CHAPTER 8

INFECTIVE/INFECTIOUS DISEASES

8.1 HELMINTHIASIS, INTESTINAL

B82.0

DESCRIPTION

Infestation of the intestine with adult worms. The following species are commonly encountered:

» *Ascaris lumbricoides* (round worm).
» *Enterobius vermicularis* (pin worm).
» *Trichuris trichiura* (whipworm).
» *Ancylostoma duodenale* and *Necator americanus* (hookworm).
» *Taenia saginatum* and *Taenia solium* (beef and pork tapeworms).

DIAGNOSTIC CRITERIA

Clinical

» Most infestations are asymptomatic and become apparent with the passage of a worm rectally or orally.
» Signs and symptoms include:
  > vague abdominal pains,
  > diarrhoea,
  > rectal prolapse,
  > protein losing enteropathy.
  > perianal itch,
  > vaginitis,
  > iron deficiency anaemia, and
» Surgical complications are secondary to mechanical obstruction in the bowel, pancreatic duct or biliary tree.
» Migration of worm larvae may cause cutaneous, pulmonary or cerebral symptoms. See Chapter 13: The Nervous System, section 13.7: Neurocysticercosis.

Investigations

» Identification of the adult worm from stool or vomitus.
» Stool microscopy (fresh sample): Recognition of the worm or identification of worm eggs or proglottids in stool.

GENERAL AND SUPPORTIVE MEASURES

Prevent infestation by:

» Hand washing.
» Careful preparation of foods by adequate washing and cooking.
» Wearing shoes (hookworm).
» Improved sanitation will protect the environment from contamination.

Deworming for all children between 12–60 months is performed 6 monthly as part of routine child health care.

MEDICINE TREATMENT

All helminths excluding *Taenia* and *Enterobius*:

Children 1–2 years of age:

- Mebendazole, oral, 100 mg 12 hourly for 3 days.

Children > 2 years:

- Mebendazole, oral, 500 mg as a single dose immediately.

Enterobius

- Mebendazole, oral, 100 mg immediately as a single dose.
  - Repeat after 2 weeks.

Taenia

- Albendazole, oral, daily for three days.
  - If 1–2 years of age: 200 mg.
  - If > 2 years of age: 400 mg.

REFERRAL

» All patients with mechanical obstruction and complications related to migration of worm larvae.

8.2 AMOEBIASIS (*ENTAMOEBA HISTOLYTICA*)

A06.9

DESCRIPTION

Amoebic colitis is caused by the parasite *Entamoeba histolytica*. It can cause localised intestinal disease or disseminated disease. Amoebiasis is now relatively uncommon in South Africa, but immunodeficiency is a risk factor.

DIAGNOSTIC CRITERIA

Clinical

» Diarrhoea with mucus, blood and pus (dysentery).
» Liver abscesses:
  > presents with point tenderness over the liver area,
  > pleuritic type pain,
  > fever (often fever of unknown origin).

Investigations (colitis):

» Trophozoites or cysts in fresh stool.
» Trophozoites in rectal smear (danger of perforation if biopsy is done).
» Serological tests (ELISA and agar gel diffusion).

GENERAL AND SUPPORTIVE MEASURES

Prevent infestation by:

» Hand washing.
» Careful preparation of foods by adequate washing and cooking.

Aspirate liver abscess if not responding to treatment in 5 days or if rupture is imminent.

MEDICINE TREATMENT

- Metronidazole, oral, 15 mg/kg/dose 8 hourly for 7 days.
  - 10 days in severe disease.

8.3 CUTANEOUS LARVA MIGRANS/*ANCYLOSTOMA BRAZILIENSE* (DOG HOOKWORM)

B76.9/B76.0

DESCRIPTION

Infestation of the skin by dog hookworm larvae. Maturation of the larvae cannot occur resulting in a self-limiting infection.

DIAGNOSTIC CRITERIA

» Presents as an itchy 'serpiginous' skin lesion.

GENERAL AND SUPPORTIVE MEASURES

» Regular deworming of dogs.
» Wearing shoes to protect against infection.

MEDICINE TREATMENT

- Albendazole, oral, daily for 3 days.
  - If 1–2 years of age: 200 mg.
  - If > 2 years of age: 400 mg.

8.4 HYDATID DISEASE

B67

DESCRIPTION

The development of hydatid (*Echinococcus granulosus)* cysts follows ingestion of worm ova that are usually passed in the stools of dogs in sheep farming areas. Cysts may occur in any organ, but are most commonly found in the liver and lungs.

