fall into 2 major groups: Acyanotic and cyanotic

Acyanotic Heart Diseases

Common lesions:

- Ventricular Septal Defect (VSD) most common congenital heart disease
- Patent ductus arteriosus (PDA)
- Atrio-ventricular septal defect (AVSD) or endocardial cushion defect (common in trisomy 21)
- Atrial septal defect (rarely causes heart failure)
- Coarctation of aorta

Signs and symptoms:

Each condition has specific clinical, radiological and ECG findings. Large left to right shunts present clinically with:

- Feeding difficulties (breast feeds and stops then starts again}
- Sweating during feeds.
- Failure to thrive
- Recurrent chest symptoms
- Tachypnoea and indrawing.
- Chest deformity: respiratory sulcus, precordial bulge.
- Tachycardia
- Heart murmur
- Gallop rhythm
- Hepatomegaly
- Increased jugular venous pressure.
- Chest X-ray: usually cardiomegaly with plethoric lung fields.

Diagnosis: Based on clinical signs and symptoms

Investigations:

- Chest X-Ray
- ECG
- Echocardiogram
- Cardiac catheterization/angioscan in special cases.

Complications

- Failure to thrive
- Heart failure
- Recurrent chest infections
- Infective endocarditis
- Pulmonary vascular obstructive disease (pulmonary hypertension) which can lead to Eismenger syndrome

Management: Treatment depends on the specific condition. Some congenital heart diseases can be treated with medication alone, while others require one or more surgeries.

- Furosemide, oral, 1mg/kg/dose 8-12 hourly. Supplement with potassium chloride, oral, 25-50 mg/kg/dose 8-12 hourly
- Captopril 1-3mg/kg/day (start with 1mg/kg)
- Pay special attention to nutrition/Increase calories in feeding
- Iron if Hb less than 10g/dl (preferably reach 15g/dl)
- Surgical repair generally before 1 year if possible

➤ Cyanotic heart diseases

Definition

Cyanotic heart disease is a heart defect, present at birth (congenital), that results in low blood oxygen levels (< 90 % even with oxygen).

Common lesions:

Decreased flow to the lungs (do not cause heart failure):

- Tetralogy of Fallot
- Pulmonary stenosis
- Pulmonary atresia

Increased flow to the lungs (cause heart failure and failure to thrive):

- Transposition of great vessels (TGA)
- Truncus arteriosus
- Single ventricle
- Tricuspid atresia

➤ Tetralogy of Fallot:

Definition: Tetralogy of Fallot refers to a type of congenital heart defect comprising of:

- Large ventricular septal defect
- Pulmonary stenosis
- Overriding aorta
- Right ventricular hypertrophy

Signs and symptoms:

- Progressive cyanosis with pulmonary systolic murmur
- Digital clubbing occurs after long time
- Hallmark: Paroxysmal hyper cyanotic attacks (blue spells) with the following manifestations:

- Hyperpnea and restlessness
- Increased cyanosis
- Gasping respiration
- Syncope or convulsions
- Spontaneous squatting position is frequent (in older children)
- Heart murmur disappears

Diagnosis: *Clinical plus Echocardiography findings*

Investigations:

- Chest x-ray
- Complete blood count (CBC)
- Echocardiogram
- Electrocardiogram (EKG)

Complications

- Delayed development/growth
- Polycythemia
- Hypercyanotic attack, sometimes associated with seizures and death
- Infective endocarditis
- Brain abscess

Management:

- Avoid dehydration and stress (treat early infections, quite environment)
- Propanolol 0.5-1mg/kg every 6 hours to prevent hypercyanotic attacks
- Iron 5mg/kg /day to prevent microcytosis
- Surgical repair, urgent as soon as spells begin.
- In case of Hypercyanotic attacks:
  - Squatting position (hold the infant with the legs flexed on the abdomen)
  - Oxygen 6l/min with mask
  - Diazepam 0.3mg/kg IV or 0.5mg PR if convulsing,
  - Normal saline 10-20ml/kg bolus over 30 minutes
  - Sodium bicarbonate 8.5% 1ml/kg to correct acidosis
  - Morphine 0.1mg/kg IV if persistent attacks (but risk of respiratory depression),
  - Propranolol IV 0.1 – 0.2 mg/kg slowly then continue oral maintenance to relax the infundibular spasms.

Table 14. Common causes of heart failure in Neonates

Clinical manifestations	***Likely lesions***
Very poor pulses	• Hypoplastic Left Ventricle Syndrome • Critical aortic stenosis
Poor femoral pulses	• Coarctation of aorta
Bounding pulses	• Patent ductus arteriosus (PDA) • Truncus arteriosus • Severe anaemia

Recommendations:

- All children with cyanotic heart diseases who come with diarrhea and vomiting should be admitted for closer observation. Furosemide is contra-indicated
- All new born babies with suspected cyanotic heart disease should be referred to a cardiologist/ tertiary hospital immediately.

Acquired heart diseases

Acute Rheumatic Fever

Definition

This is an acute, systemic connective tissue disease in children related to an immune reaction to untreated group A Beta haemolytic streptococcus infection of the upper respiratory tract .The initial attack of acute rheumatic fever occurs in most cases between the ages of 3 and 15 years. It is the autoimmune reaction that damages the heart valves leading to Rheumatic heart diseases

Cause: Auto-immune disease

Table 15. Revised Jones Criteria

Major manifestations:	***Minor manifestations:***	***Group A Strep(GAS) Infection:***
Carditis	Fever	GAS on throat swab (culture)
Arthritis	Arthralgia	Raised Anti-streptolysin O titre (ASOT)
Sydenham's Chorea	Prolonged P-R interval on ECG	Raised Anti-deoxyribonuclease B (Anti-DNase B)
Erythema marginatum	Raised ESR or CRP	
Subcutaneous nodules		

Criteria for ARF diagnosis according to WHO

- The first episode of ARF can be confirmed if:
  - 2 MAJOR, **or** 1 MAJOR and 2 MINOR manifestations are present **plus** evidence of preceding Group A streptococcal infection.
- Recurrent ARF (with no RHD) can be confirmed if
  - 2 MAJOR, **or** 1 MAJOR and 2 MINOR manifestations are present **plus** evidence of preceding Group A streptococcal infection.
- Recurrent ARF (with existing RHD) can be confirmed if
  - 2 MINOR manifestations are present **plus** evidence of preceding Group A streptococcal infection.

Note:

- Chorea for which other causes have been excluded, provides adequate evidence of rheumatic fever without the other criteria for diagnosis being required.
- In children with rheumatic heart disease with fever, it is critical to differentiate recurrence of acute rheumatic fever from infective endocarditis (IE).
- For children with rheumatic heart disease, recurrence of some of the above criteria would suggest a recurrence of rheumatic fever but other causes such as IE should be excluded.

Diagnosis ***is made on clinical basis***

Investigations

- Throat swab for culture (positive throat culture of group A Streptoccocal infection)
- Raised ASOT/ASLO antibodies titre (Anti-streptolysin-0-titre – ASOT of 1:300)
- Anti DNase B
- FBC/ ESR/CRP
- Chest x-ray – Features of cardiomegaly
- ECG
- Echocardiogram

Complications: Rheumatic heart disease

Management:

- The primary goal of treating an ARF attack is to eradicate streptococcal organisms and bacterial antigens from the pharyngeal region
- Persons with symptoms of ARF should be hospitalized to ensure accurate diagnosis, and to receive clinical care and education about preventing further episodes of ARF.
- The diagnosis should include an initial echocardiogram used to help identify and measure heart valvular damage.
- Long-term preventative management should be organized before discharge.
- All cases of ARF should receive:
  - A single injection of Benzathine penicillin G (Extencilline): 25,000–50,000 units/kg/dose stat; maximum 1.2 mega units dose OR
  - Oral Penicillin (Pen V) 25–50mg/kg/day in divided 3 doses for 10 days (Erythromycin 30-50mg/kg/day divided in 3 doses if penicillin allergy)

Relief of symptoms

Arthritis and fever

- Aspirin 75–100mg/kg/day in 4–6 divided doses. Treatment continued until fever and joint inflammation are controlled and then gradually reduced over a 2-week period
- Add an antacid to reduce risk of gastric irritation e.g Omeprazole 1mg/kgOr
- Prednisolone 1-2mg/kg OD for 2 weeks then taper for 2 weeks with good response begiAspirin in the 3rd week and continue until 8th week tapering in the final 2 weeks

Chorea

- Most mild-moderate cases do not need medication
- Provide calm and supportive environment (prevent accidental self-harm)

For severe cases:

- Carbamazepine per os:
  - <6 years: 10-20mg/kg/day divided in 3 doses,
  - Y-ears: 400-800mg/day divided in 3 doses,
  - >12 years: 200mg x 2/day
- Valproic acid 20-30mg/kg/day divided in 2 doses
- Duration: 2 weeks

Carditis

- Bed rest if in cardiac failure
- Anti-failure medication as above
- Anti-coagulation medication if atrial fibrillation is present

Management plan when the acute episode is controlled

- Administer the first dose of secondary prophylaxis
- Register the individual with the local health authority or RHD Programme;
- Provide disease education for the person with ARF and the family
  - Understanding of ARF and RHD and risks of ARF recurrence
  - Importance of regular secondary prophylaxis and medical review
  - Recognising own signs and symptoms of ARF and RHD
  - Risks associated with future RHD (e.g. pregnancy, surgery and high level of aftercare)
  - Importance of dental health

- Include an ARF diagnosis alert on computer systems and/or medical files (if applicable);
- Refer to local health facility for ongoing management;
- Arrange dental review (and provide advice about endocarditis prevention);

Long-term Management

- Regular secondary prophylaxis (refer to 5.5 Table 6 Recommended Secondary Prophylaxis Regimen)
- Regular medical review
- Regular dental review
- Echocardiogram (if available) following each episode of ARF, and routine echocardiogram: every 2 years for children (sooner if there is evidence of cardiac symptoms)

Secondary prophylaxis

Aim:

- Prevents the occurrence of GAS infections which can lead to recurrent ARF
- Reduces the severity of RHD
- Helps prevent death from severe RHD.

Indications for Use

Secondary prophylaxis is indicated for people who have

- ARF confirmed by the Jones Criteria
- RHD confirmed on echocardiogram
- ARF or RHD not confirmed, but highly suspected.

Doses:

Benzathine Penicillin G IM every 4 weeks:

- 1,200,000 units for ALL people ≥30kg
- 600,000 units for children <30kg

Penicillin V if Benzathine Penicillin G IM injections not tolerated or contraindicated:
Dose: 250mg oral, twice-daily for ALL children.
Erythromycin if proven allergy to Penicillin: 250mg oral, twice-daily for ALL people.

Table 16. Recommended Secondary Prophylaxis Regimens

Disease Classification	***Duration of Secondary Prophylaxis***
ARF (No proven Carditis)	• Minimum of 5 years after last ARF, or • Until age 18 years (whichever is longer)
Mild-moderate RHD (or healed carditis)	• Minimum 10 years after last ARF, or • Until age 25 years (whichever is longer)
Severe RHD and following **Cardiac Surgery** for RHD	• Continue medication for life

➤ Rheumatic heart Diseases

Definition

It is an inflammatory damage of the heart valves, as a complication of acute rheumatic fever. The mitral valve is the most commonly involved valve, although any valve may be affected.

Types of valvular lesions;

- Mitral regurgitation/stenosis
- Aortic regurgitation/stenosis
- Tricuspid regurgitation
- Mixed regurgitation and stenosis
- Multivalvular heart diseases

Signs and symptoms:

- May be asymptomatic when minor lesions
- Heart murmurs over affected valve

Complications:

- Congestive cardiac failure with pulmonary oedema
- Bacterial endocarditis.

Diagnosis: ***on clinical basis***

Investigations:

- Chest x-ray
- ECG
- Echocardiography

Management:

- Treat underlying complication, e.g., heart failure, pulmonary oedema
- Continue prophylaxis against recurrent rheumatic fever
- Ensure oral hygiene
- Endocarditis prophylaxis if dental procedures, urinary tract instrumentation, and GIT manipulations;
  - Above the diaphragm;
    - Amoxicillin 50mg/kg (Max 2gr) 1 hour before the procedure OR
    - Erythromycin 50mg/kg (max 1.5gr) – if allergic to penicillins
  - Below the diaphragm:
    - Ampicillin 50mg/kg IV or IM (max 2gr) with Gentamycin, 2mg/kg (max 120mg) 30minutes before the procedure then,
    - Amoxycillin per os 25mg/kg (max1gr) 6 hours after the procedure
- Ensure good follow up by cardiologist

➤ Infective endocarditis

Definition

Infection of the endothelial surface of the heart. Suspect infective endocarditis in all children with persistent fever and underlying heart disease.

Cause/predisposing factors:

- Rheumatic valvular disease
- Congenital heart disease

Signs and symptom:

- Persistent low grade fever without an obvious underlying cause
- Fatigue, joint pain, new murmurs, clubbing, splenomegaly and haematuria

Table 17. Major and minor clinical criteria used in the modified Duke criteria for diagnosis of infective endocarditis (IE)

Major criteria	*Minor criteria*
• Positive blood culture: ○ typical micro-organisms from two separate blood cultures: S. viridans, including nutritional variant strains, S. bovis, *HACEK group, S. aureus, or ○ Enterococci, in the absence of a primary focus, or ○ persistently positive blood culture with a micro-organism consistent with IE ○ from blood cultures drawn > 12 hours apart, or ○ all 3 or a majority of 4 or more separate blood cultures, with the first and last drawn at least one hour apart, or ○ positive serology for Q fever, ○ Single positive blood culture for Coxiella burnetti or anti-phase 1 IgG antibody titre > 1:800. • Evidence of endocardial involvement: ○ positive echocardiogram for IE (transoesophageal echocardiography is recommended for patients with prosthetic valves): oscillating intracardiac mass, on valve or supporting structures, or in the path of regurgitant jets, or on implanted ○ materials, in the absence of an alternative anatomic explanation, or ○ abscess, or ○ new partial dehiscence of prosthetic valve, or ○ New valvular regurgitation.	• Predisposing heart condition or • IV drug use • Fever ≥ 38°C. • Vascular phenomena: ○ major arterial emboli, ○ septic pulmonary infarcts, ○ mycotic aneurysm, ○ intracranial haemorrhage, ○ conjunctival haemorrhages, ○ Janeway lesions. • Immunologic phenomena: ○ Osler's nodes, ○ Roth spots, ○ glomerulonephritis, ○ Rheumatoid factor. • Microbiologic evidence: ○ positive blood culture but not meeting major criterion, or ○ Serologic evidence of active infection with organism consistent with IE.

Table 18. Interpretation of IE

Definite IE	**Possible IE**	**Rejected**
Pathological criteria • Micro-organisms ○ by culture or histology in a vegetation, or in a vegetation that has embolised, **or** ○ in an intracardiac abscess, or lesions • Vegetation or intracardiac abscess present – confirmed by histology showing active IE. Clinical criteria – see Table above • 2 major criteria, • 1 major and 3 minor, or • 5 minor.	• At least one major and one minor criterion, **or** • 3 minor	• Alternative diagnosis for manifestation of endocarditis, **or** • resolution of manifestations, with antibiotic therapy ≤ 4 days, **or** • No pathologic evidence of IE at surgery or autopsy, after antibiotic therapy for ≤ 4 days.

Limitations of the Duke Criteria in children

The clinical criteria rely heavily on relatively rare clinical features.

In contrast, common clinical features like splenomegaly, clubbing and haematuria have not been included.

Investigations:

- Blood cultures (at least 3 cultures) before antibiotics
- FBC /CRP/ESR
- Urine test strips – haematuria
- Echocardiography

Management:

Non-pharmacological management

- Bed rest/limit physical activity
- Ensure adequate nutrition
- Maintain haemoglobin > 10 g/dL
- Measures to reduce fever

Pharmacological management

- Paracetamol, oral, 20 mg/kg at once, then 10–15 mg/kg/dose, 6 hourly as required
- Antibiotics regimen: IV antibiotics are always given, based on culture and sensitivity results
  - Native valve endocarditis (NVE) due to Streptococci:
    - Benzylpenicillin (Penicillin G), IV, 300 000 units/kg/day divided in 4 doses for 4 weeks OR
    - Ceftriaxone 100mg/kg/day as single dose (maximum 2g) for 4 weeks
      PLUS
    - Gentamicin, IV, 3mg/kg/day divided in 3 doses (maximum 240mg/day) for 2wks
    - Patients allergic to penicillin and cephalosporins: Vancomycin 40mg/kg/day divided in 3 doses (max 2g/day) for 4 weeks.
  - NVE due to staphylococci
    - Cloxacillin 200mg/kg/day divided in 4 doses 6 for 4 weeks
      PLUS
    - Gentamicin 3mg/kg/day divided in 3 doses (maximum 240mg/day) for first 5 days .OR
    - Cloxacillin-resistant strains or allergy to penicillin: Vancomycin 40mg/kg/day divided in 3 doses (max 2g/day) for 6 weeks.

  Note: All highly suspected cases of infective endocarditis must be referred to the cardiologist where bloodcultures and proper management will be done.

— | Cardiomyopathies

Definition

Cardiomyopathies are diseases characterized by structural and functional abnormalities of the myocardium.

Classification: Classification based on the predominant structural and functional abnormalities:

- Dilated cardiomyopathy: primarily systolic dysfunction,
- Hypertrophic cardiomyopathy: primarily diastolic dysfunction,
- Restrictive cardiomyopathy: primarily diastolic but often combined with systolic dysfunction

Dilated cardiomyopathy

Dilated cardiomyopathy refers to a group of conditions of diverse etiology in which both ventricles are dilated with reduced contractility

Causes:

- Infections (e.g. Viral+++, Rickettsia, Chagas disease…)
- Neuromuscular disorders (e.g. Duchenne dystrophy, Becker dystrophy, …)
- Endocrine, metabolic and nutritional (e.g. hyperthyroidism, beriberi, kwashiorkor…)
- Diseases of coronary arteries (e.g. Kawasaki, Aberrant Left Coronary Artery)
- Autoimmune diseases (e.g. Rheumatic carditis, juvenile rheumatoid arthritis, systemic lupus erythematosus, dermatomyositis, systemic lupus erythematosus…)
- Drugs toxicity (e.g. doxorubicin, cyclophosphamide, IPECA…)
- Hematologic diseases (e.g. anaemia, Sickle cell anaemia, hypereosinophilic syndrome: Löffler syndrome)

Signs and symptoms: ***see signs of congestive heart failure***

Diagnosis:

- ECG: prominent P wave, LV or RV hypertrophy, nonspecific T-wave abnormalities.
- Chest X-ray: cardiomegaly, pulmonary oedema
- Echocardiogram: confirm diagnosis and shows LA and LV dilation, poor contractility
- FBC, Urea and creatinine, Electrolytes (Na, K),
- Myocardial biopsy, PCR, genetic… according to the etiology

Management:

- Treatment: Refer to principles and medications of congestive heart failure

Hypertrophic cardiomyopathy

Definition

Hypertrophic cardiomyopathy is a genetic disorder that is characterized by left ventricular hypertrophy unexplained by secondary causes and a non-dilated left ventricle with preserved or increased ejection fraction

Causes:

- Left ventricle obstruction (Coartation of aorta, hypertension, aortic stenosis)
- Secondary (infants of diabetic mothers, corticosteroids in premature infants)
- Metabolic (Glycogen storage disease type II (Pompe disease)
- Familiar hypertrophic cardiomyopathy
- Syndroms (Beckwith - Wiedman syndrom, Friedereich, ataxia…)

Signs and Symptoms:

- Weakness
- Fatigue
- Dyspnea on effort
- Palpitations
- Angina pectoris
- Dizziness and syncope
- Increased risk of sudden death

Diagnosis:

- ECG: LV hypertrophy
- Chest X-ray: Mild cardiomegaly
- Echocardiogram: LV hypertrophy, ventricular outflow tract gradient
- Doppler flow studies may demonstrate diastolic dysfunction before the development of hypertrophy.

Management:

- Prohibit competitive sports and strenuous physical activities
- Propranolol 0.5 -1mg/kg/day devised in 3 doses or atenolol
- Implantable cardioverter-defibrillator if documented arrhythmias or a history of unexplained syncope
- Open heart surgery for septal myotomy: rarely indicated

➤ Restrictive cardiomyopathy

Definition

Restrictive cardiomyopathy (RCM) is a myocardial disease, characterized by impaired filling of the ventricles in the presence of normal wall thickness and systolic function.

Cause/Etiologies:

- Idiopathic, Systemic disease (scleroderma, amyloidosis, or sarcoidosis)
- Mucopolysaccharidosis
- Hypereosinophilic syndrome; malignancies
- Radiation therapy
- Isolated noncompaction of the left ventricular myocardium

Signs and symptoms:

- Dyspnea
- Edema and ascites
- Hepatomegaly with increased venous pressure
- Pulmonary congestion

Diagnosis: ***clinical basis***

Investigations

- ECG: Prominent P waves, ST segment depression, T-wave inversion
- Chest X-ray: mild to moderate cardiomegaly
- Echocardiogram: markedly enlarged atria and small to normal-sized ventricles with often preserved systolic function but highly abnormal diastolic function

Complications

- Arrhythmias
- Mitral regurgitation
- Progressive heart failure
- Tricuspid regurgitation

Management:

- Lasix 2mg/kg divided in 2 doses
- Aldactone 1-2mg/kg devised in 2 doses

- Antiarrhythmic agents / biventricular pacing are used as required
- Aspirin or warfarin in case of noncompaction LV with an increased risk of mural thrombosis and stroke
- Cardiac transplantation where possible and indicated

➤ Pericarditis/Pericardial Effusion:

Definition

Accumulation of fluid in the pericardial space, usually secondary to pericarditis..

Causes:

- Infection such as viral, bacterial (tuberculosis…)
- Inflammatory disorders, such as lupus
- Cancer that has spread (metastasized) to the pericardium
- Kidney failure with excessive blood levels of nitrogen
- Heart surgery (postpericardectomy syndrome).

Signs and symptoms:

- Pericardial tamponade:
- Chest pressure or pain and signs of congestive heart failure with sometimes shock.

Note: Many patients with pericardial effusion have no symptoms. The condition is often discovered on a chest x-ray or echocardiogram that was performed for another reason.

Diagnosis:

- Most patients present with a prolonged history of:
  - Low cardiac output,
  - Distended neck veins,
  - Muffled or diminished heart sounds.
- Patients with HIV may be asymptomatic and incidentally diagnosed on chest Xray.
- Often associated with TB.
- Acute septic pericarditis may occur in patients with septicaemia

Investigations

- ECG
  - Small complexes tachycardia
  - Diffuse T wave changes
- Chest X-ray: “water bottle” heart, or triangular heart with smoothed out borders
- Echocardiogram
- Tuberculin skin test
- Diagnostic pericardiocentesis
  - in all patients with suspected bacterial or neoplastic pericarditis and patients whom diagnosis is not readily obtained
- Cell count and differential, culture, gram stain, PCR

Management

Non-pharmacological treatment

- Semi-sitting position if tamponnade suspected
- Pericardiocentesis
  - preferably under ultrasound guidance
  - Performed by an experienced person
  - indicated in children with symptomatic pericardial effusion

Pharmacological treatment:

- If hypotensive, rapidly administer intravenous fluids 20ml/kg of Normal saline over 30min to 1 hour,
- If suspected TB pericarditis: standard anti TB treatment + steroids
- In case of purulent pericarditis: cloxacillin, IV 50 mg/kg/dose 6 hourly for 3 – 4 weeks + ceftriaxone, IV, 100 mg/kg as a single daily dose, to adapt according to culture results.
- Treat heart Failure (See Section on heart failure)

Recommendation: All patients with pericardial effusion should be referred to a cardiologist

Hypertension in children

Definition

Hypertension is defined as systolic and/or diastolic blood pressure ≥ the 95th percentile for gender, age and height percentile on at least three consecutive occasions.
A sustained blood pressure of > 115/80 is abnormal in children between 6 weeks and 6 years of age.

Hypertensive emergency/crisis exists when CNS signs of hypertension appear such as encephalopathy, convulsions, retinal haemorrhages or blindness. Great care is required to reduce the blood pressure in a controlled manner to avoid potentially serious consequences of impaired auto-regulation of cerebral blood flow.

Hypertensive urgency is defined as a significant elevation of blood pressure without accompanying end organ damage. Patients are generally symptomatic with complaints of headache, blurred vision and nausea, despite the lack of end organ involvement

Accurate measurement of BP:

- Use the widest cuff that can be applied to the upper arm
- The cuff bladder must encircle at least 80% of the upper arm and should cover at least 75% of the distance between the elbow and the shoulder joints
- It is better to use a cuff that is slightly too large than one that is too small

Causes:

- Severe hypertension suggests renal disease
- Coarctation of aorta
- Rarely pheochromocytoma
- Long term steroid therapy

Most common causes of secondary hypertension by age:

New born:

- Renal abnormalities
- Coarctation of the aorta
- Renal artery stenosis
- Renal artery or veinal thrombosis

First year:

- Coarctation of the aorta
- Renal vascular desease
- Tumor
- Medications (steroids…)

1-6 years:

- Renal vascular diseases
- Renal parenchymal diseases (glomerulonephritis, hemolytic-uremic syndrome…)
- Coarctation of the aorta
- Medications
- Essential hypertension

6-15 years:

- Renal vascular diseases
- Renal parenchymal diseases (glomerulonephritis, hemolytic-uremic syndrome…)
- Essential hypertension
- Coarctation of the aorta
- Endocrine causes
- Nutritional causes (obesity)

Signs and symptoms:

- Headache
- Convulsions, coma and visual symptoms
- Oedema, haematuria, proteinuria
- Acute heart failure and pulmonary oedema
- Some children may be asymptomatic

Table 19. Blood pressure in children correlates with body size and age.

Age of child	95th Percentile of Systolic and Diastolic Blood Pressure	
	First 12 hours	First week
newborn prem	65/45 mmHg	80/50 mmHg
newborn fullterm	80/50 mmHg	100/70 mmHg
	Systolic mmHg	Diastolic mmHg
6 weeks–6 years	115	80
8 years	120	82
9 years	125	84
10 years	130	86
12 years	135	88
14 years	140	90

Table 20. 95th Percentile of systolic and diastolic BP correlated with Height

Height cm	Systolic mmHg	Diastolic mmHg
100	114	70
110	116	72
120	118	74
130	120	74
140	125	75
150	130	75
160	135 (131)	77
170	140 (133)	80
180	145 (135)	83

Diagnosis: Mainly Clinical

Symptoms and signs of any of the following systems:

- Central nervous
- Cardiovascular
- Respiratory
- Urogenital

Investigations:

- Urea, creatinine, electrolytes (Na+, K+),
- Fundoscopy
- ECG
- Echocardiogram
- Abdominal ultrasound (focused on kidneys).
- Others according to the suspected etiology

Management of acute hypertension (hypertension of sudden onset)

Non-pharmacological treatment

- Admit patient to paediatric high dependence care unit
- Monitor BP every 10 minutes until stable – thereafter every 30 minutes for 24 hours
- Insert two peripheral intravenous drips
- Rest on cardiac bed
- Control fluid intake and output (restriction)
- Restrict dietary sodium

Pharmacological treatment: Do not combine drugs of the same class

- Frusemide, IV, 1–2 mg/kg as a bolus slowly over 5 minutes increase up to 8 mg/kg/day. If oliguric; Max 5mg/kg/day
- Nifedipine 0.25-0.5mg/kg (max: 10mg) sublingual OR
- Amlodipine, oral, 0.2 mg/kg/dose. May be repeated 6 hours later, thereafter every 12 hours.
- Refer the patient to a specialist when the patient is stable

Recommendations:

- For acute or chronic hypertension blood pressure needs to be lowered cautiously
- Aim to reduce the SBP slowly over the next 24 - 48 hours
- Do not decrease BP to < 95th percentile in first 24 hours
- Advise a change in lifestyle
- Institute and monitor a weight reduction programme for obese individuals
- Regular aerobic exercise is recommended in essential hypertension
- Dietary advice
- Limit salt and saturated fat intake
- Increase dietary fiber intake

Management of Chronic Hypertension

Non-pharmacological management:

- Introduce physical activity, diet management and weight reduction, if obese.
- Advise against smoking in teenager
- Follow up to monitor blood pressure and educate patient on hypertension
- If blood pressure decreases, continue with non-drug management and follow up
- If BP is increasing progressively, reinvestigate to exclude secondary causes or refer to the specialist

- If BP is stable but persistently > 95th percentile and secondary causes have been excluded, start drug treatment after failed non-drug management for 6 months
- Consider earlier initiation of drug treatment if positive family history for cardiovascular disease, essential hypertension or diabetes mellitus

Pharmacological management:

Table 21. Recommended medications and doses for patients with chronic Hypertension.

Drug	Dosage	Side effect/comment
First line: Hydrochlorothiazide	1-2mg/kg/day once daily (maximum 25mg/day).	Hypokalemia
Second line: Nifedipine OR Amlodipine	0.3-1mg/kg/day divided in 3 doses 0.1mg/kg/day (maximum dose 10mg/day) once daily	Not well studied in children less than 6 years of age
Third line: Captopril OR Lisinopril	0.5 – 4mg/kg/day divided in 2 doses 0.07- 0.6mg/kg daily	• Hyperkalaemia • Check renal function and Serum-K periodically, • Not used in bilateral renal artery stenosis, contraindicated in renal failure • Can cause cough
Forth line: Atenolol	0.5-1mg/kg/day once daily (max up to 2mg/kg/day, do not exceed /100mg/day).	• Bradycardia
Furosemide (Lasix) if associated oedema or stage 4 chronic kidney disease. Note: Do not associate Furosemide with Hydrochlorothiazide	1-4mg/kg/day in 2 to 4 divided doses	• Hyponatremia • Hypokalemia

Table 22. Recommended Hypertension medications for patients with Renal Failure

For CKD 1-3 (GFR ≥30, creatinine <2x normal value for age	
First- line drug	Lisinopril
Second -line drug	Hydrochlorothiazide
Third- line drug	Amlodipine
Forth- line drug	Atenolol (use half of normal recommended dose)
For CKD 4 or 5 (GFR < 30, creatinine ≥2x normal value for age	
First-line drug	Furosemide
Second-line drug	Amlodipine
Third-line drug	Atenolol (use half of normal recommended dose).

Recommendations:

- All patients with hypertension and persistent proteinuria should be treated with an ACE inhibitor
- Always exclude bilateral renal artery stenosis before treating with an ACE inhibitor
- Renal function must be monitored when an ACE inhibitor is prescribed because it may cause a decline in GFR resulting in deterioration of renal function and hyperkalaemia
- Patients with hypertension due to a neuro-secretory tumour (phaeochromocytoma or neuroblastoma), should receive an α-blocker either as single drug or in combination with ß-adrenergic blocker
- For patients with persistent hypertension despite the use of first line drugs, a second/third drug should be added
- Specific classes of antihypertensive drugs should be used according to the underlying pathogenesis or illness
- For patients with predominantly fluid overload: use diuretics with/without ß-blocker

Cardiac arrhythmias in children

Definition

Heart rate that is abnormally slow or fast for age or irregular.