DIAGNOSTIC CRITERIA

» Typical radiological features.
» Diagnostic aspiration of an organ cyst should never be attempted.

GENERAL AND SUPPORTIVE MEASURES

» Prevent infestation by:
  > hand washing,
  > adequate food preparation.

» Surgical removal of cysts may be indicated.

MEDICINE TREATMENT

- Albendazole, oral, 15 mg/kg/day up to a maximum of 400 mg 12 hourly with a fatty meal (e.g. a glass of full cream milk).
  - Duration is 3–6 months according to response on imaging for inoperable cysts or 14–28 days before and 28 days after PAIR [Percutaneous puncture, Aspiration, Injection (of a scolecidal agent), Re-aspiration] or surgery.
  - Monitor liver function tests and FBC monthly.

REFERRAL

» All with liver cysts refered for PAIR, which should be carried out under expert supervision.

8.5 SCHISTOSOMIASIS (BILHARZIA)

B65.0/B65.1

DESCRIPTION

» Disease manifestations caused by infestation by species of the genus Schistosoma.

» Infestations with *S. haematobium* and *S. mansoni* are endemic in certain areas of South Africa.

» Nematodes reside in the venous plexus draining the bladder wall (haematobium) or intestine (mansoni).

Complications include:

» haematuria,
» dysuria,
» cystitis,
» calcifications in the bladder wall,
» obstructive uropathy,
» bladder stones,
» intestinal perforation,
» fistulas,
» spinal cord granulomas with pressure effects.
» strictures,
» hepatosplenomegaly,
» portal hypertension,
» cirrhosis,
» ascites,
» pulmonary hypertension,
» bladder cancer,

DIAGNOSTIC CRITERIA

Clinical

» Transient pruritic papular rash (swimmers itch) after exposure to cercariae in the water.

» A few weeks after exposure:

> fever,
> chills,
> headache,
> wheezing,
> hepatosplenomegaly,
> arthralgia,

> urticaria,
> cough, and
> lymphadenopathy,
> eosinophilia.

» Haematuria and dysuria.
» Abdominal pain and diarrhoea often after ingestion of food.

Investigations
» Serology for schistosomiasis.
» Urine and stools microscopy for viable eggs or rectal biopsy specimens.

GENERAL AND SUPPORTIVE MEASURES
» Educate patient/caregiver on preventative measures.
» Symptomatic and supportive treatment.
» Avoid exposure to water contaminated by schistosoma.
» Surgical intervention to correct or prevent complications.

MEDICINE TREATMENT
Acute Schistosomiasis
- Prednisone, oral, 0.5–1 mg/kg daily for 5 days.

Start antihelmintic once acute symptoms have resolved:
- Praziquantel, oral, 40 mg/kg as a single dose or in 2 divided doses on the same day.

Chronic Schistosomiasis
- Praziquantel, oral, 40 mg/kg as a single dose or in 2 divided doses on the same day.
- If given within 6 weeks of exposure, to be repeated in 4–6 weeks.

REFERRAL
» Schistosomiasis with suspected complications following adequate therapy.

8.6 CANDIDIASIS, SYSTEMIC AND OTHER
B37

DESCRIPTION
Superficial and/or disseminated (systemic) fungal infection caused by *C. albicans, C. tropicalis* and other candida species.

Risk factors include:
» Prolonged, broad-spectrum antibiotic therapy.
» Compromised immune system, including patients infected with HIV or on cancer chemotherapy, and the premature baby.
» Steroid therapy.
» Diabetes mellitus.

» IV hyperalimentation – contaminated solution or as an associated risk factor.
» Instrumentation, and central or peripheral vascular catheters.

DIAGNOSTIC CRITERIA

Clinical

» Oral candidiasis (thrush):
  > White plaque adheres to inner cheeks, lips, palate and tongue.
  > Stomatitis with red mucosa and ulcers may also be present.
  > In immunocompromised patients, the lesions may extend into the oesophagus.
» Oesophageal candidiasis:
  > Presents as difficulty swallowing, drooling or retrosternal pain (irritability in small children).
» Skin lesions in the newborn:
  > A red, maculopapular or pustular rash is seen in infants born to women with candida amnionitis.
» Cutaneous lesions:
  > May be represented by scattered, red papules or nodules.
  > Superficial infections of any moist area, such as axillae or neck folds, are common and may present as an erythematous, intertriginous rash with 'satellite' lesions.
» Vulvovaginitis:
  > A thick cheesy vaginal discharge with intense pruritus; white plaques on the glans of the penis.
  > Common in diabetics and patients on broad-spectrum antibiotics.
  > In recurrent vulvovaginitis, exclude diabetes, foreign body or sexual abuse.
» Systemic or disseminated candidiasis:
  > Mimics bacterial sepsis but fails to respond to antibiotics.
  > Thrombocytopenia is common.
  > Ophthalmitis with 'cotton wool' retinal exudates may also occur.
  > Is usually nosocomial.

Investigations

» For oesophageal candidiasis:
  > It is reasonable to initiate treatment on clinical suspicion.
  > Oesophagoscopy or barium swallow.
» Systemic candidiasis:
  > Urine and blood fungal cultures are essential.
  > Biopsy specimens, fluid or scrapings of lesions: budding yeasts and pseudohyphae are seen on microscopy.

GENERAL AND SUPPORTIVE MEASURES

» Encourage cup feeding of formula fed infants, as bottles are difficult to clean and predispose to candida infection.
» Eradicate or minimise risk factors.

» Avoid use of pacifiers (dummies), teats and bottles but if used, these should be sterilised.
» Remove all invasive devices, drain abscesses and debride infected tissue.

MEDICINE TREATMENT

Oral candidiasis

- Nystatin suspension 100 000 IU/mL, oral, 1 mL 4 hourly.
  - Keep in contact with affected areas for as long as possible.

Suspect immunodeficiency if poor response to treatment.
If no response:

- Imidazole oral gel, e.g.:
  - Miconazole gel 2%, oral, apply 8 hourly.

Oesophageal candidiasis

- Fluconazole, IV/oral, 6 mg/kg immediately as a single dose.
  - Follow with 3 mg/kg/day for 3 weeks.

LoE III[1]

Vulvovaginitis

- Fluconazole, oral, 12 mg/kg as a single dose.
  - Maximum dose: 150 mg.

OR

- Imidazole topical/vaginal, e.g.
  - Clotrimazole OR miconazole, applied locally at night for 7–14 days.
    - Do not use applicator in girls who are not sexually active.

Systemic candidiasis

- Amphotericin B deoxycholate, IV infusion in **5% dextrose water only**, 1 mg/kg/dose once daily over 4 hours for at least 2 weeks after first negative culture, or if no repeat culture available at least 3 weeks after clinical improvement. Discuss options for de-escalation of anti-fungal treatment when sensitivity available with specialist.
  - Maximum cumulative dose: 30–35 mg/kg over 4–8 weeks.
  - Adjust dosing interval in patients with renal impairment.
  - Check serum potassium and magnesium at least 3 times a week.
  - Do **not** use a bacterial filter with amphotericin B deoxycholate.

Prehydration before administering amphotericin B deoxycholate to prevent renal impairment:

- Sodium chloride 0.9%, IV, 15 mL/kg **plus** potassium chloride, 20 mmol/L infused over 2–4 hours.

REFERRAL

» Candidiasis not responding to adequate therapy.
» Patients with renal and hepatic failure.
» Confirmed azole resistance.

8.7 CYTOMEGALOVIRUS (CMV) INFECTION

B25.9

DESCRIPTION

CMV is an extremely common childhood infection, with almost all children infected by 5 years of age.

The majority of childhood infections are asymptomatic or present with a mononucleosis-like syndrome NOT requiring anti-viral treatment.

CMV can cause clinically significant disease following congenital infection and infections in immunocompromised children (especially HIV-infected children and transplant recipients).

DIAGNOSTIC CRITERIA

Clinical

» Congenital infections vary from asymptomatic through isolated neural deafness, to severe disease, including microcephaly.
» Infections in immunocompromised children can result in pneumonia, encephalitis, retinitis and gastrointestinal infections.

Investigations

Diagnostic tests should be only performed if clinical disease is suspected.

Congenital infections (performed within 3 weeks post-delivery – in children with suspected CMV older than 3 weeks, discuss with a specialist):

» Serology: CMV IgM indicates recent infection.
» CMV PCR – qualitative: blood, or urine/saliva in viral transport medium.

Hearing assessment at baseline and annually for the first 5 years of life.

Infections in immunocompromised children:

» Serology: Presence of antibodies to CMV does not imply active infection or causality.
» CMV PCR – qualitative: blood, or urine/saliva in viral transport medium.
» Quantitative CMV PCR (CMV Viral load > 10 000 copies/mL).
» Intranuclear inclusion bodies may be seen in biopsy material.