There are three types of arrhythmias in children;

- Heart block
- Ventricular arrhythmias
- Paroxysmal atrial tachycardia

Type of Arrhythmia	*cause*	*Signs and symptom*
Heart block: A delay or complete block of the electrical impulse as it travels from the sinus node to the ventricles	• Idiopathic and familial • Electrolyte disturbances (hyperkalaemia), • Digoxin toxicity • Congenital heart disease, particularly transposition of the great arteries, and especially after surgery • Myocarditis • Post infective, for example in endocardial fibroelastosis or rheumatic fever	• Chest pressure or pain • Fainting, also known as syncopy, or near-syncope • Fatigue • Light headedness or dizziness • Palpitations, which can be skipping, fluttering or pounding in the chest • Shortness of breath
Ventricular arrhythmias: A rapid heart rate, usually with a regular rhythm, originating from above the ventricles	• Heart attack • Cardiomyopathy • Heart failure • Heart surgery • Myocarditis • Valvular heart disease	• May be asymptomatic • Chest discomfort (angina) • Fainting (syncope) • Light-headedness or dizziness • Sensation of feeling the heart beat (palpitations) • Shortness of breath • Absent pulse • Loss of consciousness • Normal or low blood pressure • Rapid pulse
Paroxysmal atrial tachycardia: A rapid heart rate, usually with a regular rhythm, originating from above the ventricles.		• Palpitation • lightheadedness • Weakness • Shortness of breath • Chest pressure

Table 23. Normal heart rate/minute for age:

Age	Heart rate
Newborn	100–160
< 1 year	110–160
1–2 years	100–150
2–5 years	95–140
5–12 years	80–120
> 12 years	60–100

Table 24. Diagnosis is based on these clinical signs and symptoms

Infants:	
Color changes (pale, mottled)	Irregular pulse
Irritability	Tachycardia
Feeding difficulties	Bradycardia
Sweating	Signs of cardiac failure
Tachypnoea/apnoeic spells	
Children:	
Dizziness	Tachycardia
Palpitations	Bradycardia
Fatigue	Syncope
Chest Pain	Signs Of Cardiac Failure

Note: All patients with arrhythmias should be referred to a cardiol

Investigations

- ECG is essential for diagnosis, preferably a 12 lead ECG
- Echocardiogram
- Other according to the suspected etiology

Tachyarrhythmias:

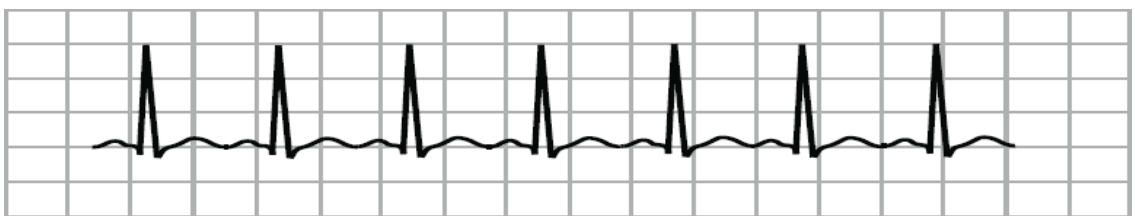

Figure 1. Sinus tachycardia

ECG Criteria
Rate: > upper limit for age
Rhythm: regular
P wave: present and normal
QRS: normal

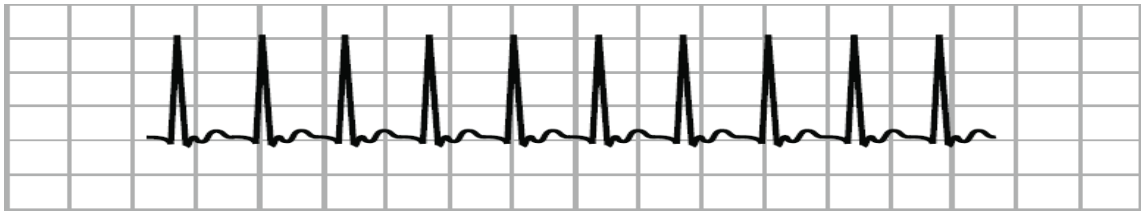

Figure 2. Supraventricular Tachycardia

ECG Criteria
Rate: usually > 200 beats per minute
Rhythm: regular
P wave: abnormal
QRS: narrowed

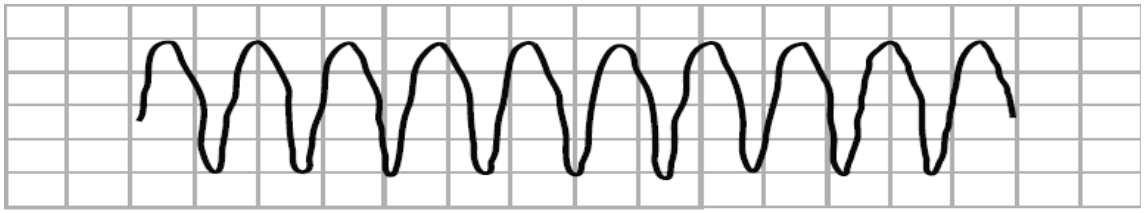

Figure 3. Ventricular Tachycardia

ECG Criteria
Rate: generally 100–220 beats per minute
Rhythm: generally regular
P wave: mostly not seen
QRS: abnormal, large with QRS > 120 millisecond

Management

Non-pharmacological treatment

- Sinus tachycardia usually requires management of the underlying condition
- ABC of resuscitation
- Admit to high care or intensive care unit
- Monitor ECG, Oxygen saturation, Blood pressure, Haemoglobin, Heart rate, Acid–base status and blood gases, Respiratory rate, Maintain adequate nutrition and hydration, Treat pyrexia

Pharmacological management:

Emergency treatment

Narrow Complex Tachycardia (supraventricular tachycardia):
Stable patient: Attempt vagal stimulation

- Place icebag on face, or
- Infants: immerse face in ice-cold water for a few seconds
- Older children: try a valsalva manoeuvre, e.g. asks the patient to blow through a straw.
- Place NGT if other means are not available
- Note: Eye-ball pressure and carotid massage is contraindicated in children.
- In consultation with a paediatrician or Cardiologist: Adenosine, IV, 0.1 mg/kg initially, increasing in increments of 0.05 mg/kg to 0.25 mg/kg. Follow with a rapid flush of at least 5 ml Normal saline.

Unstable patient: Heart failure / shocked

- DC synchronised cardioversion in increments of 0.5–1–2 J/kg
- Empty the stomach before cardioversion is attempted
- Amiodarone, IV, 5 mg/kg slowly over 20 minutes (NEVER as a rapid infusion)

Bradyarrhythmias

Causes:

- Hypoxia
- Hypothermia
- Head injuries and increased intracranial pressure
- Toxins and drug overdose
- Post operative
- Congenital excessive vagal stimulation
- Electrolyte disturbances (Hypo- or hyperkalaemia, Hypocalcaemia)

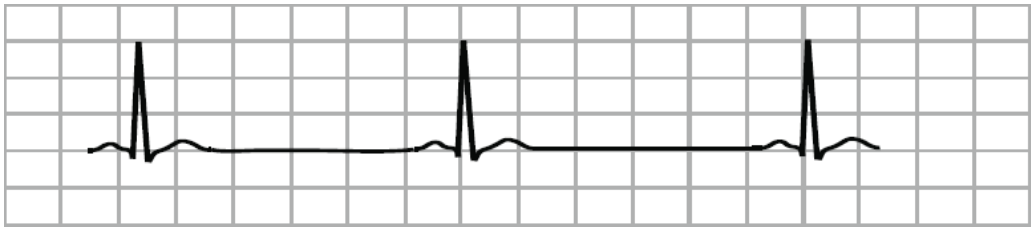

Figure 4. Sinus Bradycardia

ECG Criteria
Rate: < lower limit for age **P wave:** present, all look the same
Rhythm: regular **QRS:** normal, 80–120 millisecond

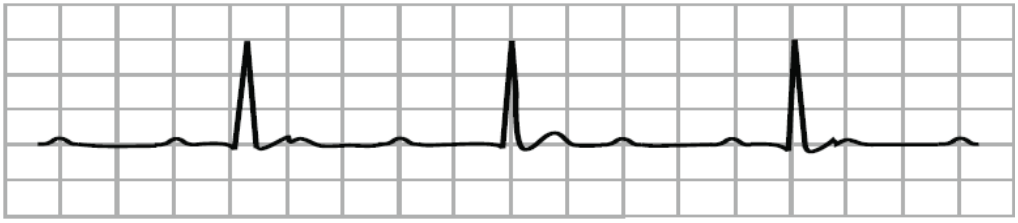

Figure 5. Heart Block (Complete)

ECG Criteria
Rate: low, usually < 60 beats per minute **P wave:** independent P waves
QRS's with no relationship between the two (AV dissociation)

Management

- If syncope and Heart rate - below 50/min:
- Start i.v. Isuprel (Isoprenaline) 0. 05 – 0. 4 microgram/kg/min.

OR

- Dobutamine (Dobutrex) 2 - 20 microgram/kg/min
- Insert pacemaker if ineffective

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GENITOURINARY SYSTEMS

Urinary tract infection (UTI)

Definition

UTI is significant bacteriuria of a clinically relevant uropathogen in a symptomatic patient.

It is classified as:

- Uncomplicated UTI (Cystitis), which is the inflammation and infection of the bladder to the bladder and urethra OR
- Complicated urinary tract infection (Pyelonephritis), an infection of the urinary tract involving the renal parenchyma

Acute cystitis

- Affects mainly girls from 2 years of age and there are no associated urological anomalies
- Escherichia coli is the causative pathogen in at least 70% of cases. Other pathogens include Proteus mirabilis, Enterococcus sp, and Klebsiella sp

Clinical features

Signs and symptoms are related to the age of the child and often non-specific.

- Burning sensation/pain on urination, urinary urgency and frequency; in children: crying when passing urine; involuntary loss of urine, cloudy urine and lower abdominal discomfort. PLUS
- No fever (or mild fever), no flank pain; no systemic signs and symptoms in children.

It is essential to rule out pyelonephritis

The symptom 'burning pain on urination' alone is insufficient to make the diagnosis.

Laboratory

Urine dipstick test:

- Perform dipstick analysis for nitrites (which indicate the presence of enterobacteria) and leukocytes (which indicate an inflammation) in the urine.
- If dipstick analysis is negative for both nitrites and leukocytes, a urinary infection is unlikely.
- If dipstick analysis is positive for nitrites and/or leukocytes, a urinary infection is likely.
- Microscopy/culture: when a dipstick analysis is positive, it is recommended to carry out urine microscopy/culture in order to confirm the infection and identify the causative pathogen, particularly in children and pregnant women.
- When urine microscopy is not feasible, an empirical antibiotherapy should be administered to patients with typical signs of cystitis and positive dipstick urinalysis (leucocytes and/or nitrites).

Treatment

Cystitis in girls 2 years and above:

- Cefixime PO: 8 mg/kg once daily for 3 days Or
- Amoxicillin/clavulanic acid PO 25 mg/kg 2 times daily for 3 days

➤ Acute pyelonephritis

- Pyelonephritis is more common in females.
- May be associated with underlying congenital anomalies of the kidneys and urinary tract.
- It may result in significant short-term morbidity, including septicaemic shock and acute renal failure, especially in infants.
- Permanent renal damage may occur in children who have recurring episodes of pyelonephritis.
- The pathogens causing pyelonephritis are the same as those causing cystitis above
- Pyelonephritis is potentially severe, especially in neonates and infants.
- Management depends on the presence of signs of severity or complications or risk of complications.

Clinical features

Neonates and infant

- Symptoms are not specific: fever, lethargy, irritability, poor oral intake, vomiting, loose stools and jaundice. Palpation of the lower abdomen may show abdominal tenderness.
- The absence of fever does not rule out the diagnosis. On the other hand, fever with no obvious cause– may be the only manifestation.
- Neonates may present with fever or hypothermia, altered general condition, altered conscious state, pale/grey colour, shock etc.
- In practice, a urinary tract infection should be suspected in children with unexplained fever or septic syndrome with no obvious focus of infection.

Older children

- Signs of cystitis (burning pain on urination and urinary urgency and frequency, etc.
- Fever > 38 °C
- Flank pain or abdominal tenderness
- Nausea and/or vomiting are common.

Laboratory: As for cystitis above Plus

- Full Blood count, where possible Urine culture, blood urea and creatinine levels
- Renal and bladder ultrasound where possible in:
  - Children < 2 years of age with a first febrile UTI
  - Children of any age with recurrent febrile UTIs
  - Children of any age with a UTI who have a family history of renal or urologic disease, poor growth, or hypertension
  - Children who do not respond as expected to appropriate antimicrobial therapy

Treatment

Criteria for hospital admission:

- Patients at risk of complications: Neonates, infants and children with immunodeficiency
- Patients with complicated pyelonephritis: urinary tract obstruction, renal abscess,
- Patients with signs of severe infection: sepsis and septic shock, dehydration or vomiting

Neonates

Ampicillin slow IV (3 minutes) for 7 to 10 days

- Neonates 0 to 7 days (< 2 kg): 50 mg/kg every 12 hours
- Neonates 0 to 7 days (≥ 2 kg): 50 mg/kg every 8 hours
- Neonates 8 days to < 1 month: 50 mg/kg every 8 hours

PLUS Gentamicin slow IV for 5 days

- Neonates 0 to 7 days (< 2 kg): 3 mg/kg once daily
- Neonates 0 to 7 days (≥ 2 kg): 5 mg/kg once daily
- Neonates 8 days to < 1 month: 5 mg/kg once daily

Or

Cefotaxime slow IV for 7 to 10 days

- Neonates 0 to 7 days (< 2 kg): 50 mg/kg every 12 hours
- Neonates 0 to 7 days (≥ 2 kg): 50 mg/kg every 8 hours
- Neonates 8 days to < 1 month: 50 mg/kg every 8 hours

Children one month and over

- Ceftriaxone IM or slow ivi 50 mg/kg once daily until the child's condition improves then change to oral route to complete 10 days of treatment with:
- Amoxicillin/clavulanic acid PO
  - Children < 40 kg: 25 mg/kg 2 times daily
  - Children ≥ 40 kg: 2 tablets of 500/62.5 mg 2 times daily

Uncomplicated pyelonephritis

- Ceftriaxone IM: 1 g single dose or Gentamicin IM: 5 mg/kg single dose

PLUS Ciprofloxacin PO: 500 mg 2 times daily for 7 days

Or

- Cefixime PO: 200 mg 2 times daily or 400 mg once daily for 10 to 14 days

Pyelonephritis with criteria for hospital admission

- Ampicillin slow IV 50mg/kg (Max 2g) every 6 hours for at least 3 days PLUS
- Gentamicin IM: 5 mg/kg once daily for 3 days then change to Amoxicillin/clavulanic acid PO (or another antibiotic depending on the antibiotic susceptibility test) to complete 10 to 14 days of treatment

Or

- Ceftriaxone IV 1 g once daily for at least 3 days PLUS Gentamicin IM: 5 mg/kg once daily for 3 days in the event of sepsis then change to amoxicillin/clavulanic acid PO (or another antibiotic depending on the antibiotic susceptibility test) to complete 10 to 14 days of treatment

Acute kidney injury (acute renal failure)

Definition

Acute kidney injury (AKI) is a syndrome characterised by a rapid decline in glomerular filtration rate and retention of fluid and nitrogenous waste products.

AKI is classified as prerenal, renal and postrenal failure. In neonates exclude congenital abnormality of the urinary tract

Clinical presentation

- Oliguria is the most common manifestation, i.e.:
  - Neonates: output < 1 mL/kg/hour.
  - Older children: output ≤ 0.3 mL/kg/hour.
- Prerenal: shock and dehydration.
- Postrenal: exclude obstruction, e.g. palpable bladder.
- Intrinsic kidney disease: oedema, volume overload, hypertension.
- Signs of underlying infection/septicaemia, e.g. fever, skin rash, etc.

Investigations

- Full blood count
- Serum urea, creatinine, electrolytes, calcium and phosphate (Look for typical biochemistry complications: hyperkalaemic metabolic acidosis, hyponatraemia, hypocalcaemia, hyperphosphataemia)
- Urine macroscopic appearance: brownish with acute tubular necrosis.
- Urine microscopy: red blood cell casts, leukocyte, hyaline and granular casts.
- Urine culture to exclude pyelonephritis.
- Ultrasound of kidneys and bladder.

Management

Non pharmacological

- Treat the underlying cause.
- Monitor fluid intake and output, blood pressure.
- Weigh daily.
- Nutritional support: High-energy diet. Give supplementary nasogastric feeds, if required.
- Restrict salt, potassium and phosphate intake.
- Avoid nephrotoxic or renally excreted medicines, e.g. NSAIDs, aminoglycosides, vancomycin, cough and cold mixtures, radiocontrast drugs.
- Fluid management:
  - Depends on volume status, urine output and extra-renal losses.
  - Never use a potassium-containing solution in an anuric patient.
  - Only use parenteral fluids if oral intake is not possible
  - Fluid balance is critical. Assess at least every 12 hours to make appropriate changes to fluid prescription.
  - Fluid management is done according to fluid status
- Insensible water loss is calculated as:
  - Neonates and young babies: 30 - 40 mL/kg/day
  - Older children: 25 mL/kg/day (400 mL/m2/day)
- Pulmonary oedema plus oliguria/anuria: Do not give fluid.
- Hydrated anuric patient without extra-renal fluid losses: Oral fluid to replace insensible water losses only.
- Normally hydrated plus oliguria: Oral fluid intake to replace insensible water loss plus urine output of previous 24 hours.
- Dehydrated, oliguric and ongoing extra-renal fluid losses:
- Replace fluid losses with an appropriate solution which mirrors losses e.g.:
  - For diarrhoea: ½ Darrows/dextrose 5%, IV or oral rehydration solution;
  - For vomiting/gastric fluid losses: sodium chloride 0.9%/dextrose 5%.
- Normally hydrated plus normal urine output: Give normal fluid intake.
- Polyuria, (urine output > 4 mL/kg/hour): which usually occurs during the recovery (diuretic) phase of acute tubular necrosis: Replace fluid and electrolyte losses with ½ Darrows/dextrose 5%, IV. Volume to replace is equal to urine output of preceding 12 hours.

Management of Hyperkalaemia

- Monitor ECG for signs of hyperkalaemia.
- Discontinue all sources of intake of potassium.
- Treat when serum potassium ≥6.5 mmol/L.
- Monitor response to treatment and adjust accordingly.
  - Calcium gluconate 10 %, IV, 0.5mL/kg/dose slowly over 3–5 minutes.
  - Salbutamol, solution, 2.5–5 mg/dose, nebulise over 20 minutes. OR
- Sodium bicarbonate 4.2%, IV, 4 mL/kg administered over 4 hours.
  - Do not mix calcium and sodium bicarbonate-containing solutions.

- Check Potassium level, if still no improvement
- Dextrose 10%, IV, 5 mL/kg over 20 minutes with/without insulin, soluble, 0.1units/kg depending on the blood glucose level.
  - If insulin is used -monitor for hypoglycaemia hourly.
- Sodium polystyrene sulphonate (Kayexelate), oral/rectal, 1 g/kg in dextrose water.
- If hyperkalaemia persists despite above treatment refer the patient urgently for dialysis.

Other complications

Metabolic acidosis: serum pH ≤ 7.1

- Sodium bicarbonate 4.2 %, IV, 4 mL/kg administered over 2–4 hours.

Infection

- Avoid nephrotoxic antibiotics.

Pulmonary oedema, volume overload and hypertension

- Do not give fluid to anuric patients with pulmonary oedema.
- Intubate and initiate positive pressure ventilation as necessary.
- Furosemide, IV, 2–5 mg/kg administered over 5 minutes. Maximum daily dose: 8 mg/kg/24 hours.
- Morphine, IV, 0.1 mg/kg. Repeat after 4 hours, if required.
- Oxygen, 100%, 2–3 L/minute by nasal cannula.

Note: Pulmonary oedema is an indication for dialysis in non-responsive cases.

Referral

- All children with AKI should be referred to a tertially hospital

DERMATOLOGY

Eczema

Definition

Eczema, also known as dermatitis, is a syndrome characterized by superficial inflammation of the epidermis and itching.

It is an inflammatory itchy skin condition characterised by:

- Vesicles, weeping and crusting during the acute stage.
- Scaling and lichenification during the chronic stage.

Types:

Atopic Dermatitis: Chronic disease that affects the skin and often occurs together with asthma, dermatitis, rhinitis and Conjunctivitis.

- Contact Dermatitis: Acute or chronic inflammation caused by allergens or irritants
- Napkin (Or Diaper area) dermatitis

Diagnostic criteria: Based on clinical history and signs

- Family history of allergies.
- Reaction after exposure to allergens.
- Typical distribution: face, flexures of knees and elbows, and creases of neck

Signs and Symptoms:

- Pruritus (constant symptom)
- And any of the following:
  - Blisters
  - Exudates and Erosions
  - Crusting/Excoriations
  - Xerosis
  - Erythroderma

Complications

- Secondary infection (bacterial, viral, fungal, etc)
- Post inflammatory Hypo or Hyper pigmentation
- Lichenification

Investigations

- Full blood count (Increase of Eosinophils is common)
- Identification of allergens (Prick Skin Test or Patch test not practical in our setting

Management

General and supportive measures

- Avoidance measures: use neutral soaps and rinse clothes properly after wash.
- Keep fingernails short to prevent scratching.
- Wrap with dressings soaked in sodium chloride 0.9%.
- Avoid sunlight and recommend use of sunscreen

For atopic dermatitis:

Non-*pharmacological management*

- Patient education
- Recommend Emollient to restore cutaneous barrier
- Aqueous cream: Apply > 2 times/day
- Emulsifying Ointment: apply > 2 times/day

Pharmacological management

- **Local Treatment:**
  - Antiseptic – Exudative lesions, Potassium permanganate diluted at 1/10,000 (500mg Tablet in 5 liters)
  - Antibiotics – Impetiginized lesions, Fucidine 2% 1 application/day/5 days.
  - Topical steroids: According to topography and thickness of the lesion
  - No long-term topical steroid treatment (local side effects and gradual loss of efficiency). Prefer short courses

First choice*:*

- Betamethasone dipropionate (Diprosone, Diprolene) Cream/Ointment 2 applications/day for 3-4 days, then 1 application/day for 3 days then 1 *application every 2 days/week for 2 weeks*

Alternatives*: According to the severity of the lesions and location:*

- Betamethasone valerate (Betneval) Cream/Ointment 2 applications/day for 3-4 days, then 1 application/day for 3 days then 1 application every 2 days/ week for 2 weeks ***OR***
- Methylprednisolone (Advantan) Cream/Ointment 1 application/day/3-4days then every 2 days/week for 1 week ***OR***
- Hydrocortisone Cream/Ointment 2 applications/day for 3-4 days, then 1 application/day for 3 days then 1 application every 2 days/week for 2 weeks

Side effects of topical steroids;

- Skin atrophy
- Skin Bleaching

- Systemic treatment:
  - Antihistamine for relief of the itching

- Desloratadine
  -Children 6 months - 6 years: 1.25 mg once a day
  -Children 6-12 years: 2.5 mg once a day
  -Above 12 years: 5 mg once a day
  OR
- Cetirizine/ Ebastine oral, as a single dose..

- Combined Phototherapy UVAB in erythrodermic atopic dermatitis

Recommendation

- Short duration of topical steroids whenever possible (Stop topical steroids as soon as skin lesions disappear)
- Encourage use of emollient
- Avoid medicated soap
- Other eczema, consider topical steroids as indicated in atopic dermatitis above

Bacterial infections (Impetigo)

Definition

A contagious intra-epidermal infection caused by streptococcus or staphylococcus and presenting as bullous lesions which rupture and crust. It comprises two types:

Non Bullous Impetigo:

- More common form and is a superficial infection of the skin that appears first as a discrete papullovesicular lesion surrounded by a localized area of redness.
- The vesicle become rapidly purulent and covered with crust.
- The lesions may occur anywhere but is more common on the face and extremities.
- There is usually no fever nor systemic signs.
- Also occurs in traumatized skin that forms vesicles or pustules initially and rapidly develops crust.

Bullous Impetigo:

- Less common and occur most often in neonates and young infants on a previously healthy skin.
- It is characterized by transparent bullae usually < 3cm diameter. The distribution involves the face buttocks trunk and perineum. Staphylococcus aureus usually responsible.

Signs and symptoms:

Non Bullous Impetigo

- Honey coloured crusters
- Lymphadenopathy
- Bullous Impetigo
- Flaccid and purulent bullous

Complications:

- Ulcerations
- Septicaemia
- Staphylococcal scaled skin syndrome (SSSS)

Investigations:

- Diagnosis is Clinical based on history and physical examination
- Swab for bacterial culture and sensitivity test

Management:

General measures

- Good personal and household hygiene to avoid spread of the infection and to reduce carriage of organisms.
- Trim finger nails.
- Wash and soak sores in soapy water to soften and remove crusts.
- Continue with general measures until the sores are completely healed.

Local Treatment:

- Antibiotics: Fucidic acid ointment (Fucidine 2%) 2 applications/day for 7 days
- Disinfectant with antiseptic solution;
- Potassium Permanganate diluted at 1/10,000 (500mg in 5 litres) OR
- Chlorhexidine solution (dermobacter) 2 applications/ Day for 7-10 da

Systemic treatment: Diffuse lesions

- Cefadroxil, oral, 15 mg/kg/dose 12 hourly for 5 days.
- Cloxacillin : <40 kg: 12.5-25 mg/kg/day PO divided q6hr *(Severe infection*: 50-100 mg/kg/day PO divided q6hr)
  : ≥40 kg: 125-500 mg PO q6hr

Penicillin allergy:
Children ≤ 18 kg
Erythromycin, oral, 10–15 mg/kg/dose 6 hourly for 5 days.
Children > 18–35 kg (able to take tablets)

- Azithromycin, oral, 250 mg daily for 3 days.

Children > 35 kg and adults

- Azithromycin, oral, 500 mg daily for 3 days. If impetigo has improved, but has not completely cured, give a 2nd 5-day course of antibiotics.

Referral

- No improvement after second course of antibiotics.
- Presence of blood in urine test or clinical features of glomerulonephritis.

Recommendation:

- Follow-up is important to ensure complete clearing of lesions

Cellulitis

Definition

A diffuse, spreading, acute infection within skin and soft tissues, commonly caused by streptococci and staphylococci.

- It is characterised by: oedema, redness, increased local temperature and no suppuration
- Frequently associated with lymphangitis and regional lymph node involvement.
- Commonly occurs on the lower legs, but may occur elsewhere.
- May follow minor trauma.
- There may be significant systemic manifestations of infection:
- Fever, tachycardia, hypotension, chills and delirium/altered mental state

Management

General measures

- Elevate the affected limb to reduce swelling and discomfort.

Medication

- Children ≤ 7 years of age
  - Cefadroxil, oral, 15mg/kg/dose 12 hourly for 5 days. OR
- Cloxacillin <40 kg: 12.5-25 mg/kg/day PO divided q6hr Severe infection: 50-100 mg/kg/day PO divided q6hr: ≥40 kg: 125-500 mg PO q6hr

Penicillin allergy*:*
Children ≤ 18 kg

- Erythromycin, oral, 10–15 mg/kg/dose 6 hourly for 5 days.

Children > 18–35 kg (able to take tablets)

- Azithromycin, oral, 250 mg daily for 3 days.

Children > 35 kg and adults
Azithromycin, oral, 500 mg daily for 3 days.
Severe cases: Refer for parenteral antibiotics.

Referral

Urgent

- Children who have significant pain, swelling or loss of function (to exclude osteomyelitis).
- Necrosis.
- Extensive cellulitis.
- Recurrent cellulitis associated with underlying conditions, e.g. lymphoedema.
- Cellulitis with systemic manifestations, e.g. confusion, hypotension.
- Poorly controlled diabetic patients.
- Involvement of the hand, face and scalp.

Non-urgent

- Inadequate response to initial antibiotic treatment

Staphylococcal scalded skin syndrome

Definition

Blistering skin condition that presents like scalded skin.

General and supportive measures

- Appropriate wound care.

Medication

- Cloxacillin, IV, 50 mg/kg/dose 6 hourly for 5 days.
- Neonates
  - Week 1–2 of age: administer 12 hourly.
  - Week 2–4 of age: administer 8 hourly.

Steven-johnson syndrome (sjs)/toxic epidermal necrosis (ten)

Definition

Life-threatening, acute hypersensitivity reaction with systemic upset, epidermal necrosis, and mucous membrane involvement.

TEN and SJS are different ends of the same spectrum: in TEN epidermal necrosis involves >30% of body surface area, while in SJS the involvement is <10%.

This condition is usually due to medication, e.g. sulphonamides, Nonnucleoside reverse transcriptase inhibitors (especially Nevirapine), Mebendazole, antiepileptics (phenytoin, Phenobarbitone, carbamazepine, lamotrigine), Allopurinol, laxatives (phenolphthalein).

Complications include:

- Dehydration, electrolyte disturbances and shock,
- Hypoalbuminaemia,
- Hypo and more commonly hyperthermia,
- High output cardiac failure,(resting cardiac output greater than 8 L/min)
- Secondary infection and sepsis; and
- Adhesions and scarring.

Diagnostic criteria

- Cutaneous lesions may start as a dusky red macular rash, progressing to confluence with epidermal necrosis and large flaccid blisters which rupture, leaving large areas of denuded skin. Mucous membrane erosions are common and multi- organ involvement may be present

General and supportive measure

- May require care in high or intensive care unit.
- Examine daily for systemic involvement, infection and ocular lesions.
- If infection is suspected, send blood and skin lesion specimens for culture and sensitivity before initiating antibiotic therapy.
- Do not puncture bullae or vesicles.
- Cool compresses and wet dressings.
- Regular supervised oral, genital and eye care to prevent adhesions and scarring.
- Encourage oral fluids, to prevent adhesions.
- Maintain fluid balance. Beware of shock.
- Nasogastric feeds if unable to eat, IV alimentation if enteral feeds are not possible.
- Stop all potentially causative medicines.

Medications

- These patients require effective pain control especially during change of dressing
- Skin hygiene, daily cleansing and bland, non-adherent dressings as needed.
- Do not use silver sulfadiazine if Stevens - Johnson syndrome is thought to be due to Cotrimoxazole or other sulphonamide.
- Empiric antibiotic therapy

For secondary infections

  - Cefadroxil , oral: 15mg/kg/dose 12 hourly Or
  - Cloxacillin oral: 25-50 mg/kg/day divided 6 hourly
- Use IV antibiotics if the oral route cannot be used.
  - Cloxacillin, IV, 50 mg/kg/dose 6 hourly. **OR**
  - Cefazolin IV 100-150 mg/kg/day divided 8 hourly
- Reconsider choice of antibiotic when the results of cultures become available or the child does not improve.

For oral lesions:

- Chlorhexidine 0.2%, 15 mL as a mouthwash.
  - Use as needed.
  - Do not swallow.

Note: The use of systemic corticosteroids is not recommended.

Referral

- All cases with signs of respiratory distress
- Discuss with a specialist, if considering re-initiation of medicine treatment

Acne

Definition

Acne is a skin disease characterized by pimples on the face, chest, and back. It occurs when the pores of the skin become clogged with oil, dead skin cells and bacteria, caused by changes in skin structures consisting of a hair follicle and its associated sebaceous gland. It can present in inflammatory or non-inflammatory forms.

Acne is most common during adolescence but may continue into adulthood. For most people, acne improves over time and tends to disappear in the early twenties. The most common sites for acne vulgaris are the forehead, cheeks, nose, and chin; the chest and back may sometimes be involved.

Causes and aggravating factors

- Sebum overproduction during puberty
- Altered hormonal status in adolescence with increased androgens in males
- Increased androgenic properties of progesterone in premenstrual females or those taking progesterone-containing contraceptives
- Some medicines (e.g., steroids) and cosmetics
- Family history
- Infection by Propionibacterium, mainly P. acnes

Signs and symptoms

Acne can be categorised as mild, moderate, and severe.

Mild

- Open and closed comedones (i.e. whiteheads and blackheads)
- Some papules and pustules (pimples), commonly on face, chest, back and shoulders

Moderate

- More frequent papules and pustules
- Mild scarring

Severe

- All of the above plus nodular abscesses
- Leads to more extensive scarring that may be keloidal in some cases

Management objectives

- Alleviate symptoms by reducing the number and severity of lesion
- Limit duration and recurrence
- Decrease sebaceous gland activity
- Decrease bacterial infection and inflammation
- Minimise cosmetic disfigurement and psychological suffering

Nonpharmacological management

Advise patients to:

- Avoid squeezing pimples because doing so may increase the risk of scarring
- Avoid excessive use of cosmetics and use only water-based products
- Wash face with mild soap and water 3 times/day; minimise scrubbing
- Get some sun (sunshine is helpful), but avoid sunburn
- Shave as lightly and as infrequently as possible.

Pharmacological management

For mild acne:

- Start with topical benzoyl peroxide cream or lotion 5%, once daily (use overnight).
- Treatment should be assessed after 4 weeks and, if beneficial, should be continued for at least 4–6 months.
- If no satisfactory response with benzoyl peroxide, use topical antibiotics or a combined preparation:
  - Erythromycin lotion or solution 1.5% or 2% applied twice daily to the affected area OR
  - Benzoyl peroxide 5%/erythromycin 3% gel applied twice daily to the affected area.

For moderate acne:

- Use topical treatment as for mild acne.
- If poor response to topical treatment, give oral antibiotics for at least 3 months:
  - Erythromycin 250 mg twice a day for 4 weeks OR
  - Doxycycline 100 mg once daily; can be taken with food or milk

Severe acne

- Use the topical treatment as for mild acne.
- Give also
  - Tetracycline 250-1,000 mg/day
  - Erythromycin 250–1,000 mg/day
- Duration of treatment depends on response. It may require 6 months to a year.
- Topical retinoid, e.g. Tretinoin cream/gel 0.05%, topical, applied sparingly once daily at bedtime until substantial improvement. Avoid contact with eyes and mucous membranes.

Referral

- All mild and moderate acne with poor response after 3 months of treatment
- All severe cases of acne
- Psychologically disturbed or depressed patient.
- Young females with premenstrual flare or with clinical signs of hyperandrogenism for consideration of oral contraceptives.

Fungal infections

Dermatophytes

Definition

Fungal infection often seen as Tinea or Ringworm with clinical entities/forms depending on the anatomic site and etiologic agents involved. It is of two types;

- Tinea Capitis: Fungal Infections of the Scalp or head and often found in children.
- Tinea Corporis: Fungal infection of the glabrous skin (Hairless part of the body)

Signs and symptoms:

Type	Clinical forms (Causative Agent)	Signs and symptoms
Tinea Capitis	Microsporic Tinea *(Microsporum spp)*	• Large patches/ plaques • Hair Fracture at few millimetres above surface of scalp (No alopecia)
	Tricophytic Tinea *(Tricophyton Spp)*	• Multiple small patches • Hair Fracture at the scalp giving black dots aspect
	Inflammatory Tinea/ kerion *(Microsporum spp and Tricophyton Spp)*	• Severe Inflammatory reaction with deep abscess causing hair loss with permanent alopecia after healing.
		• Yellow cup shaped crusts known as scotula • Hair is eliminated leading to permanent alopecia.
	Favus (Tricophyton schonleini)	Raised borders with Central normal skin, ring itself is red with dryness and scaling (Circinate lesions)
Tinea Corporis	All *spp*	• Itching • Skin rash • Small area of red, raised spots and pimples • Rash which slowly becomes ring-shaped, with a red-colored, raised border and a clearer center • The border of rash may look scaly • Rash may occur on the arms, legs, face, or other exposed body areas

Diagnosis:

- Clinical based on history and physical examination

Investigations:

- Looking at a skin scraping of the rash under the microscope using a potassium hydroxide (KOH)test
- Skin biopsy for histological exams

Management:

Types	Therapeutic options
Tinea capitis	**Topical treatment (always combined to systemic treatment).** • Ketoconazole (Nizoral) shampooing, 3times/week apply to moist hair after shower, and then wash off after 15 minutes OR • Whitefield ointment , apply BID **Systemic treatment: *First* choice:** • Griseofulvin (tabs 125mg,250mg, 500mg): 20 mg/kg/ day , 6 to 8 weeks taken once daily with fatty meal ***Alternatives:*** • Fluconazole (Flucazol syrup 50mg/ml) 6 mg/kg/day, 6 to 8weeks once a day. • If inflammatory Tinea: add systemic antibiotics to antifungal above mentioned
Tinea Corporis	**Local treatment:** • Miconazole nitrate 2% cream, 2 applications/day for 15 days OR • Clotrimazole cream, 2 applications/ day for 10 days. OR • Ketoconazole cream, 2 applications/ day for 10 days. **Systemic treatment(≥3 lesions):** *First choice:* • Griseofulvin 20 mg/kg/ day, 3-4 weeks taken with fatty meals. *Alternative:* • Fluconazole (Flucazol suspension, 50mg/ml) 6 mg/kg/day, 6 to 8weeks once a day.

Recommendation:

- Avoid sharing combs and towels to prevent Tinea capitis

Viral infections

Varicella Zoster Virus (Chicken pox, VZV)

Definition

An acute, highly contagious, viral disease caused by herpes varicella-zoster.
It spreads by infective droplets or fluid from vesicles. One attack confers permanent immunity. Varicella is contagious from about 2 days before the onset of the rash until all lesions crusted. Re-activation of the virus may appear later as herpes zoster or shingles (in children, consider immunosuppression if this occurs). Incubation period is 2–3 weeks.

Complications are more common in immunocompromised patients and include:

- Secondary skin infection,
- Pneumonia,
- Necrotizing fasciitis,
- Encephalitis,
- Haemorrhagic varicella lesions with evidence of disseminated, intravascular coagulation.
- Two important bacteria causing complications are Staphylococcus aureus and Streptococcus pyogenes

Diagnostic criteria

Clinical

- Mild headache, fever and malaise.
- Characteristic rash.
- The lesions progress from macules to vesicles in 24–48 hours.
- Successive crops appear every few days.
- The vesicles, each on an erythematous base, are superficial, tense 'teardrops' filled with clear fluid that dries to form fine crusts.
- The rash is more profuse on the trunk and sparse at the periphery of extremities.
- At the height of eruption, all stages (macules, papules, vesicles and crusts) are present at the same time.
- The rash lasts 8–10 days and heals without scarring, unless secondarily infected.
- Mucous membranes may be involved.
- Pruritus may be severe.
- Patients are contagious from 1–2 days before onset of the rash until crusting of lesions

Management

- Isolate the patient.
- Maintain adequate hydration.

Medications

- Antiviral therapy
- Indicated for immunocompetent patients with complicated varicella and for all immunocompromised patients.
- Initiate as early as possible, preferably within 24 hours of the appearance of the rash.
- Neonates, immunocompromised patients and all cases with severe chickenpox (not encephalitis)
- Acyclovir, oral, 20 mg/kg/dose 6 hourly for 7 days. Maximum dose: 800 mg/dose.
- In severe cases or in cases where oral medicine cannot be given: Acyclovir, IV, 8 hourly administered over 1 hour for 7 days
  - If 0 – 12 years: 20 mg/kg/dose 8 hourly.
  - If > 12 years: 10 mg/kg/dose 8 hourly

For mild pruritus:

- Calamine lotion, topical, applied 8 hourly.

For severe pruritus:

- Less than 2 years: Chlorphenamine, oral, 0.1 mg/kg 6–8 hourly for 24–48 hours.
- Over 2 years: Cetirizine, oral, 2.5-5 mg 12-24 hourly.

Secondary skin infection

- Cefadroxil, oral, 15 mg/kg/dose, 12 hourly for 5 days.

- Prophylaxis: Post exposure prophylaxis must be given to:
  - Neonates whose mothers develop varicella from 5 days before delivery to 2 days after delivery:
  - Varicella-zoster immunoglobulin, IM, 1 mL (100 units) given within 96 hours of exposure.
  - If varicella-zoster immunoglobulin is not available: Acyclovir, oral, 20 mg/kg/dose 6 hourly for 10 days.
  - Note: In neonates, prophylaxis may not prevent disease.

Infants and children > 28 days

- Immunocompromised children exposed to varicella:
  - Acyclovir, oral, 20 mg/kg/dose 8 hourly for 10 days given in the second week after exposure.
- Hospitalised immunocompetent children exposed to varicella (to limit spread).
  - Acyclovir, oral, 20 mg/kg/dose 8 hourly for 10 days given in the second week after exposure.

Referral: All patients with complications.

Parasitic infections

Scabies

Definition

Scabies is a contagious skin condition caused by a tiny mite (*Sarcoptes scabei*). It burrows into the outer layer of the skin and deposits its eggs there. It spreads easily through person-to-person contact. It is particularly problematic in areas of poor sanitation and overcrowding.

Signs and symptoms

- Nocturnal intense pruritus
- Lesion distribution:
- Interdigital web spaces.
- Around the nipples.
- Genital region.
- Lesion characteristics:
  - Papules, pustules or excoriations.
  - The pathognomonic sign: intradermal tunnel called scabietic “burrow”

Diagnosis

- Based on clinical history and physical examination.
  - The history particularly itching of recent onset, and careful scrutiny of hands and wrists will usually establish the diagnosis.

Investigation:

- Microscopic identification of skin scrapings

Complications:

- Secondary skin infection
- Sepsis

Management objectives

- Prevent re-infection or further spread of the disease
- Relieve the itching

Non pharmacological management

- All close family and skin-to-skin contacts must be treated at the same time to prevent re-infection, even if symptoms are not evident.
- The patient should be advised to wash, boil, dry in the sun, and iron all clothing, bedding, and bed linens after each use.
- The mattress, pillows, and chair cushions must be placed in the sun for at least 3 consecutive days.
- Advise the patient to keep his or her nails short and clean.
- Instruct the patient to dry his or her skin thoroughly after bathing and to put on clean clothes.
- The whole house should be cleaned and disinfected with a disinfectant spray.

Pharmacological management

- Use benzyl benzoate lotion 25%.
  - Adults and children >6 years: full strength 25% solution
  - Children <6 years: 12% solution (dilute 25% solution 1 part solution: 1 part water
  - Infants: 1:3 dilution
  - Apply benzyl benzoate lotion to the entire body, excluding the face and nipple area of breastfeeding women, for 3 consecutive evenings.
  - Leave on overnight and wash off the next day.
  - Attention should be paid to the toes, fingers, genital area and areas where the rash is seen.
  - A scrub bath must be taken before and after the 3 days of application.
  - Repeat the treatment after 10 days.
- Itching may persist for some weeks after completing the treatment. This can be relieved by taking Chlorpheniramine
  - Give Chlorpheniramine (4 mg tablets; 2 mg/5 ml syrup) PO every 4–6 hours daily.
    - Adults: One 4 mg tablet 4–6 times/day, not to exceed 24 mg/day
    - Children
      - 2–5 years: 1 mg (. teaspoon) syrup 4–6 times/day, not to exceed 6 mg/ day
      - 6–12 years: 2 mg (. tablet or 5 mL—1 teaspoon—syrup) 4–6 times/ day, not to exceed 12 mg/day
- Note: Itching usually starts to abate after 1 week and the rash after 3 weeks.

Referral

- If there are signs of treatment resistance, refer the patient to the specialist.

INFECTIOUS DISEASES

Malaria

Definition

Malaria is a febrile haematozoid parasitic illness due to *Plasmodium* parasites. It may be simple or severe form. In Rwanda, the main species is Falciparum (98% and the cause of severe malaria cases. In Rwanda, there 3 forms of malaria:

Simple Malaria

- Axillary temperature 37.5 °C or history of fever in the last 24 hours with or without the following signs: headache, weakness, chills, loss of appetite, stiffness, and muscular pains
- Laboratory confirmation using either a blood smear or a rapid test is compulsory in all cases without exception.

Simple malaria with minor digestive symptoms

- Characterized by signs of simple malaria with vomiting that prevents oral medication with or without associated moderate diarrhoea.
- The confirmation of Plasmodium by either blood smear or rapid test is compulsory without any exception.

Severe malaria

- ***All severe malaria cases must be admitted to hospital.***
- It is characterized by positive parasitaemia due to Plasmodium falciparum, accompanied by one or more of the following signs of severity or danger in the absence of an identified alternative cause:
    - Inability to drink or suckle;
    - Prostration; Generalized weakness with inability to sit, stand or walk without support
    - Vomiting every feed
    - Convulsions (≥ 2 convulsions in 24 hours);
    - Lethargy and unconsciousness.
    - Respiratory distress syndrome/Pulmonary oedema
    - Metabolic acidosis
    - Hypoglycaemia <2.2Mmol/L or < 40mg/dl
    - Renal impairment
    - Significant bleeding from any site
    - Signs of shock
    - Hyperparasitaemia of Falciparum> 10%
- Severe malaria is a medical emergency. Delay in diagnosis and inappropriate treatment, leads to rapid worsening of the situation.
- The keys to effective management are early ***recognition, assessment and appropriate antimalarial and supportive therapy.***

Management of different forms of malaria

Management of simple malaria; First line treatment:

- Artemisinin combination therapy (ACT): Artemether 20 mg and Lumefantrine 120 mg (COARTEM®), taken preferably during meals twice a day for 3 days

Table 25.Schematic diagram of COARTEM dosing according to the body weight of the patient

Category of body weight of the patient in kg	Type of blister administered	Number of tablets of COARTEM per dose					
		Day 1		Day 2		Day 3	
		First dose	8 hours after first dose	24 hours after first dose	36 hours after first dose	48 hours after first dose	60 hours after first dose
5 kg ≤ weight < 14 kg	6*1 (5-15 kg)	1	1	1	1	1	1
15 kg ≤ weight < 24 kg	6*2 (15-25kg)	2	2	2	2	2	2
25 kg ≤ weight < 34 kg	6*3 (25-35 kg)	3	3	3	3	3	3
≥ 35 kg	6*4 (> 35 kg)	4	4	4	4	4	4

Important instructions to follow:

- Respect the dose prescribed by the health provider;
- Artemether-lumefantrine is contraindicated in:
  - Children weighing less than 5 kg
  - During first trimester pregnancy
  - In cases of allergy to one of the two drugs in the combination
  - In severe liver or renal disease
- In such cases, oral quinine sulphate is indicated, 10 mg per kg body 3 times for 7 days;
- If there is no improvement after 48 hours of treatment Artemether-Lumefantrine, verify if the patient swallowed the drugs correctly, re-examine the patient carefully and do another peripheral blood smear, and if the test is positive, change the treatment to oral quinine sulphate at 10 mg per kg body weight per dose, taken three times a day over seven consecutive days.
- If the peripheral blood smear is negative, exclude and treat other causes of illness and/or refer the patient to the specialist
- If there is no improvement after 48 hours of treatment with quinine probably due to associated pathologies other than malaria, refer the patient to the specialist

Recommendation:

Monotherapy using artemisinine derivatives is not allowed for the management of simple malaria in Rwanda.

Management of simple malaria with minor digestive symptom:

*Artesunat***e** IV: 2.4 mg/kg body weight as a single dose on admission (time= 0) then at 12 hour, then daily thereafter.

- If the patient's condition improves, change to oral Artemether-lumefantrine twice a day for three consecutive days.
- If the patient's condition does not improve within 24 hours of treatment, refer the patient to the specialist

Note: *Preparation: Artesunate will be diluted in 1 ml 5% sodium bicarbonate (provided in the package), and then further diluted with 5% dextrose or 0.9% normal saline to a total volume of 6 ml, giving a final concentration of 10 mg/ml.*

In case of contra indications of Arthemether derivatives give;

- Quinine dihydrochloride (Salt) intra-rectal: 15mg/kg body weight diluted in 4 ml of distilled water or physiological saline and administered rectally with a 5 ml syringe every eight hours. The drug is administered slowly through the anus, and the buttocks are held together

for 5 minutes to prevent a premature reflex ejection of the drug.

- If the patient's condition improves, change to oral COARTEMR, 2 times a day for 3 consecutive days, or in the case of contraindications to COARTEMR, administer oral quinine
- If no improvement after 24 hours of treatment, refer to the hospital

Recommendation:

- If the drug is ejected during the first 10 minutes following its administration, administer another half dose;
- Diarrhoea and anal lesions contraindicates utilisation of intra-rectal route, then give Quinine dihydrochloride (salt) intravenous: 10 mg /kg body weight per dose, diluted in 5 to 10 ml of 5% or 10% glucose, every 8 hours.
- Rapid administration of Quinine is unsafe.
- If the patient's condition does not improve within 24 hours of treatment, refer the patient to hospital
- Quinine IM is contraindicated

Supportive treatment:

In case of diarrhoea and/or vomiting;

- Evaluate and monitor the hydration status of the patient
- Rehydrate the child with ORS or other available liquids, encourage breast feeding and other modes of feeding and if necessary use a nasogastric tube
- Anti-emetics should be avoided as necessary
- In case of fever, give oral Paracetamol 15 mg/ kg per dose

Management of severe malaria;

Recommendations:

- Treatment must be initiated based on malaria positive blood smear or rapid diagnostic test results
- Meanwhile, other investigations to determine severity and prognosis should be undertaken
- The management of severe malaria must be done in either district hospital or referral hospital (private or public).

Pre-transfer treatment at the health centre:

- It is indicated to administer antimalarial treatment only after obtaining a positive blood smear or positive rapid diagnostic test
- While preparing for the transfer of the patient, urgently administer IV Artusinate or quinine intrarectally IR or IV (IV infusion) if there is a contraindication to artemesinine derivates and depending on the general condition of the patient (weak pulse or not, dehydration or none), the health centre staff will administer, either:
  - Artesunate3.2 mg /kg IV as a single dose before transferring the patient **OR**
  - Quinine by intrarectal route in children, 20mg per kg body weight diluted in 4ml of distilled water of physiological saline, administered with a 5 ml syringe without a needle **OR**
  - Give quinine IV, preferably by intravenous infusion as a loading dose of 20 mg /kg body weight to run in 4 hours (not exceeding a total dose of 1200 mg for the loading dose);

Recommendation:

- Give parenteral antimalarial in the treatment of severe malaria for a minimum of 24h, once started (irrespective of the patient's ability to tolerate oral medication earlier), and, thereafter, complete treatment by giving a complete course of artemether plus lumefantrine orally.

- For cerebral malaria, administer the first dose of antibiotics; Ampicillin 50 mg/kg body weight per dose, four times a day accompanied by - chloramphenicol 25 mg/ kg body weight per dose, four times a day.
- In case of hypovolaemia (severe anaemia, rapid breathing, coma or systolic BP < 80 mm Hg), start with normal saline or Ringer's lactate infusion in a dose of 20 ml/kg to run for 15 minutes to move the patient out of shock.
- For malnourished children (kwashiorkor or marasmas), give the loading dose of quinine in IV perfusion without fluid replenishment (to avoid the risk of circulatory overload).
- The administration of quinine intravenous infusion is preferable in severe cases (repeated convulsions, coma. respiratory distress, shock)
- If an intravenous line is not possible, use intramuscular artemether or intrarectal quinine.

Note: The intramuscular use of Quinine is prohibited in all health facilities in Rwanda.

Supportive treatment:

- If the temperature is ≥38°C;
  - Do tepid sponging
  - Give Paracetamol 15 mg /kg body weight by oral route or suppository and injectable forms
- To prevent hypoglycemia (characterized by lack of consciousness, severe weakness);
  - Give 3-5ml/kg body weight of 10% glucose bolus or if not available 1 ml/kg of 50% glucose diluted in 4ml of water for injection Or
  - Administer water with 10% sugar per mouth or with nasogastric tube, at a rate of 5 ml/kg (Preparation of 10% sugar/water: take 100 ml of boiled clean water and add 10 g of sugar or 2 coffee spoons

Treatment of the severe malaria in the hospital;

- Artesunate 2.4 mg/kg IV or IM given on admission (time = 0), then at 12h and 24h, then once a day; Quinine is an acceptable alternative if parenteral Artusinate is not available

If Quinine is indicated:

- Loading dose of 20 mg/kg body weight of quinine dihydrochloride (do not exceed 1200 mg) diluted in an isotonic solution or 5 or 10% glucose on the basis of 5 to 10 ml/kg body weight to run for 4 hours in IV perfusion.
- Then run IV glucose 5 or 10% for 4 hours as maintenance drip. Thereafter, a maintenance dose of 10 mg/kg body weight of quinine dihydrochloride, to run for 4 hours repeated every 8 hours until the patient can swallow, within 48 hours
- After 48 hours, if the patient's state does not permit the patient to take quinine orally, continue the drip of quinine by reducing the doses to 7 mg/kg every 8 hours to run for 4 hours.
- Give parenteral antimalarials in the treatment of severe malaria for a minimum of 24h, once started (irrespective of the patient's ability to tolerate oral medication earlier), and, thereafter, complete treatment by giving a complete course of oral Artemether 20 mg and Lumefantrine 120 mg, as recommended for the treatment of simple malaria
- Change to oral quinine 10 mg/kg of quinine sulphate every 8 hours as soon as the patient can swallow; to complete the 7 days of treatment in case of contraindication in artemesinin derivates

***Recommendation*:**

- For the patient with weight ≥ 60kg give the loading dose, and decrease the dose from 1200mg to 800mg not to exceed 2000mg per day,

- The loading dose of quinine is not administered if the patient received quinine the past 12 hours or Mefloquine in the 7 past days
- Never exceed 2 g of daily dose of quinine
- For cerebral malaria, concurrent IV antibiotics is recommended; (Cefotaxime 50 mg/kg/ dose IV 6 hourly or Ceftriaxone 50mg/kg 12 hourly until meningitis and sepsis have been excluded
- For the anaemic form of severe malaria antibiotics are not indicated.
- Syrup Quinine is not recommended

Table 26. Summary of oral quinine dosing scheme

Body weight of patient in kg	**Number of tablets of quinine 300 mg per dose**
Weight ≤10 kg	¼ tablet
10 kg < weight ≤ 15 kg	½ tablet
15 kg < weight ≤ 21 kg	¾ tablet
21 kg < weight ≤ 31 kg	1 tablet
31 kg < weight ≤ 36 kg	1+ ¼ tablet
36 kg < weight ≤ 47 kg	1+ ½ tablet
Weight > 48 kg	2 tablets

Management of complications ***(World Health Organization 2015). Guidelines for the Treatment of Malaria. 3rd edition.***

Severe malaria is associated with a variety of manifestations and complications, which must be recognized promptly and treated as shown below.

Table 27. Immediate clinical management of severe manifestations and complications of P. falciparum malaria

Manifestation or complication	***Immediate management***
Coma (Cerebral malaria)	Maintain airway, place patient on his or her side, exclude other treatable causes of coma (e.g. hypoglycaemia, bacterial meningitis); avoid harmful ancillary treatments, intubate if necessary.
Hyperpyrexia	Administer tepid sponging, fanning, a cooling blanket and Paracetamol.
Convulsions	Maintain airways; treat promptly with intravenous or rectal diazepam 0.5 mg/kg body weight Intra-rectal; If convulsions persist, give Phenobarbital 10-15 mg/kg IVI/IM; Check blood glucose.
Hypoglycaemia	Check blood glucose, correct hypoglycaemia and maintain with glucose-containing infusion. Although hypoglycaemia is defined as glucose < 2.2 mmol/L, the threshold for intervention is < 3 mmol/L for children < 5 years and < 2.2 mmol/L for older children and adults.
Severe anaemia	Transfuse with packed cells 10ml/kg or screened fresh whole blood 20ml/kg

Manifestation or complication	*Immediate management*
Acute pulmonary oedema	Prop patient up at an angle of 45°, give oxygen, give a diuretic, stop intravenous fluids, intubate and add positive end-expiratory pressure or continuous positive airway pressure in life-threatening hypoxaemia.
Acute kidney injury	Exclude pre-renal causes, check fluid balance and urinary sodium; if in established renal failure, refer for haemodialysis/peritoneal dialysis.
Spontaneous bleeding and coagulopathy	Transfuse with screened fresh whole blood (cryoprecipitate, fresh frozen plasma and platelets, if available); give vitamin K injection.
Metabolic acidosis	Exclude or treat hypoglycaemia, hypovolaemia and septicaemia. If severe do haemodialysis.
Shock	Suspect septicaemia, take blood for cultures; give parenteral broad-spectrum antibiotics, correct haemodynamic disturbances.

Reference

1. *(World Health Organization 2015). Guidelines for the Treatment of Malaria. 3rd edition.*
2. *Rectal versus Intravenous Quinine for the Treatment of Childhood Cerebral Malaria in Kampala, Uganda: A Randomized, Double-Blind Clinical Trial* Jane Achan, Justus Byarugaba, Hubert Barennes, James K. Tumwine *Clinical Infectious Diseases, Volume 45, Issue 11, 1 December 2007, Pages 1446–1452,* https://doi.org/10.1086/522972

Meningitis

Definition

Meningitis is the inflammation of the meninges usually due to infection

Causes

- Bacteria (H.influenzae, streptococcus pneumoniae, meningococcus…)
- Viruses (Herpes group…)
- Fungi (Cryptococcus Neoformans)
- Protozoa (toxoplasma gondii…)

Note:

- Hemophilus Influenza and Streptococci are common causes in infants while Neisseria meningitides is responsible for epidemics in older children …)
- Mycobacterium tuberculosis, Fungal and protozoa infections are more common in immunocompromised children like in HIV/AIDS and malnutrition

Signs and symptoms

In younger infants

- Nonspecific features e.g. vomiting, restlessness, irritability and poor feeding
- Convulsions and bulging fontanel are more reliable signs in this age group

In older children

- Headaches
- Fever
- Convulsions
- Stiffness of the neck

Diagnosis

- Based on symptoms and signs

Investigations

- Lumber puncture and laboratory analysis of cerebral spinal fluid
- FBC, serum glucose, electrolytes (Na and K)
- Blood culture

Interpretation of the CSF results:
Either Bedside examination:

- Looks cloudy in bottle (turbid) and not a blood stained tap, and /or laboratory examination with one or more of:
  - White cell count more than 10x106/l
  - Gram positive diplococci or gram negative coco bacilli
    - If one is positive: definitive meningitis
    - If all lab negative but one of the following (coma, stiff neck, bulging fontanel and LP looks clear : probable meningitis
    - If all of the clinical signs mentioned above, and CSF not done: possible meningitis

Complications:

- Convulsions
- Brain oedema
- Coma
- Syndrome of inappropriate ADH secretion
- Brain abscess
- Cranial nerve palsies
- Psycho-motor retardation
- Hydrocephalus
- Epilepsy

Management:

General supporting measures:

- Admit in high dependence unit
- Follow ABC guidelines for unconscious patient
- Correct hypoglycemia if present
- Give maintenance fluids IV
- Stop convulsions with diazepam 0.5mg/kg intra rectal or Phenobarbital10 15mg/kg IV Feeding by NGT with milk, soup and porridge, if stabilized (then, stop IV fluids)

Antibiotics:

- *Definitive meningitis*: Cefotaxime 50 mg/kg/dose IV 6 hourly for 10 to14 days) or Ceftriaxone 50mg/kg 12 hourly for10 to 14 days
- If not available Ampicillin 50 mg/kg IV 6 hourly + Chloramphenicol 25mg/Kg IV 6 hourly for 10 to 14 days
- *Probable meningitis*: Same as definitive meningitis
- *Possible meningitis*: Same as definitive meningitis

Dexamethasone

- Reduces the risk of hearing loss in patients with H. influenzae or S. pneumoniae.
  - Given with or before the first dose of antibiotics except in neonates
  - Children > 1 month: 0.15 mg/kg (max. 10 mg) every 6 hours for 2 to 4 days
  - Monitor;

    - Vital signs (temperature, RR, HR, level of consciousness, diuresis)
    - Fluid input and output
- If suspected viral meningoencephalitis; Add Acyclovir IV 20mg/kg 8 hourly for 3 weeks
- If tuberculous meningitis, fungal and protozoal meningitis treatment refer to the respective treatment services
- Raised intracranial pressure or cerebral oedema (Must be managed in HDU/ICU)
    - Elevate head of bed ± 30°.
    - Maintain PaCO2 at 30–35 mmHg; intubate and ventilate if necessary.
    - Avoid fluid overload.
    - Mannitol, IV, 250 mg/kg administered over 30–60 minutes.
    - Dexamethasone, IV, 0.5 mg/kg 12 hourly.

Contraindications to performing LP:

- Focal neurological signs (strabismus, focal convulsions, unequal pupils…)
- Papilledema
- Glasgow coma scale less than 8/15 or Blantyre scale <3

Tetanus

Definition

Tetanus is an acute spastic paralytic illness caused by tetanospasmin, the neurotoxin produced by Clostridium tetani. The toxin prevents neurotransmitter release from spinal inhibitory neurons. It occurs in several clinical forms including generalized, localized and neonatal disease.