AND

» Clinical features suggestive of CMV disease.

MEDICINE TREATMENT

Symptomatic congenital infections:

- Valganciclovir, oral, 16 mg/kg, 12 hourly for 6 months.
  - Monitor FBC & differential white cell count, AST/ALT weekly initially, then monthly.

- If unable to tolerate oral medication:
  - Ganciclovir, IV, 5 mg/kg administered over 1 hour, 12 hourly until able to tolerate oral medication.

Infections in immunocompromised children:
Pneumonia and biopsy-proven GIT disease (specialist initiated):

- Initial therapy:
  - Ganciclovir, IV, 5 mg/kg administered over 1 hour, 12 hourly for 7 days.
  - Follow with: Valganciclovir, oral, 16 mg/kg 12 hourly for 5 weeks.

- Maintenance therapy: Not indicated.

CNS disease **(Specialist initiated)**:

- Initial therapy:
  - Ganciclovir, IV, 5 mg/kg administered over 1 hour, 12 hourly for 7 days.
  - Follow with: Valganciclovir, oral, 16 mg/kg 12 hourly for 5 weeks.
- Maintenance therapy: Indicated for patients with good clinical response.
  - Valganciclovir, oral, 16 mg/kg daily until CD4 count rises for > 6 months to > 15% (< 6 years) or > 100 cells/mm^3 (> 6 years) on ART.

Retinitis:
See Chapter 16: Eye Conditions, section 16.4: Cytomegalovirus (CMV) retinitis.

REFERRAL

» All cases of severe organ-related disease or disseminated disease.

8.8 DIPHTHERIA

A36.9
*****Notifiable condition

Telephone Hotline	
NICD hotline (24 hours)	082 883 9920
National Institute of Communicable Diseases	011 555 0327 or 011 555 0352

DESCRIPTION

Diphtheria is an acute, communicable infection of the upper respiratory tract, caused by *Corynebacterium diphtheriae*. Disease is unlikely if the patient shows documented evidence of complete immunisation.
Cutaneous diphtheria can also occur.
Incubation period is between 2 and 7 days.

Complications include:

» In the first 2 weeks of the disease:
  > Cervical lymphadenopathy with peri-adenitis and with swelling of the neck ('bull-neck').

> Upper airway obstruction by membranes.
> Myocarditis

» Usually after 3 weeks:
> Neuritis resulting in paresis/paralysis of the soft palate and bulbar, eye, respiratory and limb muscles.

DIAGNOSTIC CRITERIA

Clinical

Any person presenting with: pharyngitis, nasopharyngitis, tonsillitis, laryngitis, tracheitis (or any combination of these), where fever is absent or low-grade.

AND

One or more of the following:

» Adherent pseudomembrane which bleeds if manipulated or dislodged.
» Features suggestive of severe diphtheria, including: stridor, 'bull-neck', cardiac complications (myocarditis, acute cardiac failure and circulatory collapse), acute renal failure.
» Link to a confirmed case.

Investigations

» Nasal or pharyngeal swab: Microscopy and culture.
» Culture of membrane.
» Important: Inform the laboratory that the specimen is from a patient with suspected diphtheria.

GENERAL AND SUPPORTIVE MEASURES

» Staff in direct contact with the patient should wear a protective mask (N-95).
» Isolate the patient in a high or intensive care unit until 3 successive nose and throat cultures at 24-hour intervals are negative.
» Usually non-communicable within 4 days of antibiotics.
» Nutritional support.
» If respiratory failure develops, provide ventilatory support.
» Tracheostomy if life-threatening upper airway obstruction.
» Bed rest for 14 days.

MEDICINE TREATMENT

Note:

Do **not** withhold treatment pending culture results.

Antibiotic therapy (must be given for a total of 14 days).

Parenteral treatment for patients unable to swallow: Switch to oral as soon as patient able to swallow:

- Benzylpenicillin, IV, 50 000 units/kg/dose 6 hourly.

Oral treatment for patients able to swallow:

- Phenoxymethylpenicillin, oral, 15 mg/kg/dose 6 hourly.
- Maximum: 500 mg per dose.

In severe penicillin allergy:
Parenteral treatment for patients unable to swallow. Switch to oral as soon as patient able to swallow:

- Azithromycin, IV, 10 mg/kg daily.

Oral treatment for patients able to swallow:

- Azithromycin, oral, 10 mg/kg daily.