Cause

- Clostridia tetani

Signs and symptoms:

- Trismus (lock jaw)
- Opisthotonos (Rigid arching of back mucles)
- Dysphagia
- Laryngospasm
- Autonomic nervous system instability with hypertension, tachycardia and dysrhythmias

Diagnosis:

The diagnosis is made on clinical grounds.

- Unimmunised/incompletely immunised child.
- History of wound/trauma or unhygienic care of umbilical cord/stump.
- Trismus/False smile
- Stiffness of the neck, back and abdominal muscles.
- Pharyngospasm, laryngospasm, dysphagia, inability to suck, chew and swallow which severely compromises feeding and eating activities.
- Spontaneous muscle contractions/spasms or muscle contractions/ spasms triggered by minimal stimuli such as touch, sound, light or movement.
- No involvement of sensorium, i.e. consciousness is not disturbed.
- Autonomic nervous system instability with hypertension, tachycardia and dysrhythmias

Complications

- Asphyxia and Brain damage due to hypoxia spasms
- Inability to suck, chew and swallow leading to dehydration.
- Heart failure from arrhythmias
- Pneumonia, Laryngospasms, Respiratory failure
- Fractures

Investigations:

- No specific lab test is available to determine the diagnosis of tetanus
- Other tests done to rule out meningitis, rabies, strychnine poisoning e.t.

Management:

Non-Drug Treatment

- Admit to high or intensive care unit/High Dependency unit, in a tertially hospital
- Oxygen to prevent hypoxia and ventilatory support if needed
- Monitor:
  - Temperature
  - Respiration
  - Heart rate
  - Blood gases
  - SaO2
  - blood pressure
  - blood glucose
  - electrolytes
  - acid–base status
- Protect the patient from all unnecessary sensory and other stimuli
- Ensure adequate hydration and nutrition
- Wound care and debridement/umbilical cord care
- Educate parents/caregivers regarding prevention of tetanus by vaccination

Pharmacological

- Tetanus immunoglobulin, IM, 500–2 000 IU as a single dose
- Eliminate toxin production
  - Benzylpenicillin (Penicillin G), IV, 50000IU/kg/day (Neonate 12hourly and in older children 6hourly)
  - Metronidazole 40mg/kg/day IV in three divided doses for 7-10 days

Neonates less than 7 days old:

Weight	Dosage
<1.2 kg	7.5mg/kg/ i.v 48 hours
1.2-2 kg	7.5kg/kg ivi 0.d
> 2kg	15kg/kg/day 12 hourly

Neonates 7 days and older

Weight	Dosage
<1.2kg	7.5kg/kg 48 hourly
1.2-2 kg	15mg/kg/day 12 hourly
>2kg	30mg/kg/day 12 hourly

Infants and children Metronidazole 30mg/kg/24 hr ivi 6 hourly

  - Diazepam, IV, 0.1–0.2 mg/kg/dose 4–6 hourly, titrated according to response. Do not exceed dose of 10 mg/dose. Alternating with chlorpromazine 0.5 mg/kg 6 hourly PO (NGT)

After recovery from tetanus, patients should be actively immunized as the disease does not confer immunity

NB: Don't remove the NGT from the child until at least one-week seizure free.

Prevention of tetanus

Minor Wounds:

- Children with clean minor wounds do not require tetanus immunoglobulin or antibiotics
- Tetanus vaccine should be given, except in fully immunized patients who have received a booster within the past 5 years

For more severe wounds

- If child with penetrating wound is fully not immunized give tetanus immunoglobulin
  - < 5 years 75 IU
  - 5–10 years 125 IU
  - > 10 years 250 IU
  - Tetanus toxoid vaccine (TT), IM, 0.5 mL

- phenoxymethylpenicillin, oral, 12.5 mg/kg/dose 6 hourly for 7 days

OR

- Erythromycin, oral, 6.25–12.5 mg/kg/dose, 6 hourly for 7 days (if allergic to penicillins)

Recommendation

- Refer all cases of tetanus to intensive care /High dependency unit

Hepatitis

Definition

It is an acute inflammation of the liver with varying degrees of hepatocellular necrosis. The most commonly known are hepatitis A, B and less commonly C, D and E viruses. **Hepatitis A**

Cause:

- Hepatitis A RNA (virus)
- Vaccination does exist but provided in developed countries
- HAV is spread via the faecal-oral route

Symptoms and signs:

- Abrupt onset with nonspecific symptoms, such as fever, malaise, anorexia, vomiting, nausea, abdominal pain or discomfort, and diarrhoea.
- Jaundice occurs one week after onset of symptoms, along with choluria (bilirubin in the urine) and mild hepatomegaly.
- Young children are asymptomatic; Symptomatic 30 percent of infected children younger than six years, jaundice usually lasts for less than two weeks. Conjugated bilirubin and aminotransferases return to normal within two to three months
- In contrast, older children and adults with HAV infection are usually symptomatic for several weeks. Approximately 70 percent are jaundiced, and 80 percent have hepatomegaly. Symptoms last for a longer time
- The most common extrahepatic manifestations include an evanescent rash (11 percent) and arthralgias (14 percent). and less common extrahepatic manifestations include vasculitis, arthritis, optic neuritis, transverse myelitis, encephalitis, and bone marrow suppression

Complications:

- Acute liver failure is rare in developed countries , but account for 60% of liver failure in Latin America
- Death

Diagnosis: Made based on clinical symptoms and signs

Investigations

- Liver Function tests
- Anti-HAV IgM in a patient with the typical clinical presentation
- Serological tests for Hepatitis A

Management:

- improved sanitary conditions, adherence to sanitary practices, hand washing +++ (virus may survive for up to four hours on the fingertips)
- No specific treatment for Hepatitis A
- Bed rest may be recommended but does not alter the course of the illness
- Human immunoglobulin prophylaxis for those who had contact
- Isolate patient of Hepatitis A for 7–10 after the onset of jaundice

Patients rarely require hospitalization except for those who develop fulminant hepatic failure.

Hepatitis B

Cause:

- Hepatitis B DNA virus (HBV)
- Perinatal transmission is the most common cause of chronic infection
- Infants born to women with HBV infection (HBeAg positive or negative) should be tested for hepatitis B at 9-18 months even if vaccinated (at least 5% develop chronic HBV)
- All pregnant women should be screened for HBV infection

Symptoms and signs:

Infection with HBV is associated with characteristic changes in the serum levels of hepatitis B antigens and antibodies. These markers are used to define different clinical states

Acute hepatitis

- Acute HBV infection in children ranges from asymptomatic infection to fulminant hepatitis.
- Constitutional symptoms, anorexia, nausea, jaundice and right-upper-quadrant discomfort.
- The symptoms and jaundice generally disappear after one to three months, but some patients have prolonged fatigue even after normalization of serum aminotransferase concentrations. Older children and adolescents have mild constitutional symptoms during acute HBV infection.

Chronic hepatitis

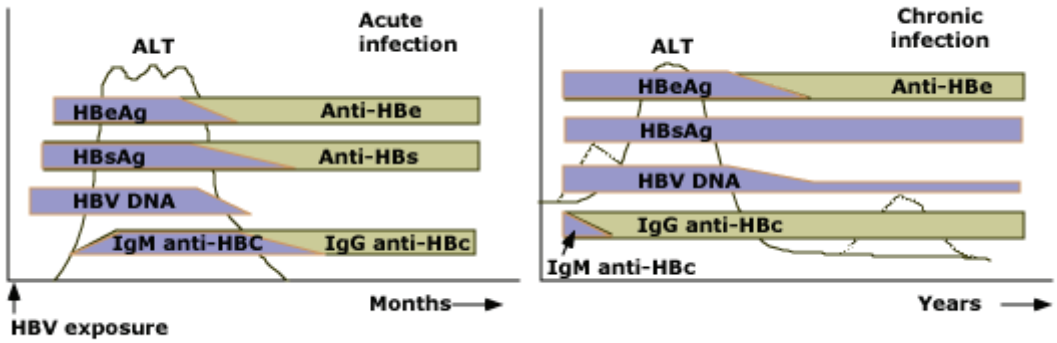
- Commonly asymptomatic and grow and develop normally.
- Vague right upper quadrant discomfort and fatigue, loss of appetite, jaundice.
- Extrahepatic manifestations including polyarteritis nodosa and glomerulonephropathy.

Diagnosis:

- Based on persistence of HBsAg for more than six months; IgG anti-HBc is positive, while IgM anti-HBc is negative
- Some carriers have large numbers of HBV in their serum and liver without symptoms or signs and without antibodies in their serum.

Investigations

Table 28. Serologic responses to HBV infection



- ***Left panel**: Acute infection*:
  - HBeAg (hepatitis B e antigen), HBsAg (hepatitis B surface antigen), and HBV DNA beginning in the preclinical phase.

- IgM anti-HBc (hepatitis B core antigen) appears early in the clinical phase; the combination of this antibody and HBs Ag makes the diagnosis of acute infection.
- Recovery: normalization of the serum ALT, the disappearance of HBV DNA, HBeAg to anti-HBe seroconversion, and subsequently HBsAg to anti-HBs seroconversion and switch from IgM to IgG anti-HBc. Then previous HBV infection is characterized by anti-HBs and IgG anti-HBc.

- ***Right panel:*** *Chronic infection*:
  - Persistence of HBsAg for more than six months after acute infection
  - Persistence of HBeAg (for a variable period), HBsAg, and HBV DNA in the circulation
  - Anti-HBs is not seen.

- Other tests
  - Liver Function tests (Prothrombin time, Bleeding time)
  - Glycemia if severe
  - HBV tests (refer to figure)
  - Blood ammonia
  - Urea and electrolytes in cases of liver failure
  - CBC to determine severity of anaemia

Complications:

- Chronic Liver Disease: In children born from infected mother 76 percent of them are HBeAg positive at 10 years of age. The frequency of spontaneous seroconversion increases during puberty (Cirrhosis)
- Liver failure (hepatic encephalopathy)
- Portal hypertension (GIT bleeding, hematemesis and melena stools)
- Hepatorenal syndrome /reduced glomerular filtration rate.
- Liver cancer

Management:

General measures:

- Counseling of the patient about alcohol use in adolescents and family, surveillance for disease progression and development of complications,
- Regular monitoring of liver function tests every 3 months
- Patients who are in the inactive carrier phase of hepatitis B infection (ie, HBsAg positive, HBeAg negative, anti HBe positive, persistently normal ALT/AST levels, serum HBV DNA <10(5) copies/mL) should undergo monitoring of liver biochemical tests every 6 to 12 months.

Selection of patients for treatment:

- Treatment is generally considered in patients with HBV DNA positive chronic hepatitis who are in the immune active phase (usually defined as ALT >2 x ULN and HBV DNA >20,000 IU/mL or 10(5) copies/mL, for at least six months)
- Children with ALT values greater than 10 times the upper limit of normal but with concomitant low HBV DNA levels may be in the process of spontaneous seroconversion, and may not require treatment. These patients should be observed for several months with serial serologic testing.
- If there is evidence of hepatic decompensating, such as jaundice or coagulopathy, treatment should be initiated earlier
- Several other considerations may be relevant to treatment decisions (co-infected with HCV, HIV or HDV)

Choice of treatment:

- Lamivudine, TDF and interferon (IFN), are licensed for use in children Adefovir approved for use in those over 12 years of age.
- IFN alfa as the first-line treatment for the patients with serum ALT more than twice the upper limit of normal, have positive HBeAg, who are committed to adhering to the treatment, and have no comorbid diseases that might be exacerbated by an immunostimulatory agent
- If the patient does not respond to IFN alfa (defined by detectable HBV DNA and elevated serum ALT six months after completion of the course of IFN alfa), a nucleoside/nucleotide analog such as lamivudine or adefovir can be used – this shall be considered as primary treatment if IFN alpha not available

Acute liver failure

Definition

Acute liver failure is the rapid deterioration of liver function due to massive necrosis of liver cells resulting into coagulopathy and alteration in the mental status of a previously healthy individual.

Causes:

- Hepatotoxicity due to drugs like acetaminophen
- Viral (hepatitis, cymegalovirus, hemorrhagic fever viruses, herpes simplex virus)
- Autoimmune hepatitis
- Miscellaneous causes
- Poisons e.g. Mushrooms

Signs and symptoms:

- Malaise
- Vomiting
- Anorexia
- Stupor/Encephalopathy
- Foetor hepaticus
- Bleeding tendency
- Ascites
- Jaundice often present but not always
- Ascites

Diagnosis: Based on the above clinical signs and symptoms

Investigations:

- Raised or low liver enzymes, low serum albumin, raised bilirubin, raised blood ammonia
- Hypoglycaemia
- Prolonged prothrombin time
- Low fibrinogen
- FBC
- Urea-creatinine and electrolytes

Management

Non-pharmacological treatment:

- Admit to high care or intensive care unit
- Monitor blood pressure, urine output, heart rate, neurological state, respiration, gastrointestinal bleeding, haematocrit, blood glucose (3 hourly if comatose), acid–base status, liver and renal functions, coagulation, competence (INR), electrolytes: sodium, potassium, calcium and phosphate
- Maintain hydration
- Aim to reduce ammonia production by the gut and optimise renal excretion for patients with encephalopathy
- Withdraw protein completely initially followed by restricted intake if level of consciousness improves, i.e. 0.5–1 g/kg/24 hours
- Stop medium chain triglyceride supplements but maintain an adequate energy intake
- Stop sedatives, diuretics and hepatotoxic drugs, if possible

Pharmacological treatment:

- Lactulose, oral, 1 g/kg/dose 4–8 hourly via nasogastric tube, then adjust dose to produce frequent soft stools daily (to reduce intestinal protein absorption)

OR

- Polyethylene glycol solution with sodium sulphate and electrolytes, oral/via nasogastric tube, 10–25 mL/kg/hour over 6 hours. Follow with lactulose.
- Neomycin, oral, 12.5 mg/kg/dose 6 hourly for 5 days
- Mannitol, IV, 250 mg/kg administered over 30–60 minutes (if cerebral Oedema with serum osmolality < 320)
- Fresh frozen plasma, IV, 20 mL/kg over 2 hours (pre-operative)
- Vitamin K1, IV/oral, 2.5–10 mg daily never gives IM
  - Monitor response to vitamin K1 with INR and PTT
- Platelet transfusion (if platelet count < 10 x 109/L or if < 50 and with active bleeding
- Ranitidine, IV/oral 3–4 mg/kg/day 8 hourly

  OR
- Omeprazole, oral initiated by the specialist;
  - Neonate 1–2 mg/kg, 12– 24 hourly
  - 1 month–2 years 5 mg, 12 hourly
  - 2–6 years 10 mg, 12 hourly
  - 7–12 years 20 mg, 12 hourly

  AND/OR
- Sucralfate, oral, 250–500 mg 6 hourly
- Dextrose 10%, IV bolus 2 mL/kg (for patient with hypoglycaemia
- Ringers lactate with dextrose 5%, IV, 60–80mL/kg/day, ensure a minimum of 3–6 mmol/kg/day of potassium

- Avoid diuretics
- Packed red cells, 10 mL/kg over 3 hours if haemoglobin < 7 g/dL For anaemia
- For sedation, if essential;
  - Midazolam, IV, 0.1 mg/kg Amelioration of liver injury, especially in idiopathic/toxin cases
  - Ampicillin, IV, 25 mg/kg/dose, 6 hourly + Cefotaxime, IV, 25–50 mg/kg/dose, 6–8 hourly + Nystatin 100 000 units/mL, oral, 0.5 mL after each feed. Keep nystatin in contact with affected area for as long as possible

Recommendation

- All cases of liver failure should be managed in a referral /Tertially hospital

Septicaemia

Definition

Septicemia is a suspected or proven infection plus an uncontrolled systemic inflammatory response syndrome, SIRS (e.g., fever, tachycardia, tachypnea, and leukocytosis).

Causes:

- Bacterial: (Streptococcus pneumoniae, Haemophilus influenzae type b, Neisseria meningitidis, group A streptococcus, S. aureus, Salmonella)
- Viral infection: (influenza, enteroviruses, hemorrhagic fever group, HSV, RSV)
- Encephalitis: (arboviruses, enteroviruses, HSV)
- Vaccine reaction (pertussis, influenza, measles)
- Toxin-mediated *reaction* (toxic shock, staphylococcal scalded skin syndrome)

Clinical evaluation:

- Assess Air way, Breathing (RR, signs of respiratory distress and pulse oximetry),
- Circulation (HR, BP, Skin for signs of dehydration, JVP)
- SIRS a is systemic inflammatory response with at least two of the following four criteria, one of which must be abnormal temperature or leucocyte count:
  - Core temperature of < 36°C or > 38.5°C,
  - Tachycardia,
  - Tachypnoea,
  - Increased WBC (>12,000/mm3) or decreased (<4000/mm3) PLUS, one of the following:
    - Cardiovascular dysfunction,
    - Acute respiratory distress syndrome, or
    - ≥ 2 other organ dysfunctions
- Identify source of infection e.g pneumonia, abdominal abscess, meningitis e.t.c
- Assess organ function e.g. CNS (LOC, focal signs) , Renal function for urinary output

Diagnosis: Based on signs and symptoms complemented by laboratory investigations

Clinical

On examination, look for the following:

- Fever with no obvious focus of infection
- Blood film for malaria is negative
- No stiff neck or other specific signs of meningitis (or a lumbar puncture for meningitis is negative)
- Signs of systemic upset (e.g. inability to drink or breastfeed, convulsions, lethargy or vomiting everything)

- Purpura may be present.
- Always fully undress the child and examine carefully for signs of local infection before deciding that no cause can be found.

Laboratory evaluation

- Identify SIRS; CBC and White-cell differential
- Identify source of infection; Blood and urine culture and sensitivity, sputum, CSF analysis, Chest radiography and Ultrasonography when indicated
- Assess organ function;
  - Renal function: Electrolytes, BUN, creatinine
  - Hepatic function: Bilirubin, AST, alkaline phosphatase
  - Coagulation: INR, PTT, platelets

Complications:

- Convulsions
- Confusion or coma
- Dehydration
- Multiorgan failure
- Disseminated intravascular coagulation(with bleeding episodes)
- Pneumonia
- Septic shock; which is the main cause of death

Management:

- Assess for Air way, Breathing, Circulation, and Dehydration followed by appropriate management.
- Treat the source of sepsis e.g abscess, peritonitis
- First choice treatment
  - Neonates: Cefotaxime, IV, 75 mg/kg/dose, 8 hourly
  - Children > 1 month: Ceftriaxone, IV, 50 mg/kg/dose, 12 hourly.

Alternative:

  - Give IV ampicillin at 50 mg/kg every 6 h plus IV gentamicin 7.5 mg/kg once a day for 7–10 days
- If staphylococcal infection is suspected use Cloxacillin, IV, 50 mg/kg/dose 6 hourly for at least 14 days, (longer courses often required).

Monitoring

- The child should be checked by nurses at least every 3 hours and by a doctor at least twice a day.
- Check for the presence of complications such as shock, reduced urine output, signs of bleeding (petechiae, purpura, bleeding from venepuncture sites), or skin ulceration.

Recommendation:

- Immunization with the conjugate H. influenzae type b and S. pneumoniae vaccines is for all infants

N.B Use of Corticosteroids in patients with sepsis has adverse effects like hyperglycemia and immunosuppression thus leading to nosocomial infection and impaired wound healing. Studies reveal that early use of short-course, high-dose corticosteroids does not improve survival in severe sepsis.

Septic arthritis

Definition

Septic arthritis is defined as an acute articular suppurative infection caused by pyogenic microorganisms. It may occur as a result of haematogenous seeding of the synovium during transient periods of bacteraemia and often part of a generalised septicaemia which may involve more than one joint

Table 29. Causes of septic arthritis

Neonates	S.aureus, Group B. Streptococci, E. coli, fungi
Infants/children	S.aureus, H. influenzae, Group A Streptococci, S. pneumonia
Children - Sexually active	N. gonorrhoea
Chronic septic arthritis	Brucella, tuberculosis, atypical mycobacteria, fungi and other uncommon organisms

Risk factors:

- Trauma
- Rheumatoid arthritis or osteoarthritis
- Sickle cell disease
- Skin infections
- Sexual activity
- Immune deficiency (HIV, etc.)

Symptoms and signs:

- Fever, local pain, loss of function and toxic/septic looking child.
- In neonates and infants signs and symptoms may be nonspecific and subtle (not well remarked)
- Malaise, irritability, feeding problems and pseudoparalysis
- Local tenderness, warmth, swelling at a joint with restriction of passive and active movement.
- Poor weight gain

Old infants and children:

- Acute onset of pain, warm, and swollen joint
- Usually monarticular and affecting large weight-bearing joints (knee, shoulder or hip)

Complications:

- Sepsis
- Osteomyelitis
- Destruction of articular cartilage, permanently damaging the joint
- Secondary infectious site (bacterial endocarditis, brain abscess, etc.)

Investigations:

- Joint ultrasonography
- Aspiration of pus under sonar guidance for microscopy, Gram stain, culture and sensitivity.(Done by a specialist/orthopedic surgeon)
- FBC and CRP
- X-ray
- Blood culture and sensitivity before starting antibiotic treatment
- Scintigraphy
- MRI

Management:

Non- pharmacological management:

- Emergency surgical drainage of pus from infected joints

Pharmacological management:

Antibiotics: Minimum duration of therapy is 4–6 weeks.

Neonates:

- Cloxacillin IV:
  - 1st -2nd week of life: 50 mg/kg/dose 12 hourly,
  - 3rd – 4th week of life: 50mg/kg/dose 8 hourly
  - > 4 weeks of life 50mg/kg/dose 6 hourly + Cefotaxime, IV, 50 mg/kg/dose (preterm 12 hourly, 1st week of life 8 hourly and > 2 weeks 6 hourly)

Infants and children:

- Cloxacillin IV 50mg/kg/dose, 6 hourly PLUS Cefotaxime IV 25–50mg/kg/dose, 6 hourly
- Do arthrocentesis and culture to treat appropriately to sensitivities

Antipyretics and anti-inflammatories:

- Ibuprofen, oral, 5–10 mg/kg/dose, 6 hourly

Recommendations:

- Penicillin antibiotic given for up to 6 weeks, with the first 2 weeks administered intravenously followed by a switch to oral treatment if an oral option exists and clinical signs, symptoms, and inflammatory markers are settling
- IV antibiotics regimen is adjusted based on the results of culture and sensitivity testing

Alternative:

- Vancomycin 50mg/kg/day divided in 3 doses. Maximum dose is 1g/dose

Acute Osteitis/Osteomyelitis

Definition

Osteitis is inflammation of the bone while osteomyelitis is an infection of the bone

Most cases result from haematogenous deposition of organisms in the bone marrow after a transient bacteraemia episode. Osteomyelitis most commonly begins in the metaphyses of long bones which are highly vascular. The spread of infection through the epiphysis can result in septic arthritis.

Causes:

- Neonates: S. aureus, Group B Streptococci, Gram negative (E. coli).
- Infants/children: S. aureus, H. influenzae, Group A Streptococci, S. pneumoniae.
- Traumatic direct infection: P. aeruginosa (penetrating foot wounds).
- Co-existing medical conditions e.g. diabetes, HIV, leucopoenia: M. tuberculosis, fungi.
- Sickle cell disease: Salmonella, pneumococcus.

Diagnostic criteria

Clinical

- Local pain and tenderness, loss of function, general toxicity and fever.
- If lower extremities are involved (development of a limp or refusal to bear weight).
- In neonates, early signs may be subtle or non-specific, e.g. irritability, feeding problems and pseudoparalysis.
- Investigate for multi-organ disease, e.g. endocarditis, pericarditis and pneumonia.

Investigations

- Full blood count (raised white cell count)
- CRP raised
- Aspiration of pus for microscopy, Gram stain, culture and sensitivity.
- Blood culture
- X-ray after 2 weeks.
- Bone scan (Tc99).
- MRI.

General Management

- Immobilize affected limb in position of function.
- Supportive and symptomatic care.

Medications

- Minimum duration of therapy: 4–6 weeks.
- Initiate IV antibiotic treatment immediately as diagnosis is made and blood and pus specimens have been collected.
- Adjust antibiotic therapy based on culture results or if response to antibiotic treatment is unsatisfactory.
- Where a single agent has been found to be sensitive, continue treatment on that single agent.
- Continue with IV antibiotics until there is evidence of good clinical response and laboratory markers of infection improve. Once clinical improvement and inflammatory markers have normalized, patients can be switched to oral antibiotic therapy.
- Ongoing fever suggests an undrained focus of pus.

Neonates:

- Cloxacillin, IV, 50 mg/kg/dose
  - If 1st week of life: 12 hourly.
  - If 2nd–4th week of life: 8 hourly.
  - If > 4 weeks old: 6 hourly.

  PLUS
- Cefotaxime, IV, 50 mg/kg/dose.
  - Preterm: 12 hourly.
  - If 1st week of life: 8 hourly.
  - If > 2 weeks old: 6 hourly.

Infants and children:

- Cloxacillin, IV, 50 mg/kg/dose 6 hourly.

  PLUS
- Ceftriaxone, IV, 50 mg/kg/dose 12 hourly.

Special Circumstances

- If MRSA, replace Cloxacillin with vancomycin.
  - Vancomycin IV, 15 mg/kg/dose administered over 1 hour given 8 hourly (Monitor renal function)
- Penetrating foot bone injuries: replace cefotaxime with ceftazidime plus an aminoglycoside:
  - Ceftazidime, IV, 50 mg/kg/dose 6 hourly.

    PLUS
  - Gentamicin, IV, 6 mg/kg once daily.

Oral antibiotics

- Can transition to oral therapy once there is sustained clinical improvement, resolution of fever, normal white cell count and CRP 4-6 weeks of treatment.
- Flucloxacillin, oral, 25 mg/kg/dose, 6 hourly.

Referral: ***Refer or discuss all cases with an orthopaedic surgeon***

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Salmonella infections (typhoid fever):

Definition: is a systemic infection with the bacterium Salmonella enterica serotype typhi.

Causes and risk factors

- Salmonella typhi causes typhoid. The bacteria survives only in humans.
- More than 95% of all transmission occurs through food, especially eggs.
- Water contaminated by faeces from an infected person carries the disease.
- Symptoms are most severe in infants and those with other comorbidities
- Immune compromised patients are frequently affected and have recurrences.

Signs and symptoms

Initial signs and symptoms:

- Prolonged or high fever (≥38.8), with profuse sweating, in a previously healthy individual, lasting>1 week; the person may become delirious and possible convulsions
- A slower pulse rate than expected with the level of fever
- Dull frontal headache
- Poorly localized abdominal pain, constipation, anorexia, nausea and diarrhoea later in the illness; may be accompanied by frank bleeding
- A coated tongue, abdomen tenderness and hepatosplenomegaly are common findings
- Jaundice may occur

Signs of complications

- Intestinal perforation—abdominal tenderness, with sudden increase in pulse rate and hypotension
- Altered mental status

NB: there is no typhoid fever without fever or hypothermia in infants !!!

Diagnosis:

On examination, key diagnostic features of typhoid are:

- Fever with no obvious focus of infection
- No stiff neck or other specific signs of meningitis, or a lumbar puncture for meningitis is

negative (note: children with typhoid can occasionally have a stiff neck
- Signs of systemic upset, e.g. inability to drink or breastfeed, convulsions, lethargy, disorientation/confusion, or vomiting everything
- Rose spots on the abdominal wall in light-skinned children
- Hepatosplenomegaly, tense and distended abdomen.

Note:
- Typhoid fever can present atypically in young infants as an acute febrile illness with shock and hypothermia.
- The differential diagnosis is broad and includes malaria, amoebiasis, dengue fever, leishmaniasis, and other causes of bacterial gastroenteritis

Laboratory evaluation
- FBC (may show leukocytosis or leucopenia, thrombocytopenia, severe anaemia follows intestinal bleeding)
- Blood culture(Gold standard) will isolate the bacteria during the first 2 weeks of illness
- Stool culture will isolate the bacteria during the later period of illness.
- Plain X-rays of abdomen in erect position will show gas under the diaphragm if there is gut perforation

Note:
- Serologic tests such as the Widal test are of limited clinical utility in endemic areas because positive results may represent previous infection. Positive serology alone shall never be a base for treatment of typhoid fever

Complications:
- ***GIT:*** gastrointestinal bleeding, intestinal perforation, abdominal mass due to abscess formation
- ***CVS:*** Asymptomatic electrocardiographic changes, Myocarditis, Shock
- ***CNS:*** Encephalopathy, Delirium, Psychotic behaviour, Meningitis, Impairment of coordination
- ***Haematologic:*** Anaemia, Disseminated intravascular coagulation
- ***Respiratory***: Bronchitis, Pneumonia (Salmonella enterica serotype typhi, Streptococcus pneumoniae)
- ***Others***: Focal abscess, Pharyngitis, Relapse and Chronic carriage
- Chronic carriers frequently have high serum antibody titers against the Vi antigen, which is a clinically useful test for rapid identification of such patients

Management:

Management objectives:
- Reduce the fever
- Prevent dehydration
- Prevent the spread of the disease in the community

Nonpharmacological management
- Encourage adequate oral fluids or initiate IV infusion.
- Ensure appropriate nutrition.
- Tepid sponging with lukewarm water (32-35oC) to reduce the fever.
- Isolate the patient
- Identify and treat all carriers

Pharmacological
- Paracetamol to reduce fever
- Rectal Diazepam if there are convulsions

- blood transfusion in case of severe bleeding
- Ciprofloxacin ivi 10mg/kg/dose (max400mg) 12 hourly or 15mg/kg (max500mg) orally 12 hourly for 7-10 days
- Ceftriaxone 50 mg/kg 12 hourly IV for 7-14 days OR
- Cefotaxime 50 mg/kg IV 6 hourly for 7-14days

Follow up review: check for the following:

- Efficacy of treatment: fever
- Perforation (abdominal pain, tenderness,)
- Myocarditis (heart rate, gallop rhythm)

Varicella (chicken pox)

#? Transfer to Dermatology

Definition

An acute, highly contagious, viral disease caused by herpes varicella-zoster.
It spreads by infective droplets or fluid from vesicles. One attack confers permanent immunity. Varicella is contagious from about 2 days before the onset of the rash until all lesions crusted. Re-activation of the virus may appear later as herpes zoster or shingles (in children, consider immunosuppression if this occurs). Incubation period is 2–3 weeks.

Complications are more common in immunocompromised patients and include:

- Secondary skin infection,
- Pneumonia,
- Necrotizing fasciitis,
- Encephalitis,
- Haemorrhagic varicella lesions with evidence of disseminated, intravascular coagulation.
- Two important bacteria causing complications are Staphylococcus aureus and Streptococcus pyogenes

Diagnostic criteria

Clinical

- Mild headache, fever and malaise.
- Characteristic rash.
- The lesions progress from macules to vesicles in 24–48 hours.
- Successive crops appear every few days.
- The vesicles, each on an erythematous base, are superficial, tense 'teardrops' filled with clear fluid that dries to form fine crusts.
- The rash is more profuse on the trunk and sparse at the periphery of extremities.
- At the height of eruption, all stages (macules, papules, vesicles and crusts) are present at the same time.
- The rash lasts 8–10 days and heals without scarring, unless secondarily infected.
- Mucous membranes may be involved.
- Pruritus may be severe.
- Patients are contagious from 1–2 days before onset of the rash until crusting of lesions

Management

- Isolate the patient.
- Maintain adequate hydration.

Medications

- Antiviral therapy
- Indicated for immunocompetent patients with complicated varicella and for all immunocompromised patients.
- Initiate as early as possible, preferably within 24 hours of the appearance of the rash.
- Neonates, immunocompromised patients and all cases with severe chickenpox (not encephalitis)
- Acyclovir, oral, 20 mg/kg/dose 6 hourly for 7 days. Maximum dose: 800 mg/dose.
- In severe cases or in cases where oral medicine cannot be given: Acyclovir, IV, 8 hourly administered over 1 hour for 7 days
  - If 0 – 12 years: 20 mg/kg/dose 8 hourly.
  - If > 12 years: 10 mg/kg/dose 8 hourly

For mild pruritus:

- Calamine lotion, topical, applied 8 hourly.

For severe pruritus:

- Less than 2 years: Chlorphenamine, oral, 0.1 mg/kg 6–8 hourly for 24–48 hours.
- Over 2 years: Cetirizine, oral, 2.5-5 mg 12-24 hourly.

Secondary skin infection

- Cefadroxil, oral, 15 mg/kg/dose, 12 hourly for 5 days.
- Prophylaxis: Post exposure prophylaxis must be given to:
  - Neonates whose mothers develop varicella from 5 days before delivery to 2 days after delivery:
  - Varicella-zoster immunoglobulin, IM, 1 mL (100 units) given within 96 hours of exposure.
  - If varicella-zoster immunoglobulin is not available: Acyclovir, oral, 20 mg/kg/dose 6 hourly for 10 days.
  - Note: In neonates, prophylaxis may not prevent disease.

Infants and children > 28 days

- Immunocompromised children exposed to varicella:
  - Acyclovir, oral, 20 mg/kg/dose 8 hourly for 10 days given in the second week after exposure.
- Hospitalised immunocompetent children exposed to varicella (to limit spread).
  - Acyclovir, oral, 20 mg/kg/dose 8 hourly for 10 days given in the second week after exposure.

Referral: All patients with complications.

— | Mumps

Definition: A viral infection primarily involving the salivary glands.
Incubation period: 14–21 days.

Signs and symptoms:

- Fever.
- Pain on opening the mouth or eating.
- About two days later a tender swelling appears below the ears at the angle of the jaw. Often first on one side and later on the other.
- The swelling disappears in about 10 days.

General measures

- Bed rest during febrile period.
- Advise on oral hygiene.
- Recommend plenty of fluids and soft food during acute stage.
- Patient is infectious from 3 days before parotid swelling to 7 days after it started.
- Isolate until swelling subsides.
- Children may return to school 1 week after initial swelling.

Medication

Children

- Paracetamol, oral, 10–15 mg/kg/dose 6 hourly when required.

Referral

- Abdominal pain (to exclude pancreatitis).
- Painful swollen testes (orchitis).
- Suspected meningoencephalitis.

ENDOCRINE SYSTEM CONDITIONS

Diabetes mellitus

Definition

Diabetes mellitus is disorder of absolute or relative insulin deficiency that results in increased blood glucose and disruption of energy storage and metabolism. Diabetes Mellitus is generally divided into two classifications: Diabetes Mellitus I and Diabetes Mellitus Type II.

***Diabetes Mellitus Type I*:** This results from the destruction of the pancreatic beta cells that leads to absolute insulin deficiency. Type IA is secondary to the autoimmune destruction of the beta cells. Type IB is secondary to non-autoimmune destruction of the beta cells. Type I diabetes accounts for approximately 2/3 of the new diagnosis of diabetes in patients $\leq$19 years old. There is a component of genetic susceptibility and close relatives of patients with type I DM are at higher risk of developing the disease.

***Diabetes Mellitus Type II*:** This is secondary to varying degrees of insulin resistance and insulin deficiency and is related to both genetic and environmental influences including predisposing medications such as steroids and some ARVs. It is the most common type of diabetes mellitus in adults.

***Neonatal diabetes*:** This is defined as persistent hyperglycaemia occurring in the first months of life that lasts more than 2 weeks and requires insulin therapy for management. The majority of affected infants are small for gestational age and present with weight loss, volume depletions, hyperglycaemia and glycosuria with or without ketonuria and ketoacidosis.

Signs and Symptoms

History of:

- Polyuria: This occurs when the serum glucose concentration rises above 180 mg/dl exceeding the renal threshold for glucose and leads to increased urinary glucose excretion and a subsequent osmotic diuresis. This may present as nocturia, bedwetting, or daytime incontinence in a previously toilet trained child, or heavy diapers.

- Polydipsia: This is secondary to increased thirst from increased serum osmolality and dehydration.
- Polyphagia: This is due to an increased appetite that occurs initially secondary to loss of calories from glycosuria. This symptoms is not always present.
- Weight loss: This is due to hypovolemia and increased catabolism.
- Weakness/Lethargy with ultimate progression to coma: This is secondary to hypovolemia and electrolyte disturbances including progressive acidosis.
- Visual disturbances: This is secondary to osmotic changes in the lens.
- Further history to exclude other co-existing autoimmune disease such as hypothyroidism, vitiligo, rheumatoid arthritis, etc., and to further ask about family history of endocrinopathies or autoimmune diseases

Physical examination:

- Full general and systemic examination
- Fundoscopy: to rule out diabetic retinopathy.
- Foot examination: for features of diabetic neuropathy and diabetic wounds

Diagnosis:

Clinical: The diagnosis should be suspected based on the signs and symptoms described above. Any of the above signs or symptoms should prompt further investigations.

Investigations:

- Blood sugar: Diagnostic criteria for diabetes mellitus:
  - Symptoms of DM plus random plasma glucose ≥200 mg/dl (11.1 mmol/L) OR
  - Fasting plasma glucose ≥126 mg/dl (7.0 mmol/L). Fasting is defined as no oral intake for at least 8 hours.
    OR
  - Two-hour plasma glucose ≥200 mg/dl during an oral glucose tolerance test (OGTT) as described by the WHO.
    OR
  - HgA1C > 6.5 percent. This laboratory should be performed in a certified laboratory with an assay standardized to the diabetes control and complications trial (DCCT).
- Additional studies to evaluate severity and complications of the disease:
  - Blood gas if concern for diabetic ketoacidosis (where) available.
  - Electrolytes
  - Renal function tests (urea and creatinine) to evaluate for diabetic nephropathy and dehydration.
  - Urine analysis to check for glycosuria, ketones, and protein
  - HbA1c: This can be used for diagnosis (see below) or to assess severity of disease and to assess response to therapy.
  - Lipid profile
  - Thyroid-stimulating hormone (TSH): This should be performed in type 1 diabetics as autoimmune diseases may occur together.

Complications:

Short-term complications:

- Diabetic ketoacidosis (DKA): Occurs more frequently in type I diabetes mellitus, but may occur in some forms of type I diabetes mellitus.
- Hyperosmolar hyperglycaemic state (HHS): Occurs in type II diabetes mellitus.
- Insulin resistance secondary to hyperglycaemia: This occurs in both type I and type II diabetes mellitus.
- Infections due to immunosuppression and commonly include oral candidiasis and urinary tract infections.

- Death: Patients presenting with DKA or HHS have a high mortality rate.

Long Term complications:

- Vascular complications including both microangiopathy and macroangiopathy:
  - Nephropathy
  - Retinopathy
  - Neuropathy
  - Cardiovascular disease
  - Hypertension
- Dyslipidaemia
- Growth retardation or obesity depending on the insulin therapy. Patients may also have delayed puberty secondary to poor growth.
- Psychiatric disorders including depression related to their chronic disease.

Management:

General objectives:

- Maintain normal glycaemia with insulin therapy or oral medications (in type II diabetes mellitus) to prevent both the signs and symptoms of uncontrolled hyperglycaemia and the complications mentioned above.

Non pharmaceutical management

- Assess A-B-C-D (Airway, Breathing, Circulation, Disability)
- If patient has signs or symptoms of diabetic ketoacidosis (DKA) or hyperosmolar hyperglycaemic state, this is an emergency and treatment must be initiated immediately.
- The patient and the family should be counselled on the cause and the treatment of diabetes and its management. The patient and the family should be taught how to monitor blood glucose, record the test results, administer and adjust insulin doses based on blood glucose values and food intake.
- They family should be counselled on the complications of diabetes mellitus and how to manage them. In particular, they should know the signs and symptoms of acute hypoglycaemia and its management. They should also understand the importance of maintaining normoglycemia to avoid long-term complications. They should be instructed on how to manage acute illnesses in the context of diabetes mellitus, for example how to manage their insulin dose if they are unable to tolerate oral intake.
- Diet modification is important in both type I and type II diabetes mellitus. A nutritionist should be involved in providing individualized recommendations.

Pharmaceutical management

- The majority of children with diabetes mellitus have type I diabetes and may present with diabetic ketoacidosis (DKA). The management of DKA is detailed below.
- Diabetes Mellitus Type I: Children with Diabetes Mellitus Type I require insulin therapy. The patient is insulin dependent and while the insulin therapy may be adjusted based on the clinical condition and blood glucose results, the insulin therapy should NEVER be stopped completely as this could result in the development of DKA and death.

Diabetic ketoacidosis

Definition

DKA is the increase in the serum concentration of ketones greater than 5 mEq/L, a blood glucose level greater than 250 mg/dL and a blood pH less than 7.3.

Other features include: Ketonaemia, ketonuria and low serum bicarbonate level <18 mEq/L.

Causes:

- Previously undiagnosed diabetes
- Interruption of insulin therapy
- Underlying infection and intercurrent illness
- Poor management of DM type 1
- Stress
- Medication like corticosteroids

Signs and Symptoms:

The signs and symptoms of DKA can develop suddenly and include:

- Polydipsia
- Polyuria
- Nausea and vomiting
- Abdominal pain
- Weakness or fatigue
- Rapid deep breathing
- Fruity-scented breath
- Confusion or drowsiness
- Hot, dry skin
- Blurred vision

Suspect DKA even if the blood glucose is normal in a child with known diabetes and any of the following:

- Nausea or vomiting
- Abdominal pain
- Hyperventilation
- Dehydration
- Reduced level of consciousness

Investigations:

- Blood glucose
- Urine dipsticks for glucose and ketones
- Blood urea and electrolytes
- Malaria
- Full blood count
- Blood and urine cultures

Management:

DKA treatment goals

- Management of A,B, C
- Admission to HDU/ICU if possible for close monitoring
- Correct dehydration with intravenous fluids
- Correct hyperglycaemia with insulin and ivi fluids
- Correct acidosis and reverse ketosis
- Monitor for complications of DKA (cerebral oedema).
- Correct electrolyte imbalances, especially potassium loss
- Restore blood glucose to near normal.
- Identify and treat any precipitating event.

Fluid requirements

- Fluids for resuscitation in shock:
  - Sodium chloride 0.9%, IV, 10–20 mL/kg over 10–30 minutes.
  - Repeat if shock persists.

- Fluid requirements after resuscitation
  - Fluid requirement = deficit + maintenance
  - Calculate deficit = estimated % dehydration x body weight (e.g. 10kg with 5% dehydration 10 x 50 = 500mL)
  - Calculate maintenance (mL): use the Holliday–Segar formula (max wt.75kg :
    - ≤1 year: 120 mL/kg/24 hours
    - All children older than 1 year; it is the sum of the following:
      - First 10 kg body weight: 100 mL/kg/24 hours
      - Second 10 kg body weight: 50 mL/kg/24 hours
      - Additional weight > 20 kg body weight: 20 ml/kg/24 hour
- Add the deficit to 48 hour maintenance and replace this volume evenly over 48 hours, initially with sodium chloride 0.9%.

Example 6 year old with 24kg
Deficit after resuscitation is 50 x 24 = 1200ml
Maintenance (100 x 10) + (10 x 50+ (4 x20) = 1580ml/24hour
Maintenance in 48 hours = 1580 x 2 = 3160ml
Deficit + maintenance = 3160+1200 = 4360
Rehydration will be 4360/48 = 91ml/hour

- When blood glucose falls to < 15 mmol/L change the infusion to a dextrose containing maintenance fluid, e.g. dextrose 5% in sodium chloride 0.45%.
- Assess hydration status at least every 3 hours

Table 30. Alternative Rehydration plan

AGE	1st hour	Next 7 hours	Next 16hours
< 1 yr	20 ml/kg	15 ml/kg	7 ml/kg
1 - 7 yrs	20 ml/kg	10 ml/kg	5 ml/kg
8 – 14 yrs	20 ml/kg	9 ml/kg	5 ml/kg
> 15 yrs	20 ml/kg	8 ml/kg	4 ml/kg

Emergency Insulin Therapy:

- Delay insulin until serum K+ is > 3,5 mmol/l
- Insulin should only be started after 30-60 minutes of fluid therapy, provided shock has been treated.
- Use regular Insulin short-acting (Actrapid or Humulin R), IV, 0.1 unit/kg, hourly
- If the rate of blood glucose fall exceeds 5 mmol/ L/hour or the blood glucose falls to 14 mmol/L:
  - Add a dextrose-containing fluid.
  - Do not stop the insulin while dextrose is being infused.
- If the blood glucose falls below 4 mmol/L:
  - Give a bolus of 2 mL/kg of dextrose 10% and increase the concentration of dextrose in the infusion.
- If glucose fall is inadequate, ie. a fall of < 4 mmol/l/hr - double the dose of insulin
- If glucose fall is excessive, ie a fall of > 5,5 mmol/l/hr - halve the dose of insulin
- Continue with IV insulin until:
  - Base deficit is < 5 or bicarbonate is ≥15 mmol/L,
  - There is no ketonuria,
  - Blood glucose is ≤10 mmol/L.

- If blood glucose stable and urine ketones negative, then start standard insulin regimen

Potassium (K+):

- If hyperkalaemia (serum K+ or ECG) withhold potassium supplementation
- If serum K+ is normal or low and patient is passing urine: Start K+ supplementation immediately
- K+ replacement will be necessary in all cases (even with initial hyperkalaemia)

Table 31. Doses

Serum Potassium	Required potassium supplement as KCL added to each litre of ivi fluids
<3,0 mmol/l	40 mmol
3,0 - 4,0 mmol/l	30 mmol
4,1 - 5,0 mmol/l	20 mmol
5,1 - 6,0 mmol/l	10 mmol
6,0 mmol/l	None

Changing from intravenous to subcutaneous insulin

- When oral fluids are tolerated, reduce intravenous fluids.
- Subcutaneous insulin can be started once the child is well hydrated and able to tolerate a normal diet

Transitional insulin therapy (Sliding Scale):

Monitor Blood Glucose 4–hourly and give the corresponding amount of Soluble/Regular insulin subcutaneously

Blood Glucose Result	Amount of Soluble/Regular Insulin to be given
Less than 6 mmol/L	No Insulin
6.1 – 9.0 mmol/L	0.06 units/kg body weight
9.1 – 12.0 mmol/L	0.09 units/kg body weight
12.1–15.0 mmol/L	0.12 units/kg body weight
15.1–18.0 mmol/L	0.15 units/kg body weight

Sliding scale is considered when the patient is;

- Out of coma and no acidosis
- Continue the sliding scale, making appropriate adjustments to the doses of insulin, until the patient is eating normally and the urine is free of ketones. This may take on average between 12 – 24 hours.

Maintenance insulin therapy:

- Determine dose on normal requirement: 1 units/kg/day
- 2 Injections regimen:
  - Administer subcutaneously in the form of 50% intermediate acting insulin (NPH or Lente) and 50% rapid insulin. Total dose divided in 2 doses:
    - 2/3 before breakfast (1/2 rapid insulin and 1/2 intermediate acting insulin)
    - Remaining 1/3 before the evening meal (1/2 Rapid insulin and 1/2 intermediate acting insulin)

OR

- 4 Injections regimen (Prandial regimen):Total dose divided in 4 doses:
  - 50% of intermediate acting insulin at bed time
  - 50% of rapid acting insulin dived in 3 doses – 20% before breakfast, 10% before lunch and 20% before dinner

Treatment of intercurrent infection:

- Start empiric antibiotics on suspicion of infection until culture results are available: Cefotaxime 100mg/kg/day/7days

Recommendation:

- Regular follow-up of all diabetics is important to assess their blood sugar control
- Dietary education
- Physical activity
- Diabetes education
- Keep urine free of ketones

Hypoglycaemia

Definition

Blood glucose levels below the lower limit of the normal range (blood glucose < 2.2 mmol/L, for malnourished children <3 mmol/L).

Causes/Risk factors:

Individuals with diabetes

- Excessive dose of medication anti−diabetic medication
- Omitted or inadequate amount of food
- Unaccustomed physical over activity
- Alcohol intake

Signs and symptoms:

- Dizziness
- Blurred vision
- Headaches
- Palpitation
- Irritability and abnormal behaviour
- Sweating
- Tremors
- Tachycardia
- Confusion
- Unconsciousness
- Convulsions

Note: Patients with frequent hypoglycaemic episodes develop hypoglycaemia unawareness, where the symptoms above do not occur despite a dangerously low blood sugar level.

Nocturnal hypoglycaemia

Nightmares and headaches may be suggestive of nocturnal hypoglycaemia.

Blood glucose concentrations fall to their lowest levels between 02h00 and 04h00.

Grading of severity:

Mild (Grade 1)

- Child or adolescent is aware of, responds to and self-treats the hypoglycaemia.
- Children < 6 years of age can rarely be classified as grade 1 because they are unable to help themselves.

Moderate (Grade 2)

- Child or adolescent cannot respond to hypoglycaemia and requires help from someone else, but oral treatment is successful.

Severe (Grade 3)

- Child or adolescent is semiconscious or unconscious with or without convulsions and may require parenteral therapy with glucagon or intravenous glucose.

Diagnosis: is made on clinical signs and investigations

Investigations:

- Blood glucose

Management:

Outside the hospital

Mild or moderate hypoglycaemia:

- Glucose, oral, 5–15 g or 1-3 level teaspoons of sugar (depending on child's age) in a small amount of water.
- Wait 10–15 minutes.
- If blood glucose has not risen to 6-8 mmol/L, repeat above.
- As symptoms improve, the next meal or oral complex carbohydrate should be taken, e.g. fruit, bread, cereal, milk, etc.

Severe hypoglycaemia

- Glucagon, IM/SC, 0.1–0.2 mg/10 kg body weight.
  - If < 12 years of age: 0.5 mg.
  - If > 12 years of age: 1.0 mg.
- If glucagon is not available:
  - A teaspoon of sugar moistened with water placed under the tongue, every 20 minutes until patient awakes

In hospital

- 10% Glucose, IV, 2−4 ml/kg 1 to 3 minutes followed by 5−10% Glucose, IV, according to total daily fluid requirement until the patient is able to eat normally (Dextrose 50% 1 mL + water for injection 4 mL = 5 mL 10% dextrose solution).
- If IV dextrose cannot be given; give glucagon, IM/SC, 0.1–0.2 mg/10 kg body wt
  - If < 12 years of age: 0.5 mg.
  - If > 12 years of age: 1.0 mg.

Recommendation

- Monitor blood glucose every 15-30 minutes until stable, then repeat 1–2 hourly.
- Keep blood glucose between 6 and 8 mmol/L

Referral

- Recurrent episodes of hypoglycaemia.

Guidelines for management of diabetics on sick days

Definition

Illness associated with fever tends to raise blood glucose because of higher levels of stress hormones, gluconeogenesis and insulin resistance.

Illness associated with vomiting and/or diarrhoea may lower blood glucose, with the possibility of hypoglycaemia and the development of starvation ketones.

Diagnostic criteria

- Unstable blood glucose measurements as a result of illness, stress or starvation.
- Increased insulin requirements are induced by a catabolic state and stress.
- Ketonuria may also indicate the following:
  - In the presence of hyperglycaemia, it is indicative of severe insulin deficiency and calls for urgent therapy to prevent progression into ketoacidosis;
  - In the presence of low blood glucose levels, it is indicative of a starvation state or is the result of a counter-regulatory response to hypoglycaemia.

General and supportive measures

- Monitor glucose more frequently.
- Test urine for ketones.
- Ensure adequate intake of calories and fluids on sick days to prevent ketogenesis. If insufficient calories are consumed, ketones will appear in the urine without hyperglycaemia. In this circumstance encourage the patient to eat whatever he/she feels like.
- Treat underlying intercurrent illness.

Special circumstances:

Gastroenteritis:

- If hypoglycaemia occurs especially with gastroenteritis, and there is mild ketonuria, ensure that the child takes regular frequent amounts of carbohydrate, using oral rehydration solution or intravenous fluids.

Loss of appetite:

- Replace meals with easily digestible food and sugar-containing fluids.

Vomiting:

- If the patient has difficulty eating or keeping food down and the blood glucose is < 10 mmol/L, encourage the patient to take sugar containing liquids. Give small volumes. Some glucose will be absorbed. If there is no vomiting, increase the amount of liquid.

Medications

Insulin therapy

- Insulin must be given every day. Insulin injections should not be omitted because of sickness and/or vomiting. If vomiting occurs, IV fluids may be needed to avoid hypoglycaemia
- During an infection, the daily requirement of insulin may rise by up to 25%.

Moderate urine ketones

- The extra dose of insulin is usually 10–20% of the total daily dose given as short acting insulin every three hours.
- If the blood glucose drops < 8.3 mmol/L, it may be necessary to sip regular juice or other sugar-containing drinks. This is done to raise the blood glucose before giving the next insulin injection.

Large amount of urine ketones

- Give 20% of the total daily insulin dose.
- Repeat as above if necessary.

Extra fluids

In addition to taking extra insulin, extra fluids, e.g. water and fruit juices are important to prevent acidosis. These fluids replace the fluids lost in the urine and prevent dehydration.

Referral

In a child with inter-current illness **urgent** specialist advice must be obtained when:

- Patient is unable to carry out the advice regarding sick days;
- he diagnosis is unclear
- Vomiting is persistent, particularly in young children;
- Blood glucose continues to rise despite increased insulin;
- Hypoglycaemia is severe;
- Ketonuria is heavy or persistent;
- The child is becoming exhausted, confused, hyperventilating, dehydrated or has severe abdominal pain.

Hypocalcaemia in Children

Definition

The adjusted serum calcium levels below the normal ranges (calcium is 2.2 - 2.6mmol/L). Symptoms of hypocalcaemia, such as muscle cramps, paraesthesia, tetany and carpopedal spasm, typically develop when serum adjusted calcium falls below 1.9mmol/L. However, this threshold varies and symptoms also depend on the rate of fall.

The main causes of hypocalcaemia in children are:

- Vitamin D deficiency
- Calcium deficiency
- Magnesium deficiency
- Reduced parathyroid hormone production or resistance,
- Impaired renal function.

Diagnosis: Based on clinical signs and symptoms

Signs and symptoms of tetany include:

- Paraesthesia
- Weakness
- Lethargy
- Cramps
- Laryngospasm
- Seizures
- Positive Trousseau's sign
- Carpopedal spasm
- positive Chvostek's sign
- Prolonged QT interval on the ECG.

Investigations

- Calcium
- Albumin

- Phosphate
- Kidney function
- Magnesium
- 25 Hydroxyvitamin D.

Medication

Acute hypocalcaemia

- Calcium gluconate 10%, IV, 1–2 mL/kg administered over 5–10 minutes, 6–8 hourly. Maximum dose: 10 mL.
- ECG monitoring is advised.

If hypomagnesaemic:

- Magnesium sulphate 50%, IV/IM, 0.2 mL/kg every 12–24 hours.

Chronic therapy

- Long-c therapy depends on the cause.
- Manage hypophosphataemia or hyperphosphatemia, depending on the cause of hypocalcaemia, before long-term calcium is initiated.
- Elemental calcium oral, 50 mg/kg/day until normal calcium level is achieved (given with meals).
- Maintenance dose: 30 mg/kg/day
- If vitamin D deficient:
  - Vitamin D, oral:
    - Under 6 months 2500 IU/day
    - 6 months -12 years 5 000 IU/day
    - 12 - 18 years 10 000 IU/day
- For hypoparathyroidism and pseudohypoparathyroidism:
  - Calcitriol, oral, 0.01–0.04 mcg/kg/day. **OR**
  - Alfacalcidol, oral, 0.05 mcg/kg/day.
    - If < 20 kg: 0.05 mcg/kg/day.
    - If > 20kg: 1 mcg/day.

Referral

- Chronic hypocalcaemia.

MUSCULOSKELETAL CONDITIONS

Juvenile rheumatoid arthritis

Definition

Juvenile rheumatoid arthritis is a chronic non-suppurative inflammatory condition of the synovium. Occurs in different forms

- ***Systemic onset arthritis*** (still's disease), occur at any age (mostly at 2−4 years old)
- ***Polyarticular onset arthritis***, typically involves five or more joints, usually small joints
- ***Pauciarticular onset arthritis***, commonest type of juvenile rheumatoid arthritis (50 %), less than five joints affected

Systemic onset arthritis:

Symptoms & signs:

- Arthritis in one or more joints.
- Plus 2 weeks of daily fever.
- With one of the following:
  - Erythematous macular rash, or
  - Serositis, i.e. pericarditis and pleuritis, or
  - Hepatosplenomegaly, or
  - Generalized lymphadenopathy

Polyarticular onset arthritis:

Signs and symptoms:

- Affects ≥ 5 joints in the first 6 months
- Involves large and small joints
- Rheumatoid factor either positive or negative
- Aggressive form of diseases with chronic course persisting into adulthood

Pauciarticular onset arthritis:

Signs and symptoms:

- Involves the large joints.(wrists, knees, ankles or elbows)
- Often asymmetrical distribution
- ≤ 4 joints are involved
- Associated with an increased risk of iridocyclitis/uveitis

Diagnosis

- Based on clinical signs

Investigations

- FBC, differential, ESR
- Rheumatoid factor
- X−ray of affected joints
- Anti-nuclear antibodies (ANA)

Complications

- Leg length discrepancy
- Scoliosis
- Contractures
- Iridocyclitis/uveitis

Management:

Non-pharmaceutical management

- Occupational and physiotherapy are essential
- Education of the patient and their families

Pharmaceutical management

- First choice: Brufen 5-10 mg/kg/dose x 3/day
- Alternative: Prednisone p.o. 2 mg/kg as a single daily dose for 1–2 weeks, continue with 0.3–0.5 mg/kg/day as single dose for 3 months
- If arthritis not controlled;
- Give methotrexate p.o, 0.3 mg/kg/week as a single dose on an empty stomach, increase at monthly intervals up to 1 mg/kg/week until there is satisfactory response, maximum dose is 25 mg/week + folic acid 5mg daily for methotrexate treatment

Recommendation

- Refer patient for rheumatology specialist consultation and adequate management (methotrexate treatment)

Rickets

Definition

Failure to calcify osteoid tissue in a growing child, usually due to deficiency of vitamin D, its active metabolites, calcium, phosphorus or other rare causes. This leads to bone deformity.
Occurs in ex-premature babies during infancy and in children with developmental disability, on anticonvulsants or not exposed to sunlight. In older children it is caused by renal tubulopathy and other rare conditions.

Diagnosis

Clinical signs

- Bowing of long bones, widening of metaphyses and cranial bossing.
- Rachitic rosary
- Occasionally convulsions or tetany due to hypocalcaemia.

Investigations:

- FBC
- Urea & Electrolytes, Creatinine
- Bone profile (Ca, Mg, Phosphate, Alkaline phosphatase)
- 25-OH Vitamin D levels (combined vitamin D2 and D3 (where possible)
- X-ray of wrists

General and supportive measures

- Prevent vitamin D deficiency.
- Exposure to sunlight, at least 3 hours a week.

Note: Breast milk does not contain adequate vitamin D to prevent deficiency.

- Ensure adequate sunlight exposure of infant or provide vitamin D until weaning.
- Normal vitamin D-containing diet for lactating mothers.

Medications

Prophylaxis

- For premature babies:
  - Vitamin D, oral, 800 IU, once daily.
- Infants who are exclusively breastfed or not on adequate volume of commercial milk formula:
  - Vitamin D, oral, 400 IU once daily.

Treatment of active rickets

- Treat only after confirmation of active rickets on x–ray.
- Vitamin D, oral, 5 000 IU once daily, in addition to milk in the diet.
- Repeat X–ray after 6–8 weeks.
  - If no radiological improvement, further investigation is required.
  - If healing occurs, continue for 3 months. Confirm complete healing and adequate diet for the future.

Note: Children with low levels of calcium should have both calcium and Vit D. This intervention shows a complete recovery within 3 months of supplementation.

HAEMATOLOGICAL CONDITIONS

Anaemia

Definition

Anaemia is defined as a haemoglobin (Hb) level below reference values, which vary depending on sex, age and pregnancy status

Haemoglobin level reference ranges

- 0-2 weeks: 12-20 g/dL
- 2-6 months: 10-17 g/dL
- months-1 year: 9.5-14 g/dL
- 1-6 years: 9.5-14 g/dL
- 6-18 years: 10-15.5 g/dL

Causes of anaemia

- Decreased production of red blood cells:
  - Iron deficiency, nutritional deficiencies (folic acid, vitamin B12, vitamin A)
  - Depressed bone marrow function, certain infections (HIV, EBV), renal failure;
- Loss of red blood cells
  - Acute or chronic haemorrhage
- Increased destruction of red blood cells (haemolysis)
  - Parasitic (malaria), bacterial and viral (HIV) infections
  - Haemoglobinopathies (sickle cell disease, thalassaemia)
  - Reaction to certain drugs (co-trimoxazole, etc.)

In tropical settings, the causes of anaemia are often interlinked.