Diphtheria antitoxin treatment (DAT):
DAT should be given to all probable classic respiratory diphtheria cases without waiting for laboratory confirmation. DAT neutralises circulating unbound diphtheria toxin and prevents progression of disease; delaying administration increases mortality. The dosing of DAT is product-specific; refer to package insert.

Close contacts (household and regular visitors):
Regardless of immunisation status, isolate contact and swab throat for culture. Keep under surveillance for 7 days. Give antibiotic prophylaxis as follows:

Prophylactic treatment for contacts:

Age group	Benzylpenicillin
Children	< 6 years: Single dose: 600 000 units, IM.
	> 6 years: Single dose: 1.2 million units, IM.
Adults	Single dose: 1.2 million units, IM.

In severe penicillin allergy:

Age group	Azithromycin
Children	Oral, 10 mg/kg per day on day one, **THEN** 5 mg/kg per day for 4 days (total of 5 days).
Adults	Oral, 500 mg on day one, **THEN** 250 mg daily for 4 days (total of 5 days).

All close contacts:
If 1st culture was positive, follow up throat culture after 2 weeks and treat again.

REFERRAL

» All

8.9 MALARIA

B54
*Notifiable disease.

DESCRIPTION

Malaria is transmitted by the bite of an infected female *Anopheles* mosquito. The incubation period varies with the species of the parasite, *Plasmodium falciparum* being shortest, usually 7–21 days, and *P. malariae* the longest. The incubation period may be prolonged by use of malaria prophylaxis or certain antibiotics.

The confirmation of the diagnosis and treatment of malaria is an emergency as complications develop rapidly. Malaria can be missed outside transmission areas.

DIAGNOSTIC CRITERIA

Clinical

» A child living in, or with recent **travel history** to a malaria transmission area.
» Fever, which may be intermittent.
» Flu-like symptoms including sweating or rigors, i.e. cold, shaking feeling.
» Body pains and headache.
» Occasionally diarrhoea, loss of appetite, nausea and vomiting, tachypnoea and cough.
» A young child may present with fever, poor feeding, lethargy, vomiting, diarrhoea or cough.
» Clinical features are non-specific and overlap with many other infections.

Investigations

» Testing is urgent. Obtain the result immediately.
  > Rapid diagnostic test.
    In areas where malaria transmission occurs, rapid tests should always be available for malaria screening but cannot be used for monitoring response to treatment as they may remain positive for over 4 weeks.

» Malaria parasites in blood smear – thick and thin smears.
  > One negative malaria test does not exclude the diagnosis.
  > Repeat smears if initially negative, and malaria suspected.
  > If severe malaria suspected, commence therapy and repeat smears after 6–12 hours.
  > Repeat smears after 48 hours and if no improvement in degree of parasitaemia, consider alternative therapy.

If severe malaria is suspected and the diagnosis cannot be confirmed immediately, treat while awaiting laboratory results.

8.9.1 *P. FALCIPARUM* MALARIA, NON-SEVERE, UNCOMPLICATED

B50.9

DESCRIPTION

A child with uncomplicated malaria is alert, can tolerate oral medication, has an age-appropriate level of consciousness and has no clinical or laboratory evidence of severe malaria.

Ideally, treatment should be started in hospital. Initial doses should be directly observed. Observe for 1 hour to ensure dose is not vomited.

MEDICINE TREATMENT

Treat according to the National Malaria Guidelines.

Option 1:

Only for clearly uncomplicated, low risk malaria cases (> 5 kg):

- Artemether/lumefantrine 20/120 mg, oral, with fat-containing food/milk to ensure adequate absorption.
  - Give first dose immediately.
  - Follow with second dose 8 hours later.
  - Then 12 hourly for another 2 days (total number of doses in 3 days = 6).

Weight	Dose	Total tablets per course
5–≤ 15 kg	1 tablet	6
15–≤ 25 kg	2 tablets	12
25–≤ 35 kg	3 tablets	18
> 35 kg	4 tablets	24

OR

Option 2:

Manage children < 5 kg with uncomplicated malaria with quinine plus clindamycin:

- Quinine, oral, 10 mg/kg/dose 8 hourly for 7–10 days.

2–3 days after initiating treatment with quinine:

- Clindamycin, oral, 10 mg/kg/dose 12 hourly for 7 days.