Clinical symptoms and signs

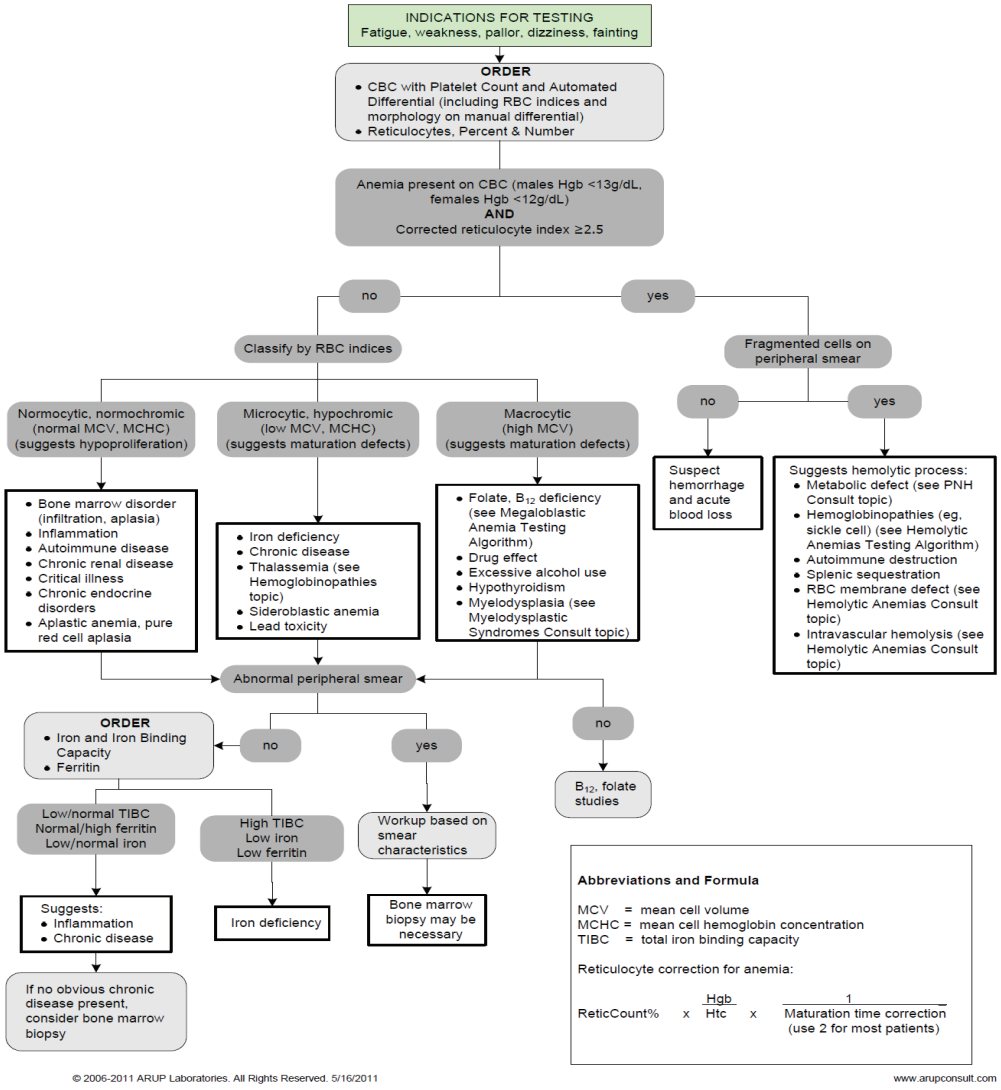
- Dizziness, fainting
- Headache
- Shortness of breath on exertion (exercise intolerance)

- Visual disturbances
- Poor growth
- Confusion, decreased mental activity
- Mood or sleep disturbances
- Pale mucous membranes, palms and nail beds
- Rapid heartbeat or palpitations
- Dyspnoea, tachypnea
- Signs of heart failure if severe anaemia
- Other signs of severe anaemia include: Heart murmur, sweating, thirst, cold extremities, oedema in the lower limbs and shock
- Some signs may indicate the likely cause of the anaemia:
  - Cheilosis (cracking of the corners of the mouth) and glossitis (nutritional deficiency)
  - Jaundice, hepatosplenomegaly, dark coloured urine (haemolysis)
  - Melena, haematuria, etc. (bleeding.)

Classification of anaemia

- Anaemia is classified according to physiologic process (decreased production, increased destruction or blood loss).
- In practice, classifying anaemia according MCV is a useful approach to assessing the common causes of anaemia in children

Algorithm for classification of anaemia



Investigations

Investigate according to clinical situation

- FBC, reticulocyte count and peripheral blood smear examination
- Blood film for malaria parasites/RDT
- Blood urea and serum creatinine
- Stool examination for eggs of hookworm, ova, parasites and occult blood,

Other tests that can be done at a tertially level depending on the clinical presentation

- Sickling test/ Hemoglobin electrophoresis
- Analysis for nutritional deficiencies
- Bone marrow aspiration to assess the decreased production of red cells
- Coombs direct and indirect (in cases of haemolytic anaemia)
- Iron studies (Fe, Ferritin, TIBC, transferrin % saturation)

Reticulocytes

- Reticulocytes are circulating immature RBC. Reticulocyte count helps to categorize the anaemia into hypo-or hyper-proliferative type. Normal 0.5-1.5%

Hypoprolifearative:

- Decreased reticulocytes
- Bone marrow unable to produce the required number of RBC's
- Lack of essential substance (iron, B12, folate) or Bone marrow infiltration such as in leukemia , Aplastic anaemia

Hyperproliferative:

- Increased reticulocytes
- Cause of anaemia outside marrow
  - Hemolytic anemia
  - Hemorrhage
  - Post anaemia treatment
- Decreased survival of RBCs
- Marrow normal and responds adequately by increasing the output

Corrected reticulocyte count (CRC) calculations:

- CRC = Reticulocyte % x (Patients' Hematocrit/Normal hematocrit per age). A CRC >1.5 suggests increased red blood cells production as a result of haemolysis and blood loss.

Management

At health centre: Follow IMCI guidelines

Refer the child urgently if:

- There is severe anaemia (Hb <5), oedema or the child is very unwell
- Has recurrent or persistent anaemia
- Has severe acute malnutrition

Management at district hospital level:

- Obtain a detailed history from the patient or care givers
- Examine the anaemic patient carefully and perform the appropriate investigations with a goal of;
  - Confirming that the patient is anaemic
  - Establishing the type of anaemia
  - Determining the cause of the anaemia
  - Determining whether or not there are complications arising from the anaemia, the cause of the anaemia or both

- Treat or correct the underlying cause
- Always investigate cause of anaemia before initiating treatment
- In an emergency, take all blood samples before treatment

Therapeutic objectives:

- Treat underlying cause of anaemia
- In sickle cell disease patients restore haemoglobin to steady state level
- In iron deficiency replenish iron stores after correction of anaemia (continue to treat for 2-3 months)

Non-Pharmaceutical management:

- Advise on a balanced diet especially iron-rich foods such as liver; beef kidneys; molasses; meat; sardines; eggs, fish; fresh green leafy vegetables..
- Malaria prevention
- Encourage exclusive breastfeeding until 6 months, then supplementation with iron rich food.
- Discourage use of cow's milk before 12 months and excessive intake of cow's milk.

Pharmaceutical management:

- For iron deficiency anaemia:
  - Elemental Iron 4-6 mg/kg/day divided in 3 doses daily until the Hb has reached the normal range.
    - Ferrous Sulphate has 20% elemental iron
    - Ferrous Fumarate has 33% elemental iron
    - Ferrous gluconate has 12% elemental iron.
  - Continue for 2-3 months after normalization of Hb to build up iron stores.
  - Side effects of iron therapy: Diarrhea, abdominal discomfort, constipation, or black stools
- Sickle cell disease patients should receive iron tablets only if there is evidence of iron deficiency. They should however, receive folic acid. Similarly, patients whose anaemia is possibly due to malaria should receive folic acid
  - Folic acid, oral: 5 mg every 2 days for 30 days or for as long as required.
- If anaemia is due to hookworms
  - Albendazole:
    - Children 1-2 years of age 200 mg as a single dose
    - Children over 2 years of age 400 mg as a single dose
  - Or Mebendazole 100 mg orally 12h x 3 days).
- Vitamin B12 deficiency:
  - Hydroxycobalamin injection IM: Initially 100mcg/day for 10-15 days. Maintenance dose 30-50 mcg/month. Lifelong treatment may be required.
- Severe anaemia with signs of cardiac failure will need treatment of the heart failure in addition to blood.
  - Transfusion with packed cells. Look for signs of decompensation before deciding to transfuse and look for these signs during transfusion.
  - Transfuse the patient if Hb < 5 g/dl and decompensation signs are present:
    - Packed cells: 10-20 ml/kg body weight slowly over 4 hours
    - To calculate the volume needed to increase Hb: Volume of packed red cells = (desired Hb – actual Hb) x weight x 0.4
  - Furosemide 1mg/kg IV should be given at the beginning of transfusion:
    - If signs of heart failure or
    - If there is normal circulating volume, such as in chronic severe anaemia
  - Make sure the CORRECT bag of blood is given and never transfuse blood that has been out of the refrigerator for more than 2 hours.
  - Make baseline recordings of temperature, respiratory rate and pulse rate, then observe patient closely every 15 minutes for transfusion reactions

Referral:

- Refer all patients with anaemia related to poor diet to a nutritionist or a health center for nutritional follow-up
- Refer all patients with recurrent anaemia or with anaemia of unknown cause to a referral hospital

Sickle cell anaemia

Definition

Chronic haemolytic anaemia characterized by sickle shaped red blood cells as a result of mutation in the β chain of Hemoglobin

Cause:

- Homozygous inheritance of mutated HbS (amino acid valine is substituted for glutamic acid in the position 6 of the β−chain)

Signs and symptoms:

- Impaired growth and development
- Anaemia and mild jaundice
- Hepatosplenomegaly (in younger children)
- Bone pain (especially long bones in children)
- Pain and swelling of the hands and feet (hand - foot syndrome) in children between 6 months and 3 years old.
- Arthralgia with fever
- Severe abdominal pain with vomiting
- Acute chest syndromes (sudden onset of fever, cough, chest pain, tachypnea leukocytosis and pulmonary infiltrates on x−ray): Must be aggressively treated may be fatal
- Tower shaped ("frontal and parietal bossing") skull

Investigations:

- Full blood count
- Peripheral blood smear
- Sickling test (Test d'Emmel)
- Hb electrophoresis

Complications:

- Infections (especially from encapsulated organism such as Streptococcus pneumoniae:
  - Osteomyelitis (Streptococcus pneumonia and Salmonella)
  - Meningitis
- Aplastic crisis (commonly due to Parvovirus B19 infection)
- Stroke (infarctive) with hemiparesis and convulsions
- Gangrene (vaso-occlusive)
- Pulmonary hypertension
- Acute chest syndrome (sudden onset of fever, cough, chest pain, tachypnea leukocytosis and pulmonary infiltrates on X-ray): Must be aggressively treated as may be fatal
- Gall bladder stones +/- cholecystitis
- Splenic sequestration (in 5 first years of life): onset of life threatening anaemia with rapidly enlarging spleen and high reticulocyte counts
- Avascular necrosis of the femoral head is common
- Occlusion of major intracranial vessels may lead to hemiplegia

- Cranial nerve palsies and other neurological deficits
- Priapism

Management:

- ***At health centre***: Refer all suspected sickle cell cases to a district hospital

Management aims at 4 types of crisis

- Thrombotic (vaso–occlusive, painful or infarctive),
- Aplastic
- Hyperhaemolytic due to Hypersplenism
- Acute splenic sequestration

Non-pharmacological treatment:

- IV or oral fluids 2L/m2/day
- Oxygen if in respiratory distress

Pharmaceutical treatment:

- Analgesics (WHO Step wise pain management)
  - Paracetamol 10-15mg/kg/dose orally every 4-6 hours associated with Brufen 5-10mg/kg/dose every 6-8 hours
  - Codeine 0.5-1mg/kg/dose every 6 hours
  - Pethidine 0.5–2mg/kg 4hrly)
  - Morphine (titrate to effect) PO: 0.2-0.5 mg/kg/dose every 4-6 hours, IV, IM, SC: 0.1-0.2 mg/kg/dose every 2-4 hours
- If patient has an infection treat according to the bacteria, the site and the severity of the infection
- Aggressively search for cause of infection (blood and urine cultures, chest X ray) and start empiric antibiotic treatment if child has fever
- Blood Transfusion: Transfusion should be reserved for the following circumstances:
  - Urgently for sudden, severe anaemia due to acute splenic sequestration, parvovirus B19 infection, or hyperhaemolytic crises.
  - Transfusion is indicated in the following situations:
    - Acute infarctive stroke
    - Severe acute chest syndrome
    - Multiorgan failure syndromes
    - Perioperative.
    - Priapism that does not resolve after adequate hydration and analgesia

Additional treatment:

- Give supplementary folic acid (5 mg oral daily) but AVOID iron (risk of hemochromatosis).
- Hydroxyurea should be given to patients with more than 3 crises per year. Start at a dose of 10 mg/kg PO daily and titrate by 5mg/kg every 8 to 12 weeks to a maximum dose of 25mg/kg/day.
- Homozygous should be vaccinated for *salmonella, Pneumococcal and Haemophilus influenza*

Recommendation:

- Education of patient on sickle cell disease and crisis to avoid complications
  - Should drink much water daily
  - Avoid getting cold (dress with warm clothes in cold weather)
- Sickle cell screening before marriage for suspected carriers and genetic counseling if possible
- Heterozygote carriers should have family members screened for sickle cell disease

Idiopathic thrombocytopenic purpura

Definition

Immune thrombocytopenia purpura (ITP) is an immunologically mediated bleeding disorder in which autoantibodies against platelet antigens cause premature platelet destruction that leads to thrombocytopenia.

Children often develop ITP after a viral infection and usually recover fully without treatment.

History:

- A previously healthy child who has sudden onset of generalized petechiae and purpura
- A history of a preceding viral infection 1–4 weeks before the onset of thrombocytopenia
- Acute bleeding from the gums and mucous membranes

Clinical manifestations:

- Findings on physical examination are normal, other than the finding of petechiae and purpura.
- Splenomegaly is rare, as is lymphadenopathy or pallor.
- Fewer than 1% of patients have intracranial hemorrhage
- The severity of bleeding in ITP is based on symptoms and signs, but not on platelet count
- Symptoms can be categorized as:
  - No symptoms (identified on routine blood tests showing severe thrombocytopenia)
  - Mild symptoms: bruising and petechiae, occasional minor epistaxis, very little interference with daily living
  - Moderate: more severe skin and mucosal lesions, more troublesome epistaxis and menorrhagia
  - Severe: bleeding episodes—menorrhagia, epistaxis, melena—requiring transfusion or hospitalization, symptoms interfering seriously with the quality of life

Diagnosis:

- Diagnosis is based on the history, physical examination, full blood count with leukocyte differential, and examination of the peripheral smear

Laboratory:

- FBC with differential (should not show any anaemia (unless significant bleeding) or anomaly of WBC count) - Profound thrombocytopenia (platelet count $<10 \times 109/L$).
- Peripheral blood film examination (will show large or giant platelets
- HIV test
- Additional investigations are done as clinically indicated
- Bone marrow biopsy is only indicated if the patient has other cytopenias, suspicious findings on the peripheral smear, or other clinical features associated with bone marrow failure syndrome

Differential diagnosis: ITP is a diagnosis of exclusion

- HIV infection
- Bacterial or viral infections
- Leukemia
- Aplastic anaemia
- Systemic lupus erythematosus (SLE
- Wiskott-Aldrich syndrome (WAS)) must be considered in young males found to have low platelet counts, particularly if there is a history of eczema and recurrent infection.

Management

The goal of therapy is to reduce the risk for bleeding so that patients can live a normal life
The decision to treat a child should be based on the clinical symptoms and not the platelet count.

Table 32. Management of ITP according to risk category

Risk category	*Symptoms*	*Management*
Low	• Many petechiae or large bruises • Painless oral/palatal petechiae or purpura. • Dry blood clots in the nostril/nares	• Outpatient without medical treatment (unless significant psychosocial or safety concerns) • Repeat FBC and review in 1 week • Provide family education
Moderate	• Epistaxis >5 minutes • Haematuria • Haematochezia • Painful oral purpura • Significant menorrhagia	• Admission to hospital • Discuss with Paediatrician/Paed Haematologist • Transfuse with Platelets to stop bleeding Prednisolone 2 mg/kg (max 60 mg) for 4–7 days • If poor response or rapid platelet rise is required e.g. before surgery: IVIG 0.8–1.0 g/kg/day for 1–2 days • IV Rh (D) immune globulin can be used in Rh positive patients at a dose of 50-75 microgram/kg. • Additional treatments: ○ Epistaxis: oral tranexamic acid 25 mg/kg (max 1.5 g), ENT consult where possible ○ Heavy menstrual bleeding: tranexamic acid (must not be used if haematuria is present)
Severe Life-threatening	• Suspected internal haemorrhage (brain, lung, muscle, joint, etc.) OR • Mucosal bleeding that requires immediate intervention	• Urgent transfer to a tertiary hospital after stabilisation • Combination IVIG 0.8–1 g/kg and pulse IV Methylprednisolone 15–30 mg/kg (max 1 g) daily for 3 days • Platelet transfusion 20 mL/kg, continuous if required IV tranexamic acid 15 mg/kg • Urgent surgical intervention or referral depending on site of bleeding

Splenectomy in ITP

- Splenectomy removes the primary site of platelet clearance and autoantibody production and offers the highest rate of durable response (50% to 70%) compared with other ITP therapies
- It should be reserved for 1 of 2 circumstances:
  - The older child (> 4 yrs.) with severe ITP that has lasted >1 yr. (chronic ITP) and whose symptoms are not easily controlled with steroids and IVIGs is a candidate for splenectomy.

- Splenectomy must also be considered when life-threatening hemorrhage (intracranial hemorrhage) complicates acute ITP, if the platelet count cannot be corrected rapidly with transfusion of platelets and administration of IVIG and corticosteroids.

Family education

- On the illness/diagnosis
- Restrict activities to minimise the risk of head injury
  - Avoid contact sports (e.g. Rugby, Soccer)
  - Limit activities that have a risk for traumatic injury (e.g. Bicycle riding)
- Avoid anti-platelet, non-steroidal and anticoagulant medications.
- Avoid intramuscular injections
- Monitor for significant bleeding symptoms and go immediately to the emergency department if they occur
- Monitor for signs of ICH and go immediately to the emergency department if head injury or severe headache
- Consider discharge when family understands the condition, management, activity restrictions, follow-up plan and when to go to the emergency department

Splenectomy in ITP

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  - The older child (> 4 yrs.) with severe ITP that has lasted >1 yr. (chronic ITP) and whose symptoms are not easily controlled with steroids and IVIGs is a candidate for splenectomy.
  - Splenectomy must also be considered when life-threatening hemorrhage (intracranial hemorrhage) complicates acute ITP, if the platelet count cannot be corrected rapidly with transfusion of platelets and administration of IVIG and corticosteroids.

General transfusion policy management:

Red blood cells:

In children and adolescent:

- Low Hb and symptomatic
- Asymptomatic but Hb <5 g/dl
- Fever and Hb <8.0 g/dl
- Hb <8.0 g/dL in the perioperative period
- Serious infection and Hb <10.0 g/dl
  - Volume packed cells necessary = 3 x weight in Kg x requested rise in Hb.
  - Keep volume within limits e.g. do not transfuse 3 litre blood for chronic anaemia
- Postpone blood transfusion at diagnosis if WBC >100x109/l (Leukaemia is likely and high risk of increased viscosity).
- In infants within the first 4 months of life:
  - Hb <10 g/dL and major surgery
  - Hb < 10 g/dL and pulmonary disease

Platelets:

- Asymptomatic but platelets. <10.0x109/
- Symptomatic (petechiae, fever from serious mucositis) and platelet <20.0x109/l
- Before LP if platelets <30.0x109/l or DIC or high WCC.
- Before surgical procedure if platelets <50.0x109/l

Reference

Hume: Clinical Practice of Transfusion Medicine Petz LD et al (eds) 3rd edition. New York, Churchhill Livingstone 1996: 705 – 732.

Table 33. Management of transfusion reactions

Severity	Signs	Transfusion	Treatment
Mild	Itchy rash	Slow rate	• Promethazine 0.125mg/Kg (Max 25mg) • Continue if stable after 30minutes
Moderate	Severe rash Fever Rigor Tachycardia	**Stop**	• Promethazine 0.125mg/Kg (Max 25mg) • Hydrocortisone 4mg/kg IV (max 100mg) • Nebulize with salbutamol if wheezing • If stable restart with new blood
Severe	Shock Haemolysis Bleeding Collapse	**Stop**	• Maintain airway and give oxygen • Normal saline bolus 20ml/kg • Adrenaline 1:1000 at 0.01 mg/kg (Max 0.3mg) every 2-5 minutes IM. In refractory cases, drip (0.1 mcg/kg/min) • Promethazine 0.125mg/Kg (Max 25mg) • Hydrocortisone 4mg/kg IV (max 100mg) • Nebulize with salbutamol if wheezing • Consider and treat for sepsis • Preferably observe in high dependency unit

CENTRAL NERVOUS SYSTEM

Convulsions

(For neonatal convulsions refer to neonatal protocol)

Definition:

A convulsion is an involuntary change in movement, attention or level of awareness that is sustained or repetitive and occurs as a result of abnormal and excessive neuronal discharges within the brain. Convulsions may be focal (Partial) or generalised

Generalised seizures may be:

- Tonic-clonic,
- Absence (typical or atypical),
- Clonic,
- Tonic or atonic,
- Myoclonic

Focal seizures:

- Affect one part of the body but may progress to generalised tonic-clonic seizures and this is known as secondary generalisation.

Signs & symptoms of convulsions

- Shaking of body; can be generalised or focal
- Unresponsive, eyes rolling back, biting tongue or frothing of mouth
- Followed by post-ictal period (sleepiness after)

Causes

- Febrile convulsions
- Malaria
- Meningitis/Encephalitis
- Hypoglycaemia
- Hyponatraemia/ Hypernatraemia/Hypocalcaemia
- Epilepsy
- Poisoning
- Head injury, hypoxic injury

Investigation

- Bedside blood sugar level
- Malaria slide or Rapid Diagnostic Test (RDT)
- Full Blood count
- Urea, Creatinine, sodium, potassium and calcium (where possible)
- Consider lumbar puncture:
  - If signs of meningitis (fever, neck stiffness, bulging fontanelle or irritability)
  - DON'T do a lumbar puncture if the child is very sick or there are signs of raised intracranial pressure (unequal or unresponsive pupils, papilloedema, abnormal breathing)

Management

During seizure management

- Airway and Breathing: Clear airway; place child on side, protect from trauma, loosen clothing and suction secretions if possible
- Make sure child is breathing; if not, give breaths using bag and mask
- Give oxygen
- Check blood sugar & treat as per the hypoglycaemia guideline
- Most seizures are quickly self-limited. Immediate administration of an anticonvulsant is not systematic.
- If generalized seizure lasts more than 5 minutes, use diazepam to stop it:
  - Diazepam
    - Infants and Children 6 months to 5 years: Rectal: 0.5 mg/kg rectally without exceeding 10 mg
    - Children 6 to 11 years: Rectal: 0.3 mg/kg.
    - Children ≥12 years and Adolescents: Rectal: 0.2 mg/kg.
  - In all cases if seizure continues, repeat dose once after 10 minutes.
  - Monitor respiratory rate.
- If still fitting after 20 minutes
  - IV Phenobarbitone (loading 20mg/kg over 15 mins, max 1g) OR
  - IV phenytoin (loading dose 20mg/kg in Normal saline over 60 mins)
  - If seizure continues after Phenobarbitone/Phenytoin, treat as status epilepticus.

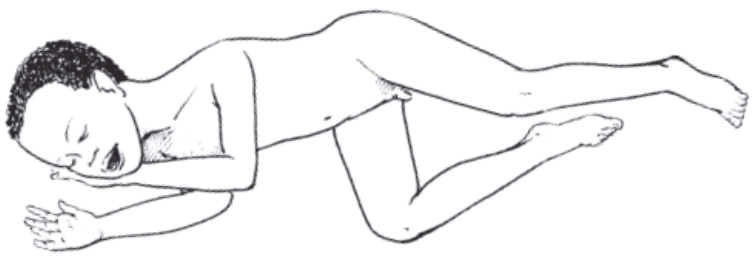

Figure 6. How to position an unconscious child

Febrile seizures

Definition

Seizures occurring in children between the ages of 6 months and 6 years associated with a fever but without evidence of intracranial infection or defined cause for the seizure. Febrile seizures can be simple or complex febrile seizures.

Simple febrile seizures:

- Are generalised tonic-clonic seizures
- Are self-limiting, usually less than 5 minutes and always less than 15 minutes
- Cause no neurological deficit after the convulsion
- Have a good prognosis and very rarely develop into epilepsy
- Consist of only one seizure during the febrile illness which needs no specific treatment
- There is often a family history of febrile seizures.

Complex febrile seizures:

Febrile seizures with one or more of the following:

- Last longer than 15 minutes
- Are recurrent within the same febrile illness or occur within 24 hours
- Have a focal (partial) onset
- Have post-ictal, focal neurological abnormalities.

Risk factors for recurrent febrile seizures include:

- Seizure disorder in a first degree relative,
- Onset before 12 months of age

Diagnostic criteria

Clinical

- Exclude intracranial, extracranial and biochemical causes of fever or seizure.
- Signs of meningism are unreliable in children < 2 years of age.
- Treat children empirically for meningitis if suspected.

Investigations

- Bedside blood sugar level
- Malaria slide or Rapid Diagnostic Test (RDT)
- Full Blood count
- Urea, Creatinine, sodium, potassium and calcium (where possible)
- Lumbar puncture is indicated in:
    - All children with clinical features of possible meningitis,
    - Children where meningitis cannot be excluded, e.g. < 1 year of age or those who have received a course of antibiotics prior to the event.

In children > 1 year of age, where a focus of extracranial infection is present and intracranial infection such as meningitis has been excluded clinically, no further investigation is required.

Neuroimaging

- All children with complex febrile seizures and persistent lethargy require Brain CT scan before doing a lumbar puncture to exclude raised intracranial pressure
- Based on clinical findings, investigate complex febrile seizures for possible underlying conditions such as meningitis, focal brain lesions, cerebral malaria and epilepsy.

Note: An EEG is of no value in simple febrile seizures, but consider in recurrent complex febrile seizures.

General and supportive measures

- Reassure parents and caregivers.
- Educate parents and caregivers regarding the first aid management of seizures.

Medicines

- Treat fever with Paracetamol, oral, 15 mg/kg/dose 6 hourly.
- If convulsing: Infants and children 6 months to 5 years: Rectal Diazepam 0.5 mg/kg without exceeding 10 mg

Note: For children with recurrent complex febrile seizures, discuss the treatment options with a Paediatrician.

Epilepsy

Definition:

Epilepsy is a condition characterized by recurrent seizures associated with abnormal paroxysmal neuronal discharges. When seizures are recurrent, persistent or associated with a syndrome, then the child may be diagnosed with epilepsy.

Causes:

- Idiopathic (70-80%)
- Secondary causes:
  - Cerebral dysgenesis or malformation
  - Cerebral vascular occlusion
  - Cerebral damage like hypoxic ischaemic encephalopathy (HIE), intraventricular haemorrhage or ischemia, head injury, infections
  - Cerebral tumors
  - Neurodegenerative disorders

Types of epilepsy and their clinical presentation

Infantile spasms (West's Syndrome) *Clinical Signs/Symptoms:*

- Onset is during the first year of age
- Epileptic spasms (flexion and extension) associated with hypsarrhythmia on the EEG
- Developmental regression
- Child appears to stare, with a sudden flexion of the trunk and head, limbs either flung in or out but held in a tonic spasm for a few seconds
- Red appearance in the face and may cry out

Generalized epilepsy with febrile seizures

Clinical Signs/Symptoms:

- Febrile convulsions which persist beyond 6 years
- Often family history of febrile convulsions
- Occasionally associated with afebrile convulsions

Primary generalized absence seizure of childhood (Petit mal)

Clinical Signs/Symptoms:

- Onset 4 - 6 years of age
- Short spells of motor arrest of maximum 15 seconds duration with little or no associated movements and no post-ictal effect

Benign Rolandic epilepsy with centrotemporal spikes

Clinical Signs/Symptoms

- Onset usually between 6–10 years but can occur before 6 years of age
- Sleep related events of hemi-facial clonic spasm
- Inability to speak with retained awareness
- Usually resolves by late adolescence

Severe Myoclonic Epilepsy of Infancy

Clinical Signs/Symptoms:

- Occur in children under 1 year of age
- Recurrent clusters of febrile convulsions, severe neuro-regression and other non-febrile seizures by 2-3 years of age

Lennox-Gastaut syndrome

Clinical Signs/Symptoms:

- Onset between 2 - 3 years of age
- Combination of generalized tonic clonic seizures, atypical absences, myoclonic seizures, atonic drop attacks and occasionally complex partial seizures
- Behavioral problems and neuro-regression

Note: Infantile spasms, Severe Myoclonic Epilepsy of Infancy and Lennox-Gastaut syndrome are regarded as malignant forms of epilepsy and are associated with neuro-regression and behavioral problems.

Complications:

- Status Epilepticus
- Trauma secondary to loss of consciousness during seizures
- Mental retardation

Diagnosis:

- Detailed clinical history and physical examination

Investigations:

- Blood work up : Full Blood count, blood sugar, malaria test, Urea, Creatinine, sodium, potassium and calcium depending on the type of epilepsy
- Electroencephalogram (EEG)
- CT scan of the brain /MRI of the brain

Management:

Non Pharmaceutical

Acute management:

- Manage Airway-Breathing-Circulation-Disability and continue to monitor throughout the seizures
- Place patient on side at 20 – 30° head up to prevent aspiration
- Monitor heart rate, respiratory rate, blood pressure, oxygen saturation (SaO2), neurological status, fluid balance
- Monitor laboratory values including blood glucose, electrolytes, if available blood gases toxicology screen and if indicated anticonvulsant blood levels
- Control fever with Paracetamol with or without tepid sponging
- Administer oxygen to maintain SaO2 of ≥ 95%
- If unable to protect airway or poor ventilation, consider use of an oral airway, bag-mask ventilation and/or intubation
- Admit to pediatric ward or to intensive care unit if indicated

Long-term management:

- Minimize the impact of the epilepsy by obtaining complete seizure control to maximize child's full potential
- Educate/counsel the patient and caregiver about epilepsy and associated complications (i.e. learning difficulties)

Pharmacological treatment in children >1 month of age:

****Please refer to neonatology protocols 3rd Edition June 2019 for management of convulsions in children <1 month of age.***

Monotherapy is preferred but combination therapy may be necessary. Combination therapy should be initiated by or in close consultation with a pediatric specialist or neurologist. Drug levels are rarely indicated unless there is concern about toxicity or compliance.

For acute generalized tonic clonic seizures in children > 1 month of age:

- Diazepam rectal 0.5 mg/kg once OR IV 0.2-0.3mg/kg once
- Repeat after 10 minutes same dose only once
- Monitor airway and breathing closely

Alternative Medications (in the absence of diazepam):

- Lorazepam IV 0.05- 0.1 mg/kg once, may repeat in 5 minutes for a total of 3 doses
- Clonazepam IV 0.1 -0.15 mg/kg loading dose by slow IV injection
- For refractory status epilepticus: Midazolam IV 0.1-0.3 mg/kg bolus followed by a continuous infusion starting at 1 ug/kg/minute. The infusion can be titrated upwards every 5 minutes as needed.