Children who are vomiting but who have no other indications of severe malaria:

Children ≥ 20 kg:

- Artesunate, IM or IV, 2.4 mg/kg at hours 0, 12 and 24, then daily until patient is able to tolerate oral treatment.

Children < 20 kg:

- Artesunate, IM or IV, 3 mg/kg at hours 0, 12 and 24, then daily until patient is able to tolerate oral treatment.

OR (only if artesunate is unavailable):

- Quinine, IV, 10 mg/kg/dose 8 hourly administered over 4–6 hours.
  - ECG and heart rate monitoring.
  - Monitor blood glucose levels regularly.
  - Switch to oral medication once able to do so.

8.9.2 *P. FALCIPARUM* MALARIA, SEVERE, COMPLICATED (OR IF REPEATED VOMITING)

B50.0/B50.8

DIAGNOSTIC CRITERIA

Clinical

» Unable to drink or breast feed.
» Vomits everything.
» Renal failure.
» Cerebral malaria: manifests with convulsions, which may be subtle, and/or any change in mental state, ranging from irritability, lethargy to coma, stiff neck or bulging fontanelle.
» Respiratory distress and metabolic acidosis similar to pneumonia.
» Anaemia: can be severe and lead to cardiac failure and a depressed mental state.
» Shock: cold moist skin, low blood pressure and evidence of poor peripheral perfusion.
» Hypoglycaemia: can present with convulsions and a depressed mental state.
» Jaundice, bleeding, acute renal failure and ARDS are less common in children than adults.

Investigations

» Hyperparasitaemia: > 5% of RBCs infected indicates severe malaria but a lower parasite density does not exclude severe malaria.
» Low Hb (< 6 g/dL).
» Test glucose immediately with a fingerprick test. Low blood glucose: < 2.2 mmol/L.
» Acidosis: serum lactate (venous) > 5 mmol/L or bicarbonate < 15 mmol/L.
» Severe thrombocytopenia: < 50 x 10^9/L.
» In severe cases, repeat smear after 72 hours and after the completion of the course of treatment.

GENERAL AND SUPPORTIVE MEASURES

» Check airway, breathing, circulation (ABC).
» Admit to a high care or intensive care unit.
» Review the child at least twice daily, including holidays.
» Avoid overhydration.
» Control convulsions.
» Ventilatory support, if necessary.

» Agitation and respiratory distress can be as a result of severe metabolic acidosis. Treat shock and acidosis. See Chapter 1: Emergencies and Trauma, section 1.1.8: Shock.
» Nutritional support.

MEDICINE TREATMENT

Urgent:

Children ≥ 20 kg:

- Artesunate, IM or IV, 2.4 mg/kg at hours 0, 12 and 24, then daily until patient is able to tolerate oral treatment.

Children < 20 kg:

- Artesunate, IM or IV, 3 mg/kg at hours 0, 12 and 24, then daily until patient is able to tolerate oral treatment.

LoE III[2]

Alternative option (only if artesunate is unavailable):

- Quinine, IV infusion, diluted in 5–10 mL/kg dextrose 5% or sodium chloride 0.9%.
  - Loading dose: 20 mg/kg over 4 hours (loading dose).
  - Follow with 10 mg/kg over 4–6 hours at 8 hourly intervals until able to take oral therapy.
  - ECG monitoring.
  - Monitor blood glucose levels.

2–3 days after initiating treatment with artesunate or quinine and able to swallow, switch to any of the 2 regimens:

Children > 5 kg:

- Artemether/lumefantrine 20/120 mg, oral, with fat-containing food/milk to ensure adequate absorption.
  - Give first dose immediately.
  - Follow with second dose 8 hours later.
  - Then 12 hourly for another 2 days (total number of doses in 3 days = 6).

Weight	Dose	Total tablets per course
5–≤ 15 kg	1 tablet	6
15–≤ 25 kg	2 tablets	12
25–≤ 35 kg	3 tablets	18
> 35 kg	4 tablets	24

OR

Children < 5 kg

- Quinine, oral, 10 mg/kg/dose 8 hourly to complete 7–10 day course.

PLUS

- Clindamycin, oral, 10 mg/kg/dose 12 hourly for 7 days.

For concurrent bacterial sepsis:

- Ceftriaxone, IV, 100 mg/kg as a single daily dose once daily for 10 days.
  - Maximum dose: 4 g/day.

For fever:

- Paracetamol, oral, 15 mg/kg/dose 6 hourly as required.

For hypoglycaemia:

- Dextrose 10%, IV, 4 mL/kg.

If Hb < 7 g/dL:

- Packed red cells, IV, 10 mL/kg over 3 hours.

Note:
Fluid loss is often underestimated in a febrile, vomiting, sweating child.

REFERRAL

» **Urgent**: Severe or complicated malaria.
» High-risk children under 2 years, splenectomised patients.
» Malaria not responding clinically to adequate treatment within 48–72 hours (possible resistance).

8.9.3 *P. OVALE, P VIVAX* AND *P. MALARIAE*

B53.0/B51.9/B52.9

- Chloroquine, oral, 10 mg base/kg as a single dose.
  - Follow with 5 mg base/kg given 6, 24 and 48 hours after the first dose.

PLUS (for *P. ovale* and/or *P. vivax*)
To eradicate the organism:

- Primaquine, oral, 0.25 mg base/kg/day for 14 days (obtained using section 21 approval).
  - Continue chloroquine once weekly until primaquine is obtained.

Note: Exclude G6PD deficiency before prescribing primaquine for non-falciparum malaria.

8.9.4 MALARIA PROPHYLAXIS

Malaria chemoprophylaxis should be used in moderate-risk malaria-endemic areas in South Africa from September to May, both together with preventive measures against mosquito bites. Risk maps are provided in the National Guidelines for the Prevention of Malaria (2018). It is recommended that persons intending to travel to malaria-endemic areas outside of South Africa

take the relevant chemoprophylaxis. There are moderate- and high-risk areas in neighbouring countries.

MEDICINE TREATMENT

- Doxycycline (children > 8 years), oral, 2.2 mg/kg (maximum 100 mg) daily.
  - Begin 2 days before travel; continue daily during travel, and for 4 weeks after leaving the area.

Children under 8 years: Refer to the National Guidelines for the Prevention of Malaria (2018) for alternative chemoprophylaxis options, which have to be procured in the private sector.

Preventative measures against mosquito bites include:

» Use of treated mosquito nets, screens, coils or pads.
» Application of a N,N-diethyl-3-methylbenzamide or N,N-diethyl-m-toluamide (DEET) insect repellent to exposed skin and clothing.
» Wearing long sleeves, long trousers and socks if outside between dusk and dawn, as mosquitoes are most active at this time.
» Visiting endemic areas only during the dry season.

CAUTION
Pregnant women and children under 5 years of age should avoid visiting malaria-endemic areas, as they are more prone to the serious complications of malaria.

8.10 MEASLES

B05
*Notifiable condition

DESCRIPTION

The following case definition is an epidemiological and not a diagnostic tool:

» Fever and maculopapular rash with any one of the following:
  > cough,
  > coryza/runny nose,
  > conjunctivitis.

Suspect measles in any child fulfilling the case definition.

An acute, highly contagious, viral, childhood exanthem.
Incubation period: 8–14 days from exposure to first symptoms and 14 days between appearance of rash in source and contact.

Complications include:

» pneumonia,
» laryngotracheobronchitis (croup),
» feeding difficulties,
» diarrhoea,

» encephalitis,
» stomatitis, and
» otitis media,
» corneal ulceration.

Subacute sclerosing panencephalitis is a rare long-term complication.

DIAGNOSTIC CRITERIA

Clinical

» Prodromal (catarrhal) phase:
  > duration 3–5 days,
  > fever,
  > runny nose (coryza),
  > cough,
  > conjunctivitis.
» Koplik's spots, followed 3–5 days later with a maculopapular rash.
» The rash begins to fade after 3 days in the order of its appearance leaving temporary darker staining.
» If fever is still present after the third day of the rash, a complication should be suspected.

Investigations

» Serum measles IgM antibodies for confirmation of diagnosis.

GENERAL AND SUPPORTIVE MEASURES

» Notify provincial EPI manager when case is suspected, prior to confirmation.
» Only admit high risk patients:
  > children less than 6 months old,
  > immune compromised/suppressed children,
  > children with severe malnutrition,
  > children with complications.
» Minimal exposure to strong light, if patient is photophobic.
» Isolate the patient in a separate room, if possible away from other children.
» All entering the room to wear mask, gloves and gown.
» Patient is infectious for 4 days after onset of the rash, longer if HIV-infected.
» Screen outpatient waiting areas for children with measles.
» If pneumonia with hypoxia, give humidified oxygen by nasal cannula.

MEDICINE TREATMENT

All patients

- Vitamin A, oral, as a single daily dose for 2 days.
  - If < 6 months of age: 50 000 units.
  - If 6–12 months of age: 100 000 units.
  - If > 1 year of age: 200 000 units.