If persistent seizure activity after benzodiazepines, start:

- Phenobarbital 15-20 mg/kg IV or by NG tube loading dose over 15minutes, may use a dextrose containing solution. If no response after 30 minutes, may repeat a 10 mg/kg IV loading dose.
- Phenytoin 15-20 mg/kg IV infused over 30 minutes in Normal saline
- If seizures persist after loading of dose of either Phenobarbital or Phenytoin, manage as status epilepticus below and arrange to transfer to a centre with high dependency unit/ intensive care unit
- Monitor for bradycardia, arrhythmias, and hypotension and pause the infusion if they occur and restart at 2/3 of the initial loading dose.

Ongoing seizure control: Children with epilepsy require maintenance anticonvulsants

Table 34. Maintenance medicine treatment choices for different types of epileptic seizures.

Type of epilepsy	First line treatment	Second line treatment
Generalised tonic and/or clonic	• Valproate **OR** • Phenobarbitone (< 6 months old)	• Lamotrigine
Focal seizures	• Carbamazepine	• Lamotrigine • Topiramate
Infantile epileptic spasms	• Stabilize then consult paediatric neurologist	
Myoclonic	• Stabilize then consult paediatric neurologist	
Lennox-Gastaut syndrome	• Stabilize then consult paediatric neurologist	

Maintenance medicine treatment dosage

- Valproate, oral, 5 mg/kg/dose (starting dose), 8–12 hourly.
  - Increase by 5 mg/kg weekly to 15–20 mg/kg/day given 8–12 hourly over 4 weeks.
  - Maximum total daily dose: 40 mg/kg/day.
  - Exclude liver dysfunction prior to initiating therapy (at least ALT),
  - Monitor at least clinically for hepatotoxicity.

- Carbamazepine, oral, 5 mg/kg/dose (starting dose), 8-12 hourly.
  - Increase slowly by 0.2 mg/kg at 2 weekly intervals to 5–10 mg/kg/dose 8–12 hourly.
  - Usual maintenance total daily dose: 10–20 mg/kg/day.
  - Maximum total daily dose: 20 mg/kg/day.
  - Dosage intervals: syrup 8 hourly, tablets 12 hourly.
  - Exacerbates myoclonic seizures and absence seizures..

- Phenobarbitone, oral, 2.5–5 mg/kg/dose as single dose at night.
  - May be used in children under six months of age.
  - Is not recommended as maintenance therapy for children older than 2 years due to undesirable side effects such as sedation, behaviour disturbances, hyperkinesia and dependence, except in situations where there is poor adherence to other drugs.
  - Exacerbates absence seizures

Note:

- Patients not responding to these medications should be referred to a referral hospital for possible use of second line drugs like Lamotrigine and Topiramate
- Avoid prescribing carbamazepine, phenobarbital, and phenytoin for patients receiving NNRTIs or PIs, as there are serious interactions involved

Referral

- All cases of suspected infantile spasms or myoclonic seizures.
- If there is concern for a secondary cause of epilepsy requiring further evaluation (examples include brain tumors, tuberous sclerosis, brain abscess, cysticercosis, etc.). This is particularly true in partial seizures where there may be a focal neurological problem.
- Seizures that are not controlled on first-line medications within 1 month.
- Seizures associated with neuro-regression.
- Mixed seizure types within one patient.

Convulsive status epilepticus

Definition

Status epilepticus is a generalized epileptic seizure lasting 5 or more minutes, or the presence of two or more seizures without recovering consciousness within 30 min, or a focal seizure that persists for >10 min, or with altered consciousness lasting for 60 min or more

Causes:

Epilepsy syndromes may present first as status epilepticus or status epilepticus may occur with inadequate anti-epileptic drug levels

- CNS infection
- Hypoxic ischemic insult
- Traumatic brain injury
- Cerebrovascular accidents
- Metabolic disease including severe hypoglycemia and inborn errors of metabolism
- Electrolyte imbalance

- Intoxication
- Cancer including primary brain tumors and metastatic disease

Signs and Symptoms

- Seizure lasting > 30 minutes or repetitive seizure activity without return to baseline consciousness.

Diagnosis

- Clinical evaluation

Investigations

- Blood work up : Full Blood count, blood sugar, malaria test, Urea, Creatinine, sodium, potassium and calcium depending on the type of epilepsy
- Lumbar puncture if infectious cause is suspected.
- Electroencephalogram (EEG)
- CT scan of the brain /MRI of the brain

Complications:

- Hypoxic ischaemic damage to brain, myocardium and muscles
- Cerebral oedema
- Long term neurologic morbidity including persistent seizures or encephalopathy
- Respiratory depression or failure due to neurologic status or aspiration
- Blood pressure disturbances including severe hypotension or severe hypertension
- Hyperthermia
- Metabolic derangement including hypoglycemia, alterations in sodium, and acidosis
- Inappropriate antidiuretic hormone (ADH) secretion
- Renal failure
- Death

Non-pharmaceutical

Acute Management:

- Carefully evaluate vital signs as convulsions may cause alterations in blood pressure or interfere with breathing resulting in a decrease in oxygen saturation levels
- Manage Airway-Breathing-Circulation-Disability and continue to monitor throughout seizures
- Place patient on side at 20–30° head up to prevent aspiration
- Monitor heart rate, respiratory rate, blood pressure, oxygen saturation (SaO2), neurological status, fluid balance every 15 minutes or as frequently as possible
- Monitor laboratory values including blood glucose, electrolytes, blood gases, toxicology screen and if indicated anticonvulsant blood levels
- Control fever with Paracetamol
- Administer oxygen to maintain SaO2 of ≥ 95%
- If unable to protect airway or poor ventilation, consider use of an oral airway, bag-mask ventilation and/or intubation
- Admission to intensive care if possible

Pharmacological treatment of status epilepticus

  - Diazepam
    - Infants and Children 6 months to 5 years: Rectal: 0.5 mg/kg rectally without exceeding 10 mg
    - Children 6 to 11 years: Rectal: 0.3 mg/kg.
    - Children ≥12 years and Adolescents: Rectal: 0.2 mg/kg.
  - In all cases if seizure continues, repeat dose once after 10 minutes.
  - Monitor respiratory rate.
- If still fitting after 20 minutes

- IV Phenobarbitone (loading 20mg/kg over 15 mins, max 1g) OR
- IV phenytoin (loading dose 20mg/kg in Normal saline over 60 mins)
- If seizure continues after Phenobarbitone, load with Phenytoin or if it persists after Phenytoin loading dose, load with Phenobarbitone if seizures continue despite the above, transfer to ICU for Endotracheal intubation and thiopental infusion

It is important to continue to address and manage the following:

- ABCs
- Hypoxia: Administer oxygen, oral airway, bag-mask ventilation or intubation.
- Haemodynamic: Assess for shock or hypertension and manage accordingly.
- Hyperthermia: Treat with paracetamol 10-15 mg/kg orally or rectally every 4-6 hours as required.
- Hypoglycemia: Treat with IV dextrose solution.
- Electrolyte imbalance: Assess aetiology and manage accordingly.
- If cerebral oedema and normal renal function, consider mannitol IV 0.5-1 gram/kg administered over 30–60 minutes.
- If there is a known space-occupying lesion, consider dexamethasone IV 1-2 mg/kg IV as a single dose then 1-1.5 mg/kg/day divided into 4 doses after discussion with a neurosurgeon

Recommendations

- Once status epilepticus is resolved, consider maintenance therapy with an appropriate anti-epileptic drug depending on the aetiology of seizure.
- Referral to a specialist is always appropriate in the case of status epilepticus. If possible, control seizures and stabilize the patient before referral. If status epilepticus has resolved, further work-up by a neurologist may be indicated.

Table 35. Phasic management of status epilepticus

Phase	***Management***	***Goals***
Early status *0-5 minutes* *Emergent initial antiepileptic drug (AED)* *5 minutes*	Early stabilisation phase • Immediate ABC • Diagnose hypoglycaemia • Establish IV access • Lorazepam, IV, 0.1 mg/kg • Diazepam 0.3 mg/kg over 3 minutes (***rectal is preferred***) If no IV access: • Diazepam, rectal, 0.5 mg/kg • OR • Lorazepam, IM, 0.1 mg/kg	• Maintain oxygen saturation • Maintain cerebral perfusion pressure • Support haemodynamic status
Established Status *5-30 minutes* *Urgent Status Control Therapy*	If still convulsing after 5-10 minutes • Repeat Lorazepam, IV, 0.1 mg/kg OR • Diazepam, rectal, 0.5 mg/kg • And load with Phenytoin, IV, 20mg/kg (infused in normal saline over 30 minutes OR • Phenobarbitone, IV, 20mg/kg If still convulsing after 15-20 minutes (use alternative option to what was used above) • Refer ICU	• Stop seizure • Control status epilepticus
Refractory Status *30-60 minutes*	ICU • Consideration for Midazolam infusion • Endotracheal intubation and thiopental infusion	• Stop seizure • Support haemodynamic status

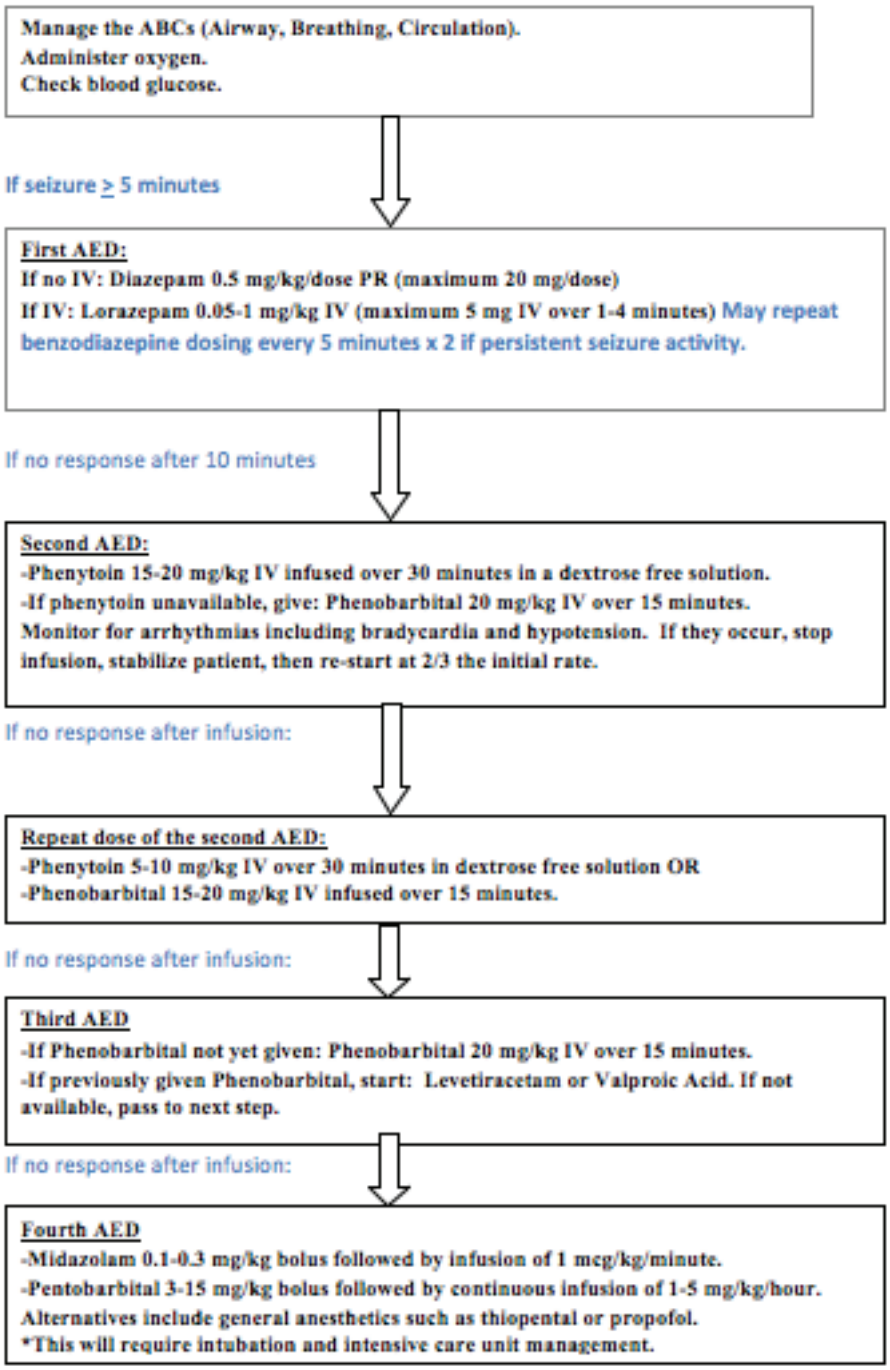

Figure 7. A flowchart showing medical management of Status Epilepticus

Cerebral palsy

Definition

Cerebral palsy is a group of non-progressive clinical syndromes due to brain abnormalities from a variety of causes that is characterized by motor and postural dysfunction of varying severity. Though it is not progressive, the appearance of the brain lesions and the clinical manifestations may change over time as the brain matures.

Causes:

- The etiology of the disorder is unknown in 70% of the cases
- Congenital infections (TORCH)
- Obstetric complications leading to perinatal hypoxia (toxemia, placenta previa, abruptio placentae, etc.)
- Teratogenic substances
- Congenital abnormalities including brain malformations and hereditary disorders
- Prematurity with Intracranial hemorrhage
- Cerebral trauma
- Infections (Bacterial sepsis, meningitis, herpes)
- Metabolic disturbances (kernicterus, severe prolonged hypoglycemia, Reye's syndrome)
- Intoxication

Clinical Signs/Symptoms:

Findings are consistent with a specific CNS lesion and commonly include:

- Spastic syndromes : diplegia, hemiplegia, or quadriplegia
- Dyskinetic syndromes : athetosis, chorea or dystonia
- Ataxic syndromes
- Atonic syndromes
- Abnormal persistence or absence of infantile reflexes

Associated Disorders & Complications may include:

- Cognitive impairments. Intellectual disability, learning problems and perceptual difficulties are common. There is a wide range of intellectual ability and children with severe physical disabilities may have normal intelligence
- Psychiatric disorders : Behavioral, emotional or psychiatric disorders
- Epilepsy: This occurs in 45% of patients with CP and the onset is generally in the first 2 years of life.
- Gastro-oesophageal reflux can result in oesophagitis or gastritis, causing pain, poor appetite and aspiration.
- Speech, swallowing, vision and hearing problems
- Constipation
- Drooling (poor saliva control).
- Incontinence. Children may be late in achieving bowel and bladder control because of cognitive deficits or lack of opportunity to access toileting facilities because of physical disability or inability to communicate. Some children have detrusor over activity causing urgency, frequency and incontinence.
- Growth failure: This is generally due to poor nutrition.
- Pulmonary disease: This is usually due to chronic aspiration and chronic pulmonary disease is a leading cause of death in patients with CP.
- Orthopedic disease: This includes hip and foot deformities and spinal curvatures. Patients may have chronic back, neck, and joint pain.

- Osteopenia: This is multifactorial related to poor nutrition, lack of motility and chronic medication use.
- Visual problems e.g. strabismus, refractive errors, visual field defects and cortical visual impairment
- Hearing deficits

Diagnosis:

- Based on history and clinical examination of the patient.

Investigations:

- Neuro-imaging including brain ultrasound, CT or MRI
- Lumbar puncture if indicated
- Basic lab-work to exclude other abnormalities (liver and renal function tests)
- Genetic screening depending on the clinical and family history
- Metabolic screening depending on the clinical and family history and basic lab work
- EEG
- Audiogram and visual evaluation to exclude correctable hearing or vision loss
- X-rays if indicated

Common reasons to come to hospital

- Respiratory problems particularly pneumonia
- Uncontrolled seizures / status epilepticus
- Unexplained irritability - consider acute infections, oesophagitis, dental disease, hip subluxation, pathological fracture.

Management:

Management involves a team approach with health professionals and teachers. Input from the family is paramount

- Perinatal asphyxia may be managed by passive or active hypothermia as per the neonatology protocols.
- Pharmacologic management of seizures (see above)
- Multidisciplinary services to address and promote social and emotional development, communication, education, nutrition, mobility and maximal independence and normal appearance.
  - Physical, occupational, and speech language therapy as necessary
  - Social services provided in a variety of context to aid in the coordination of care.
  - Nutritional assessment and support for those with dysphagia and/or poor growth
  - Mobility aids including crutches, walkers, or wheelchairs as needed
  - Surgical procedures to correct spasticity, contractures, scoliosis, or hip disorders
- Pharmacologic management of spasticity:
  - Botulinum toxin injections: Must be done by trained provider.
  - Dantrolene oral 0.5 mg/kg/dose once daily for 7 days, then increase to 1.5 mg/kg divided 3 times/day for 7 days, then increase to 3 mg/kg/day divided 3 times/day for 7 days, then increase to 6 mg/kg/day divided 3 times/day. Do not exceed 400 mg/day.
  - Benzodiazepines: Dose varies based on medication. Diazepam may be used: If 5 years: <8.5 kg: 0.5-1 mg at bedtime; 8.5-15 kg: 1-2 mg at bedtime; >5 years: 1.25 mg given 3 times per day up to 5 mg given 4 times per day.
  - Baclofen oral: <2 years: 10-20 mg divided every 3 times per day, titrate dose every 3 days in increments of 5-15 mg/day to a maximum of 40 mg daily; 2-7 years: 20-30 mg/day divided 3 times per day, titrate dose every 3 days in increments of 5-15

mg/day to a maximum of 60 mg/day, >8 years: 30-40 mg/day divided every 8 hours, titrate dose every 3 days in increments of 5-15 mg/day to a maximum of 120 mg/day.

- Intrathecal baclofen: Requires neurosurgical intervention to place pump to deliver medication. The benefits and complications should be discussed in detail with the neurosurgeon.

MANAGEMENT OF THE SICK NEONATES 0-7 DAYS

Name: Age: Weight (kg): Temperature (°C):

Ask: What are the infant's problems?: Initial Visit? Follow-up Visit

Table 36. Management of the sick neonates 0-7 days.

ASSESS (Circle all signs present)	CLASSIFY
CHECK FOR SEVERE DISEASE, SEVERE BACTERIAL INFECTION , MODERATE HYPOTHERMIA AND LOCAL BACTERIAL INFECTION • Is the infant having difficulty in feeding? • Has the infant had convulsions? • Has the infant had any attacks where s/he stops breathing, or becomes stiff or blue (apnoea)? • Count the breaths in one minute. __breaths per minute Repeat if elevated: _ Fast breathing? • Look for severe chest indrawing. • Look and listen for grunting. • Look for pus draining from the eyelids/Swollen eyes/ No eye swelling • Movement only when stimulated or no movement even when stimulate • Look and feel for bulging fontanelle • Look at the umbilicus. Is it red or draining pus? Look for discharge from the eyes. Is there a purulent or sticky discharge? Is there abundant pus? Are the eyelids swollen • Fever (temperature 37.5°C or above feels hot) or low body temperature (below 35.5°C or feels cool) • Look for skin pustules. Are there many or severe pustules?	
CHECK FOR JAUNDICE • When did the jaundice appear first? 24h of life, > 24h of life • Look for jaundice (yellow eyes or skin) • Look at the young infant's palms and soles. Are they yellow?	

DOES THE YOUNG INFANT HAVE CONGENITAL ABNORMALITIES? • Ask the mother if she has any concerns • Ask for any identified birth defects or other problems • Was the mother's RPR tested in pregnancy? ☐If yes, was it positive or negative? ☐If positive, did she receive treatment? If yes, how many doses? How long before delivery did she receive the last dose? LOOK FOR PRIORITY SIGNS • Cleft lip or palate • Imperforate anus • Nose not patent • Macrocephaly or Microcephaly or (birth head circumference more than 39 cm or <32cm) • Ambiguous Genitalia • Abdominal distention • Look for other abnormal signs	Yes _ No _
THEN CHECK FOR FEEDING PROBLEM OR LOW WEIGHT If the infant has no indication to refer urgently to hospital • Is there any difficulty feeding? Yes ___ No ___ • Is the infant breastfed? Yes _ No_ If yes, how many times in 24 hours? __ times • Is the infant suckling effectively (that is, slow deep sucks, sometimes pausing)? no suckling at all, not suckling effectively, suckling effectively • Is the infant able to attach? no attachment at all, not well attached, good attachment • Look for ulcers or white patches in the mouth (thrush). • Does the infant usually receive any other foods or drinks? Yes ___ No ___ If yes, how often? • What do you use to feed the child? • Determine weight for age. Low ___ Not low ___	
ASSESS FOR LOW BIRTH WEIGHT • Look at the current weight of the newborn; is it <1500 grams? • Is it between 1500g and 2500g • Is it above 2.5kg	
CHECK FOR HIV INFECTION Note mother's and/or child's HIV status: • Mother's HIV test: NEGATIVE /POSITIVE/ NOT DONE/KNOWN • Child's virological test: Child's serological test: NEGATIVE/ POSITIVE/ NOT DONE • If mother is HIV positive and NO positive virological test in young infant: Is the infant breastfeeding now? Was the infant breastfeeding at the time of test or 6 weeks before it? If breastfeeding: Is the mother and infant on ARV prophylaxis?	

ASSESS BREASTFEEDING • Has the infant breastfed in the previous hour? If the infant has not fed in the previous hour, ask the mother to put her infant to the breast. Observe the breastfeed for 4 minutes. Is the infant able to attach? • To check attachment, look for: Chin touching breast: Yes ___ No ___ Mouth wide open: Yes ___ No Lower lip turned outward: Yes ___ No ___ More areola above than below the mouth: Yes ___ No ___ not well attached good attachment • Is the infant sucking effectively (that is, slow deep sucks, sometimes pausing)? not sucking effectively sucking effectively	
CHECK THE CHILD'S IMMUNIZATION STATUS (Circle immunizations needed today) BCG OPV-0 Hep B 0	Return for next immunization on: _ (Date)

MANAGEMENT OF THE SICK NEONATE 0-7 DAYS OLD

Table 37. Assess for severe disease or severe bacterial infection, moderate hypothermia and local bacterial infection

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Presence of one of the following signs; • Convulsions • Unable to eat • Fast breathing (> = 60 cycles per minute) OR • Severe costal recessions OR • Grunting OR • No movements even if stimulation OR • Movements if stimulation OR • Fever (≥37, 5 ° C) OR • Severe hypothermia (<35.5 ° C) • Bulging fontanelle • Apnoeic attacks • Severe pustules	SEVERE BACTERIAL INFECTION OR VERY SEVERE DISEASE	Administer the first pre-transfer dose of antibiotics in IM (Ampicillin 50mg/kg stat and Gentamycin 5mg/kg stat) Administer phenobarbital IM in case of ongoing seizures (15mg/kg) Start warming the newborn if hypothermia Prevent hypoglycaemia (G 10% 2ml/Kg stat) Explain to the mother how to keep baby warm during the transfer URGENTLY transfer the baby to the hospital
• Red umbilicus or pus discharge from the umbilicus. • Skin pustules.	LOCAL BACTERIAL INFECTION	• Give an appropriate antibiotic by mouth • (Amoxycillin 25mg/g/dose 12hourly) • Teach the mother how to treat local infections at home • Advise the mother on the care of the newborn at home • Explain when to return immediately • Review in 2 days

• Moderate hypothermia (temperate35.5-36.5)	MODERATE HYPOTHERMIA	• Warm the baby by skin-to-skin contact (follow guidelines on hypothermia • Reassess after 1 hour and follow guidelines on hypothermia • Explain when to return immediately • Review in 2 days
No sign of serious or local bacterial infection No hypothermia	Bacterial infection unlikely And No hypothermia	• Treat the newborn for any other problem • Advise the mother on home care of the newborn • Explain when to return immediately

Table 38. Check for feeding problem

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
• Not able to feed • No attachment at all • No suckling at all.	SERIOUS ILLNESS OR SERIOUS BACTERIAL INFECTION	• Give first dose of two intramuscular antibiotics. Ampicillin 50mg/kg stat and Gentamycin 5mg/kg stat) • Advise the mother how to keep the young infant warm on the way to hospital. Refer URGENTLY to hospital.
• Attachment not well done or • Ineffective sucking or • Less than 8 feedings in 24 hours or • Receives other foods or liquids or • Ulcerations or white patches in the mouth or • Malformation in the mouth	FEEDING PROBLEM	• If the attachment is not good or the sucking is not effective: - explain the good position and the good attachment. - help the mother to treat nipple abnormalities if they exist - Clean the nose if it is blocked • If the mother is breastfeeding less than 8 times within 24 hours, advise her to breastfeed more often. • If the newborn receives other foods or liquids in addition to breast milk: - advise the mother to breastfeed more, reduce other foods and fluids, and use a cup. - give appropriate advice if the mother is HIV positive • If no breastfeeding: Refer for Breast feeding counselling - Advise and encourage mother on breastfeeding and possibly relactation if mother is HIV-negative. - Teach the mother to correctly prepare a breast-milk substitute and use a cup especially if the mother is HIV-positive • In case of thrush, teach the mother to treat him at home. • In case of malformation to the mouth, refer better management • Teach the mother how to care for the newborn at home. • Explain when to return immediately • Review the newborn in 2 days

Normal weight for age and no any other sign of inadequate feeding.	NO FEEDING PROBLEMS	Congratulate the mother for the good nutrition of the newborn Encourage the mother to breastfeed more and reinforce hygiene. Explain when

Table 39. Asses for low birth weight

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Less 1.5kg	VERY LOW BIRTH WEIGHT	• Ensure enough warm (skin to skin) before and during transfer • Test for low blood sugar, and treat or prevent it • Teach the mother how to keep the infant warm on way to hospital • Refer the new born to hospital in KMC position
Weight between 1500g and 2500g	LOW BIRTH WEIGHT	• Teach the mother to keep the baby warm at home (Kangaroo) • Encourage the mother to breastfeed every 2 or 3 hours • Review the newborn every day until good breastfeeding, gaining weight and body temperature remains stable • Then see the newborn 14 days after the last visit • Explain when to return immediately
Weight ≥ 2500 g	NO LOW WEIGHT	• Treat the newborn for any other problem • Advise the mother on the care of the newborn at home • Explain when to return immediately

Table 40. Assess for eye infection

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Swollen and purulent eyes	PROBABLE GONOCOCCAL EYE INFECTION	• Administer the appropriate antibiotic systemically (Ceftriaxone 50mg/kg IM x 1 dose Max 125mg OR cefotaxime single dose of 100 mg/kg) • Teach the mother how to look after the eyes of the newborn at home • Advise the mother to keep the newborn warm • Explain when to return immediately • Review the child 2 days later • Treat parents for Gonococcal genital infection
Purulent eyes	CONJUNCTIVITIS	• Apply the first dose of local antibiotic into the eyes(Gentamycin eye drops 1 drop 8h for 7 days • Show the mother how to look after the child at home • Explain when to return immediately • Review the child 5 days later
No swollen or purulent eyes	NO EYE INFECTION	• Treat the newborn for any other problem • Advise the mother on the care of the newborn at home • Explain when to return immediately

CLASSIFICATION OF JAUNDICE IN NEWBORN 0-7 DAYS

1. SEVERE JAUNDICE 2. JAUNDICE 3. NO JAUNDICE

Table 41. Classification of jaundice in newborn 0-7 days

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Jaundice appearing within 24 hours of life OR Jaundice on the palms and soles of the feet at any age.	Pink: SEVERE JAUNDICE	• treat to prevent hypoglycaemia • Refer URGENTLY to hospital • Teach the mother how to keep the infant warm on way to hospital
Jaundice appearing after 24 hours of age AND Palms and soles not yellow	Yellow: JAUNDICE	• Advise the caregiver to return immediately if palms and soles appear yellow • Follow-up in 2 days • Teach the mother home care
No jaundice	Green: NO JAUNDICE	Advise the mother to give home care for the young infant

Table 42. Check for HIV infection

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
HIV test of the mother and / or father of the child is positive	POSSIBLE HIV TRANSMISSION	• Treat the infant according to guidelines/ classification • Refer the infant to the HIV clinic
HIV status of parents is unknown OR HIV test of one of the parents is negative and it is positive for an other parent	HIV TRANSMISSION PROBABLE	• Start treatment for other classifications/ guidelines • Counsel parents on HIV prevention and voluntary testing
HIV test of the mother and father of the child is negative during pregnancy or breastfeeding	HIV TRANSMISSION NOT PROBABLE	• Give advice to the mother on newborn care. • No specific interventions for HIV • Counsel on HIV Prevention

Table 43. Assess for congenital problems

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Any one of the PRIORITY SIGNS: Cleft palate or lip Imperforate anus Nose not patent Macrocephaly Ambiguous genitalia Abdominal distention Ompholocaele / gastroschidis	Pink: MAJOR ABNORMALITY OR SERIOUS ILLNESS	• Keep warm, skin to skin or transport in incubator • Test for low blood sugar, and treat or prevent • Encourage mother to continue breastfeeding or give EBM 3ml/kg per hour • Refer URGENTLY

Other abnormal signs	Yellow: BIRTH ABNORMALITY	• Keep warm, skin to skin • Assess breastfeeding If not able to breastfeed, give EBM 3ml/kg per hour on the way • Address any feeding problems and support mother to breastfeed successfully • Refer for assessment
Mother's RPR positive and she is Untreated/Partially treated (fewer than three doses) / Treatment completed less than 1 month before delivery OR Mother's RPR is not known, and it is not possible to get the result now	Yellow: POSSIBLE CONGENITAL SYPHILIS	• Check for signs of congenital syphilis and if present refer to hospital • If no signs of congenital syphilis, give intramuscular penicillin • Ask about the caregiver's health, and treat as necessary. • Ensure that the mother receives full treatment for positive RPR.
No risks nor abnormal signs	Green: NO BIRTH ABNORMALITIES	Counsel the caregiver on home care for the young infant

Table 44. Assses all young infants for risk factors

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Mother or is on TB treatment Mother has TB and not on treatment	Yellow: TB EXPOSED	• If mother has received TB treatment for more than 2 months, is smear negative and baby is well, give baby BCG and follow the baby every month for 2 months • If mother has received TB treatment for less than 2 months before delivery or smear positive, refer to hospital to check the baby for signs of congenital TB; ○ Those that are symptomatic should be treated for TB ○ Those without active TB disease should be on IPT for 6 months. • Give BCG 2 weeks after completion of INH or TB treatment • Ask about the caregiver's health, and treat as necessary
Infant weighed less than 2 kg at birth OR Admitted to hospital for more than three days after delivery OR Known neurological or congenital problem	Yellow: AT RISK INFANT	• Monitor growth and health more frequently • Assess feeding and encourage breastfeeding • Conduct home visits to assess feeding and growth • Encourage mother to attend follow-up appointments and refer to other services if indicated (further medical assessment, ECD centre, support groups)

Mother has died or is ill OR Infant not breastfed OR Teenage caregiver OR Social deprivation	Yellow: POSSIBLE SOCIAL PROBLEM	• Assess breastfeeding and support mother to breastfeed successfully • If not breastfeeding, counsel and explain safe replacement feeding • Monitor growth and health more frequently • Conduct home visits to assess feeding and growth • Refer to other available services if indicated (social worker, ECD centres or community based organisations)
No risk factors	Green: NO RISK FACTORS	Counsel the caregiver on home care for the young infant

MANAGEMENT OF THE SICK YOUNG INFANT AGED 1 WEEK TO 2 MONTHS

Name: Age: Weight (kg): Temperature (°C):
Ask: What are the infant's problems?: Initial Visit? Follow-up Visit

Table 45. Management of the sick young infant aged 1 week to 2 months

ASSESS (Circle all signs present)	CLASSIFY
CHECK FOR SEVERE DISEASE AND BACTERIAL INFECTION • Is the infant having difficulty in feeding? • Has the infant had convulsions? • Has the infant had any attacks where s/he stops breathing, or becomes stiff or blue (apnoea)? • Count the breaths in one minute. __breaths per minute Repeat if elevated: _ Fast breathing? • Look for severe chest indrawing. • Look and listen for grunting. • Look for pus draining from the ear. • Movement only when stimulated or no movement even when stimulate • Look and feel for bulging fontanelle • Look at the umbilicus. Is it red or draining pus? Look for discharge from the eyes. Is there a purulent or sticky discharge? Is there abundant pus? Are the eyelids swollen • Fever (temperature 38°C or above feels hot) or low body temperature (below 35.5°C or feels cool) • Look for skin pustules. Are there many or severe pustules?	
CHECK FOR JAUNDICE • When did the jaundice appear first? • Look for jaundice (yellow eyes or skin) • Look at the young infant's palms and soles. Are they yellow?	

DOES THE YOUNG INFANT HAVE DIARRHOEA? • For how long? • Is there blood in the stool? • Look at the young infant's general condition. • Does the infant: move only when stimulated? • Does not move even when stimulated? • Lethargic or unconscious • Is the infant restless and irritable? • Offer the child fluid: Not able to drink or drinking poorly? Drinking eagerly, thirsty? • Look for sunken eyes. • Pinch the skin of the abdomen. Does it go back: Very slowly? Slowly?	Yes _ No _
THEN CHECK FOR FEEDING PROBLEM OR LOW WEIGHT If the infant has no indication to refer urgently to hospital • Is there any difficulty feeding? Yes ___ No ___ • Is the infant breastfed? Yes _ No_ If yes, how many times in 24 hours? __ times • Is the infant suckling effectively (that is, slow deep sucks, sometimes pausing)? no suckling at all, not suckling effectively, suckling effectively • Is the infant able to attach? no attachment at all, not well attached, good attachment • Look for ulcers or white patches in the mouth (thrush). • Does the infant usually receive any other foods or drinks? Yes ___ No ___ If yes, how often? • What do you use to feed the child? • Determine weight for age. Low ___ Not low ___	
CHECK FOR HIV INFECTION Note mother's and/or child's HIV status: • Mother's HIV test: NEGATIVE /POSITIVE/ NOT DONE/KNOWN • Child's virological test: Child's serological test: NEGATIVE/ POSITIVE/ NOT DONE • If mother is HIV positive and NO positive virological test in young infant: Is the infant breastfeeding now? Was the infant breastfeeding at the time of test or 6 weeks before it? If breastfeeding: Is the mother and infant on ARV prophylaxis?	
ASSESS BREASTFEEDING • Has the infant breastfed in the previous hour? If the infant has not fed in the previous hour, ask the mother to put her infant to the breast. Observe the breastfeed for 4 minutes. Is the infant able to attach? • To check attachment, look for: Chin touching breast: Yes ___ No ___ Mouth wide open: Yes ___ No Lower lip turned outward: Yes ___ No ___ More areola above than below the mouth: Yes ___ No ___ not well attached good attachment • Is the infant sucking effectively (that is, slow deep sucks, sometimes pausing)? not sucking effectively sucking effectively	

CHECK THE CHILD'S IMMUNIZATION STATUS (Circle immunizations needed today) BCG OPV-0 DPT+HIB-1 OPV-1 Rotavirus 1	Return for next immunization on: _ (Date)
RISK FACTORS IN ALL YOUNG INFANT • Has the mother been on TB treatment in the last 6 months? If so, for how long was she on treatment before the infant was born? • How much did the infant weigh at birth? • Was the infant admitted to hospital after birth? If so, for how many days? • Who is the child's caregiver? • How old is the mother/caregiver? • Is the infant exclusively breastfed?	
ASSESS OTHER PROBLEMS: Ask about mother's own health	

MANAGEMENT OF THE SICK YOUNG INFANT AGED 1 WEEK TO 2 MONTHS

CLASSIFICATION OF SIGNS OF SERIOUS ILLNESS IN A SICK YOUNG INFANT

1. VERY SEVERE DISEASE OR POSSIBLE BACTERIA INFECTION
2. LOCAL BACTERIAL INFECTION
3. NO SEVERE DISEASE OR LOCAL INFECTION UNLIKELY

VERY SEVERE DISEASE OR POSSIBLE BACTERIA INFECTION

Table 46. Classification of signs of serious illness in a sick young infant

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Any one of the following signs • Convulsions OR • Apnoea or breathing < 30 per minute OR • Fast breathing (> 60 per minute), chest indrawing, nasal flaring or grunting.OR • Bulging fontanelle. OR • Fever (37.5° or above or feels hot) or low body temperature (less than 35.5° or feels cold). OR • Only moves when stimulated or unconsciousness, OR • Abundant pus/purulent discharge from eyes, or swollen eyelids OR • Pus draining from ear OR • Umbilical redness extending to the skin and/or draining pus OR • Many or severe skin pustules OR • Unable to feed	**Pink:** POSSIBLE VERY SEVERE DISEASE	• Give first dose of antibiotic IMI (Ampicillin 50mg/kg stat and Gentamycin 5mg/kg stat) • Give an anti convulsant (Phenobarbital IM 15mg/kg) • Treat to prevent hypoglycaemia • Breastfeed if possible • Keep the infant warm on the way • Refer URGENTLY

• Red umbilicus or purulent OR • Skin pustules.	Yellow: LOCAL BACTERIAL INFECTION	• Treat skin pustules and a red umbilicus with oral Cloxacillin 50mg/kg 8h for 5 days • Teach the caregiver to treat local infections at home and counsel on home care for the young infant • Follow-up in 2 days
None of the signs of very severe disease or local bacterial infection	Green: SEVERE DISEASE OR LOCAL INFECTION UNLIKELY	Advise mother to give home care and when to come back

CLASSIFICATION OF JAUNDICE IN A SICK YOUNG INFANT

2. SEVERE JAUNDICE 2. JAUNDICE 3. NO JAUNDICE

Table 47. Classification of jaundice in a sick young infant

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Any jaundice if age less than 24 hours or Yellow palms and soles at any age	Pink: SEVERE JAUNDICE	• Test for low blood sugar, and treat or prevent it (G10% 2ml/kg) • Keep the infant warm • Refer URGENTLY
Jaundice appearing after 24 hours of age and Palms and soles not yellow	Yellow: JAUNDICE	• Advise the caregiver to return immediately if palms and soles appear yellow • Follow-up in 1 day • If the young infant is older than 14 days, refer for assessment
No jaundice	Green: NO JAUNDICE	Advise the mother to give home care for the young infant

Table 48. Classification of feeding problems or low weight

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Not able to feed or No attachment at all or Not suckling at all.	SERIOUS ILLNESS OR SERIOUS BACTERIAL INFECTION	• Give first dose of intramuscular antibiotics IMI (Ampicillin 50mg/kg stat and Gentamycin 5mg/kg stat) • Treat to prevent low blood sugar. • Advise the mother how to keep the young infant warm on the way to hospital. • Refer URGENTLY to hospital.
Not well attached to breast or Not suckling effectively or Less than 8 breastfeeds in 24hours or Receives other foods or drinks or Low weight for age or Thrush	FEEDING PROBLEM OR LOW WEIGHT	• Advise the mother to breastfeed as often and for as long as the infant wants, day and night ➢ If not well attached or not suckling effectively, teach correct positioning and attachment. ➢ If breastfeeding less than 8 times in 24 hours, advise to increase frequency of feeding • If receiving other foods or drinks, counsel mother about breastfeeding more, reducing other foods or drinks, and using a cup. • If not breastfeeding at all: ➢ Refer for breastfeeding counselling and possible relactation. ➢ Advise about correctly prepared breast milk substitutes and using a cup. • If thrush, teach the mother to treat thrush at home. • Advise mother to give home care for the young infant. • Follow-up any feeding problem or thrush in 2 days. • Follow-up low weight for age in 14 days.
Not low weight for age and no other signs of inadequate feeding	NO FEEDING PROBLEM	• Advise mother to give home care for the young infant • Praise the mother for feeding the infant well.

Table 49. Asses the neonate for hiv infection

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Child has Positive PCR	CONFIRMED HIV INFECTION	• Give Cotrimoxazole prophylaxis from age 4–6 weeks • Assess the child's feeding and counsel as necessary • Refer to HIV clinic for staging, assessment and initiation of ART • Advise the mother on home care • Follow-up in 14 days

• HIV test of Mother and/or father is positive • OR • Child has positive HIV antibody test • (seropositive)	POSSIBLE HIV INFECTION/HIV EXPOSED	• Give co-trimoxazole prophylaxis from age 4–6 weeks • Assess the child's feeding and give appropriate feeding advice • Refer to HIV clinic to confirm infant's HIV status • Follow-up in one month
HIV status for both parents not known	Probable HIV infection	Start treatment according to the current classification Advise parents to do HIV testing and encourage HIV prevention
Negative HIV test for mother and father during pregnancy or breastfeeding period	HIV INFECTION UNLIKELY	Treat, counsel and follow-up existing infections Advise the mother about feeding and about her own health No specific intervention for HIV

Table 50. Assess for congenital problems

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Any one of the PRIORITY SIGNS: Cleft palate or lip Imperforate anus Nose not patent Macrocephaly Ambiguous genitalia Abdominal distention Very low birth weight (≤ 2kg)	Pink: MAJOR ABNORMALITY OR SERIOUS ILLNESS	• Keep warm, skin to skin or transport in incubator • Test for low blood sugar, and treat or prevent • Encourage mother to continue breastfeeding or give EBM 3ml/kg per hour • Refer URGENTLY
One or more abnormal signs	Yellow: BIRTH ABNORMALITY	• Keep warm, skin to skin • Assess breastfeeding If not able to breastfeed, give EBM 3ml/kg per hour on the way • Address any feeding problems and support mother to breastfeed successfully • Refer for assessment
Mother's RPR positive and she is Untreated/Partially treated (fewer than three doses) / Treatment completed less than 1 month before delivery OR Mother's RPR is not known, and it is not possible to get the result now	Yellow: POSSIBLE CONGENITAL SYPHILIS	• Check for signs of congenital syphilis and if present refer to hospital • If no signs of congenital syphilis, give intramuscular penicillin • Ask about the caregiver's health, and treat as necessary. • Ensure that the mother receives full treatment for positive RPR.

No risks nor abnormal signs	Green: NO BIRTH ABNORMALITIES	Counsel the caregiver on home care for the young infant

CLASSIFICATION OF DIARRHEA IN A SICK YOUNG INFANT

Table 51. classifification of diarrhoea in a sick young infant

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Two of the following signs: • Lethargic or unconscious. • Sunken eyes. • Skin pinch goes back very lowly. • Young infant less than one month of age.	Pink: SEVERE DEHYDRATION	• If the infant is classified as NO POSSIBLE SEVERE BACTERIAL INFECTION: • - Give liquids and treat as severe dehydration (Plan C) OR • If the infant is classified as POSSIBLE SEVERE BACTERIAL INFECTION: Give first dose of intramuscular antibiotics IMI (Ampicillin 50mg/kg stat and Gentamycin 5mg/kg stat) • Refer urgently to the Hospital • Breastfeed or give frequent sips of ORS on the way if possible • Keep the infant warm on the way to hospital
Two of the following signs: • Restless, irritable. • Sunken eyes. • Skin pinch goes back slowly.	Yellow: Signs of DEHYDRATION	• Give fluid for some dehydration (Plan B) • If the infant is classified as POSSIBLE SEVERE BACTERIAL INFECTION: Give first dose of intramuscular antibiotics IMI (Ampicillin 50mg/kg stat and Gentamycin 5mg/kg stat) • Refer urgently to the Hospital and advise the mother to give frequent sips of ORS on the way if possible and to continue breastfeeding Explain how to come back immediately
Not enough signs to classify as some or severe dehydration.	Green: NO DEHYDRATION	• Give fluids to treat for diarrhoea at home • If exclusively breastfed, do not give other fluids • Give zinc for 14 days • Counsel the caregiver on home care for the young infant • Follow-up in 2 days
Diarrhoea lasting 14 days or more	Pink: SEVERE PERSISTENT DIARRHOEA	• Refer after treating for dehydration if present • Keep the infant warm on the way to hospital
Blood in the stool.	Pink: Bloody diarrhoea	• Treat hypoglycaemia • Keep the infant warm on the way to hospital • Refer URGENTLY.

CLASSIFICATION OF FEEDING PROBLEMS OR LOW WEIGHT

Table 52. Classification of feeding problems or low weight

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Not able to feed or No attachment at all or Not suckling at all.	NOT ABLE TO FEED— POSSIBLE SERIOUS BACTERIALINFECTION	• Give first dose of IM (Ampicillin 50mg/kg stat and Gentamycin 5mg/kg stat) • Treat to prevent low blood sugar. • Advise the mother how to keep the young infant warm on the way to hospital. • Refer URGENTLY to hospital.
Not well attached to breast or Not suckling effectively or Less than 8 breastfeeds in 24hours or Receives other foods or drinks or Low weight for age or Thrush	FEEDING PROBLEM OR LOW WEIGHT	• Advise the mother to breastfeed as often and for as long as the infant wants, day and night ➢ If not well attached or not suckling effectively, teach correct positioning and attachment. ➢ If breastfeeding less than 8 times in 24 hours, advise to increase frequency of feeding • If receiving other foods or drinks, counsel mother about breastfeeding more, reducing other foods or drinks, and using a cup. • If not breastfeeding at all: ➢ Refer for breastfeeding counselling and possible relactation. ➢ Advise about correctly prepared breast milk substitutes and using a cup. • If thrush, teach the mother to treat thrush at home. • Advise mother to give home care for the young infant. • Follow-up any feeding problem or thrush in 2 days. • Follow-up low weight for age in 14 days.
Not low weight for age and no other signs of inadequate feeding	NO FEEDING PROBLEM	• Advise mother to give home care for the young infant • Praise the mother for feeding the infant well.

ASSSES ALL YOUNG INFANTS FOR RISK FACTORS

Table 53. Assses all young infants for risk factors

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Mother is on TB treatment	**Yellow:** TB EXPOSED	• If mother has received TB treatment for more than 2 months, is smear negative and baby is well, give baby BCG and follow the baby every month for 2 months • If mother has received TB treatment for less than 2 months before delivery or smear positive, check the baby for signs of congenital TB; ○ Those that are symptomatic should be treated for TB ○ Those without active TB disease should be on IPT for 6 months. • Do an HIV PCR test at 6 weeks, or earlier if the child is sick • Give BCG on completion of INH or TB treatment • Ask about the caregiver's health, and treat as necessary
Infant weighed less than 2 kg at birth OR Admitted to hospital for more than three days after delivery OR Known neurological or congenital problem	**Yellow:** AT RISK INFANT	• Monitor growth and health more frequently • Assess feeding and encourage breastfeeding • Conduct home visits to assess feeding and growth • Encourage mother to attend follow-up appointments and refer to other services if indicated (further medical assessment, ECD centre, support groups)
Mother has died or is ill OR Infant not breastfed OR Teenage caregiver OR Social deprivation	Yellow: POSSIBLE SOCIAL PROBLEM	Assess breastfeeding and support mother to breastfeed successfully If not breastfeeding, counsel and explain safe replacement feeding Monitor growth and health more frequently Conduct home visits to assess feeding and growth Refer to other available services if indicated (social worker, ECD centres or community based organisations)
No risk factors	Green: NO RISK FACTORS	Counsel the caregiver on home care for the young infant

MANAGEMENT OF THE SICK CHILD AGED 2 MONTHS UP TO 5 YEARS

Names:
Age: Weight (kg): Height/Length (cm): Temperature (°C):
Ask: What are the child's problems? Initial Visit? Follow-up Visit

Table 54. Management of the sick child aged 2 months up to 5 years

ASSESS (Circle all signs present)	**CLASSIFY**
CHECK FOR GENERAL DANGER SIGN • Not able to drink or breastfeed • Vomits everything • Convulsions lethargic or unconscious • Convulsing now.	General danger sign present Yes _ No _
DOES THE CHILD HAVE COUGH OR DIFFICULT BREATHING? For how long? ___ Days Count the breaths in one minute: ___ breaths per minute. Fast breathing? Look for chest indrawing Look and listen for stridor Look and listen for wheezing	Yes __ No __
DOES THE CHILD HAVE DIARRHOEA? For how long? ___ Days Is there blood in the stool? Look at the child's general condition. Is the child: Lethargic or unconscious? Restless and irritable? Look for sunken eyes. Offer the child fluid; Not able to drink or drinking poorly? Drinking eagerly, thirsty? Pinch the skin of the abdomen. Does it go back: Very slowly (longer than 2 seconds)? Slowly?	Yes _ No _
DOES THE CHILD HAVE FEVER? (by history/feels hot/ temperature 37.5°C or above) Decide malaria risk: High ___ Low ___ No___ For how long? ___ Days If more than 7 days, has fever been present every day? Has child had measles within the last 3 months? Do a malaria test, if NO general danger sign in all cases in high malaria risk or NO obvious cause of fever in low malaria risk: Test POSITIVE? P. falciparum P. vivax NEGATIVE? Look or feel for stiff neck Look for runny nose Look for signs of MEASLES: Generalized rash and One of these: cough, runny nose, or red eyes Look for any other cause of fever.	

If the child has measles now or within the last 3 months:: • Look for mouth ulcers. If yes, are they deep and extensive? Look for pus draining from the eye. Look for clouding of the cornea.	
DOES THE CHILD HAVE AN EAR PROBLEM? Yes __ No __ Is there ear pain? Is there ear discharge? If Yes, for how long? ___ Days Look for pus draining from the ear Feel for tender swelling behind the ear	
CHECK FOR ACUTE MALNUTRITION Look for oedema of both feet. Determine WFH/L z-score: _____ Less than -3? Between -3 and -2? -2 or more? For children 6 months or older measure MUAC _____ mm.	
If child has MUAC less than 115 mm or WFH/L less than -3 Z scores or oedema of both feet: Is there any medical complication: General danger sign? Any severe classification? Pneumonia with chest indrawing? Child 6 months or older: Offer RUTF to eat. Is the child: Not able to finish? Able to finish? Child less than 6 months: Is there a breastfeeding problem? **Signs of severity** - Prostration, - Unconsciousness, - Convulsion, - Signs of pneumonia (rapid breathing, stridor, chest pain), - Diarrhoea, - Hypothermia, - Sign of dehydration, - Shock sign (cold end, uncollected pulse), - fever, - pallor, - Difficulty to eat. **OTP ** Outpatient Therapeutic Program,** **SFP *** Supplementation Feeding Program**	
CHECK FOR HIV INFECTION Note mother's and/or child's HIV status Mother's HIV test: NEGATIVE/POSITIVE /NOT DONE/KNOWN Child's virological test: NEGATIVE/POSITIV/ NOT DONE Child's serological test: NEGATIVE/POSITIVE/NOT DONE If mother is HIV-positive and NO positive virological test in child: Is the child breastfeeding now? Was the child breastfeeding at the time of test or 6 weeks before	
CHECK THE CHILD'S IMMUNIZATION STATUS (Circle immunizations needed today) BCG OPV-0 Hep B0 ; DPT+HIB-1 OPV-1 Hep B1 RTV-1 Pneumo-1; DPT+HIB-2 OPV-2 Hep B2 RTV-2 Pneumo-2; DPT+HIB-3 OPV-3 Hep B3 Pneumo-3; Measles1 Measles 2 Vitamin A Mebendazole	

Check for anaemia • Look for palmar pallor. Is she: Severe? Mild? No pallor)	
ASSESS FEEDING if the child is less than 2 years old, has MODERATE ACUTE MALNUTRITION, ANAEMIA, or is HIV exposed or infected Do you breastfeed your child? Yes ___ No ___ If yes, how many times in 24 hours? ___ times. Do you breastfeed during the night? Yes ___ No ___ Does the child take any other foods or fluids? Yes ___ No ___ If Yes, what food or fluids? How many times per day? ___ times. What do you use to feed the child? If MODERATE ACUTE MALNUTRITION: How large are servings? Does the child receive his own serving? ___ Who feeds the child and how? During this illness, has the child's feeding changed? Yes ___ No ___ If Yes, how?	FEEDING PROBLEMS
ASSESS OTHER PROBLEMS: Ask about mother's own health	

Table 55. Classification table for cough and/or difficult breathing

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
• Any danger signs or • Chest indrawing or • Stridor in calm child. • Grunting	SEVERE PNEUMONIA OR SEVERE DISEASE	• Give first dose of an appropriate antibiotic (Ampicillin 50mg/kg stat and Gentamycin 5mg/kg stat) • Treat to prevent hypoglycaemia • Refer URGENTLY to hospital.
• Fast breathing	PNEUMONIA	• Give an appropriate oral Amoxycillin 25mg/kg/dose 12hourly for 5 days. • Soothe the throat and relieve the cough with a safe remedy. • Advice mother when to return immediately. • Follow-up in 2 days.
No signs of pneumonia or very severe disease.	NO PNEUMONIA: COUCH OR COLD	• If coughing more than 14 days, refer for assessment. • Soothe the throat and relieve the cough with a safe remedy. Advise mother when to return immediately • Follow-up in 5 days if not improving.

Table 56. Classification table for dehydration

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Two of the following signs: • Lethargic or unconscious • Sunken eyes • Not able to drink or drinking poorly • Skin pinch goes back very slowly	SEVERE DEHYDRATION	1. If child has no other severe classification; • Give fluid for severe dehydration (Plan C). 2. If child also has another severe classification: • Refer URGENTLY to hospital with mother giving frequent sips of ORS on the way. • Advise the mother to continue breastfeeding 3. If child is 2 years or older and there is cholera in your area, give antibiotic for cholera

Two of the following signs: - Agitated, irritable - Sunken eyes - Drink strongly with thirst - Skin pinch goes back slowly	DEHYDRATION	• Give fluids to treat dehydration (Plan B) • Give Sulphate de Zinc • If the child is classified as severe disease and need a transfer: • Refer URGENTLY to hospital with mother giving frequent sips of ORS on the way. • Advise the mother to continue breastfeeding
No signs to classify as dehydration or severe dehydration	NO DEHYDRATION	• Give fluids and treat diarrhoea (plan A) • Give Zinc Sulphate • Explain the mother when to return immediately • Review in 3 days if no improvement

Table 57. Classification table for persistent diarrhoea

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Dehydration present	SEVERE DIARRHOEA PERSISTENT	• Treat dehydration before referral unless the child has another severe classification. • Give Zinc Sulphate • Refer to hospital.
No dehydration	PERSISTENT DIARRHOEA	• Advise the mother on feeding a child who has PERSISTENT DIARRHOEA. • Give Zinc sulphate and multivitamins for 14 days • Explain to the mother when to return immediately • Follow-up in 5 days.

Table 58. If blood in the stool

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Blood in stool	Bloody diarrhoea	• Treat for 5 days with Ciprofloxacin, oral, 15 mg/kg/ dose 12 hourly • Give Sulphate de Zinc • Explain to the mother when to return immediately • Review in 2 days

Table 59. Classification table for high malaria risk

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Any general danger sign Stiff neck	VERY SEVERE FEBRILE DISEASE	• Give quinine or Artesunate for severe malaria (first dose). • Give first dose of Ampicillin 150mg/kg stat and Gentamycin 5mg/kg (Preferably Cefotaxime 100mg/kg stat) • Treat the child to prevent low blood sugar • Give one dose of paracetamol in clinic for high fever (38.5° C or above). • Refer URGENTLY to hospital.

Fever (by history or feels hot or temperature 37.5° C or above)	MALARIA	• If NO cough with fast breathing, treat with oral antimalarial (Coartem) • If cough with fast breathing, treat with Amoxycillin (25mg/kg/dose 12hourly) for 5 days • Give paracetamol for high fever (38.5° C or above). • Advise mother when to return immediately. • Follow-up in 2 days if fever persists. • If fever is present every day for more than 7 days, REFER for assessment.

Table 60. Classification table for low malaria risk and no travel to a high risk area

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Any general danger sign Stiff neck	VERY SEVERE FEBRILE DISEASE	• Give quinine or Artesunate for severe malaria (first dose). • Give first dose of Ampicillin 150mg/kg stat and Gentamycin 5mg/kg (Preferably Cefotaxime 100mg/kg stat) • Treat the child to prevent low blood sugar • Give one dose of paracetamol in clinic for high fever (38.5° C or above). • Refer URGENTLY to hospital.
NO runny nose and NO measles. NO other cause of fever	MALARIA	• If NO cough with fast breathing, treat with oral antimalarial • If cough with fast breathing, treat with Amoxycillin 25mg/kg/dose (or Cotrimoxazole) for 5 days • Give paracetamol for high fever (38.5° C or above). • Advise mother when to return immediately. • Follow-up in 2 days if fever persists. • If fever is present every day for more than 7 days, REFER for assessment.
Runny nose present or measles present or Other cause of fever present	FEVER—MALARIA UNLIKELY	• Give one dose of paracetamol in clinic for high fever (38.5° C or above) • Advise mother when to return immediately. • Follow-up in 2 days if fever persists. • If fever is present every day for more than 7 days REFER for assessment

Table 61. Classification table for measles (if measles now or within the last 3 months

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Any general danger sign or Clouding of cornea or Deep or extensive mouth ulcers.	SEVERE COMPLICATED MEASLES	• Give vitamin A • Give first dose of Give first dose of Ampicillin 150mg/kg stat and Gentamycin 5mg/kg • If clouding of the cornea or pus draining from the eye, apply tetracycline eye ointment • Refer URGENTLY to hospital

Pus draining from the eye or Mouth ulcers	MEASLES WITH EYE AND MOUTH COMPLICATIONS	• Give vitamin A • If clouding of the cornea or pus draining from the eye, apply tetracycline eye ointment • If mouth ulcers, treat with gentian violet. • Follow-up in 2 days.
Measles now or within the last 3 months.	MEASLES	• Give vitamin A.

Table 62. Classification table for ear problem

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Tender swelling behind the ear.	MASTOIDITIS	• Give first dose of Give first dose of Ampicillin 150mg/kg stat and Gentamycin 5mg/ • Give first dose of paracetamol for pain. • Refer URGENTLY to hospital.
Pus is seen draining. from the ear and discharge is reported for less than 14 days or Ear pain.	ACUTE EAR INFECTION	• Give Amoxycillin25mg/kg/dose12h for 5 days • Give paracetamol for pain. • Dry the ear by wicking. • Follow-up in 5 days
Pus is seen draining. from the ear and discharge is reported for 14 daysor more	CHRONIC EAR INFECTION	Dry the ear by wicking Follow-up in 5 days
No ear pain and No pus seen draining from the ear.	NO EAR INFECTION	No additional treatment.

Table 63. Check for anaemia

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Severe palmar pallor	SEVERE ANEMIA	Treat the child to avoid hypoglycaemia *Refer urgently to the hospital
Palmar pale pallor	MILD ANEMIA	• If the child is less than 2 years old, evaluate the child's diet and advise the mother to feed her child as per guidelines • Give iron / folic acid • Give Mebendazole if the child is 12 months old or older (if he has not received it in the previous 6 months). • Explain to the mother when to return immediately • Review the child in 14 days.

No palmar pallor	NO ANAEMIA	• If the child is under 2 years of age, evaluate the child's diet and advise the mother to feed the child as per guideline • If feeding problem, review the child in 5 days. • Give Mebendazole if the child is 12 months old or older (if he has not received it in the previous 6 months). • Explain to the mother when to return immediately

Table 64. Check for acute malnutrition

SIGNS	CLASSIFY AS	IDENTIFY TREATMENT
Oedema of both feet • Sign of severity WITH • Weight for age ≤-3 DS and / or • MUAC <115 mm (11.5cm) [MUAC for HIV child, TBC <120 mm (12cm)]	SEVERE ACUTE MALNUTRITION WITH COMPLICATION	• Treat the child to avoid hypoglycaemia • Warm the child to avoid hypothermia • Refer URGENTY to the hospital
Sign of severity WITH • Weight for age between -2 and -3 DS AND / OR • MUAC between 115 and 125 [MUAC for HIV child, TBC between 120 and 130 mm]	MODERATE ACUTE MALNUTRITION WITH COMPLICATION	Treat the child to avoid hypoglycaemia Warm up the child to avoid hypothermia Refer URGENTLY to the hospital
Weight for age ≤-3 DS and / or • MUAC <115 mm (11.5cm) [MUAC for HIV children, TBC <120 mm (12cm)]	SEVERE ACUTE MALNUTRITION WITHOUT COMPLICATIONS	• Keep the child warm to avoid hypothermia • Transfer to the nutritional service (OTP)
Weight for age between -2 and -3 DS AND / OR • MUAC between 115 and 125 mm [MUAC between 120 and 130 mm for children HIV and TB]	MODERATE ACUTE MALNUTRITION WITHOUT COMPLICATIONS	• Transfer to the SFP service (Igikoni cy'umudugudu) • Mother's Education on Child Feeding and Hygiene
Size over age ≤ -3 DS OR • Weight for age ≤-3 DS	SEVERE CHRONIC MALNUTRITION	• Transfer to the SFP service (Igikoni cy'umudugudu) • Mother's Education on Child Feeding and Hygiene

Weight-age between -2 and -3 DS (-2≤DS <-3) OR • Weight for age between -2 and -3 DS (-2≤DS <-3)	MODERN CHRONIC MALNUTRITION	• Mother's Education on Child Nutrition and Hygiene
Weight for height and height-age and normal weight-age (Greater than - 2 DS), normal MUAC and without bilateral pitting oedema	NO MALNUTRITION	• If the child is less than 2 years old, evaluate the child's diet and advise the mother to feed the child as per protocol • If feeding problem, review the child in 5 days • Explain to the mother when to return immediately.

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