For fever:

- Paracetamol, oral, 10–15 mg/kg/dose, 6 hourly as required until fever subsides.

Pneumonia
Also see Chapter 15: Respiratory System, section 15.1.1: Pneumonia.

Empiric antibiotics for suspected secondary bacterial infection:
To cover *S. pneumoniae* and Gram negative infection.
Total duration of therapy: 5–7 days.

- Amoxicillin/clavulanic acid, IV, 25 mg/kg/dose 8 hourly.

When child improves, follow with oral therapy to complete 5–7 days treatment:
- Amoxicillin/clavulanic acid, oral, 30 mg/kg/dose 12 hourly.

Penicillin allergy
See Chapter 25: Drug Allergy, section 25.4.1: Allergies to penicillins.

In very severe progressive or unresponsive pneumonia consider use of aciclovir for possible herpes infection.

Croup
See Chapter 15: Respiratory System, section 15.5.2: Laryngotracheo-bronchitis, acute viral (croup).

Diarrhoea
See Chapter 2: Alimentary Tract, section 2.2.4: Diarrhoea, acute.

Encephalitis
See section 8.13: Meningo-encephalitis/encephalitis, acute viral.

Convulsions
See Chapter 13: The Nervous System, section 13.3: Status epilepticus (convulsive).

Conjunctivitis
- Chloramphenicol ophthalmic ointment 1%, inserted 6 hourly for 5 days.

If corneal clouding/ulceration present, obtain urgent ophthalmologic consultation.

Management of contacts
Immunise children older than 6 months if unvaccinated and less than 72 hours since exposure.
Between 3 and 6 days after exposure and for contacts less than 6 months old:
- Human normal immunoglobulin, IM, 0.25 mL/kg.

If immunodeficient:
- Human normal immunoglobulin, IM, 0.5 mL/kg.

Immunise all children > 6 months of age if an outbreak occurs.

REFERRAL

» Children in need of intensive care unit.
» Children with depressed level of consciousness.
» Children with corneal ulceration/opacity.

8.11 MENINGITIS, ACUTE BACTERIAL

G00
*Notifiable condition. (*N. meningitidis and H. influenzae)*

This guideline applies to children > 60 days old. For the management of neonates, see Chapter 19: Prematurity and Neonatal Conditions, section 19.5.1: Meningitis bacterial, neonatal.

DESCRIPTION

Bacterial meningitis most commonly results from haematogenous dissemination of micro-organisms from a distant site, e.g. the nasopharynx.
In children, *S. pneumoniae* and *N. meningitidis* are the usual pathogens.

Note:
Tuberculosis, cryptococcal and partially treated acute bacterial meningitis should be considered when the clinical and laboratory features are not typical of pyogenic meningitis, or when there is a slow onset of disease (> 2 days), especially in any high risk settings such as immune suppression, TB contact and malnourished children.
Differentiation of TB or cryptococcal meningitis from acute bacterial meningitis is not always easy on presentation.

Complications include:
» Raised intracranial pressure due to cerebral oedema, subdural effusion/empyema or hydrocephalus.
» Other acute complications include:
  > cerebral infarctions,
  > shock,
  > seizures,
  > metastatic infection, e.g. arthritis, pneumonia, pericarditis,
  > disseminated intravascular thrombosis,
  > inappropriate antidiuretic hormone (ADH) secretion.

Long-term neurological sequelae include deafness, blindness, intellectual disability and motor paralysis, e.g. hemiparesis.

DIAGNOSTIC CRITERIA

Clinical

» Fever
» Headache
» Vomiting
» Convulsions
» Feeding problems.
» Irritability
» Lethargy
» Photophobia

» Signs of increased intracranial pressure, e.g. bulging anterior fontanel.
» Papilloedema is not a useful sign in young children with meningitis. It is difficult to elicit and may be absent even with acutely raised ICP.

Investigations

» Lumbar puncture (LP) – send CSF for biochemistry, microscopy and culture.
  > In typical cases of bacterial meningitis: CSF glucose is low, CSF protein is raised, CSF pleocytosis with neutrophil predominance is found, and bacteria may be visualised on Gram stain. However, many cases do not have these typical CSF findings. All abnormal findings should lead to serious considerations of acute bacterial meningitis.
  > If contra-indications to LP are present, defer LP and initiate treatment immediately. For contra-indications to LP, see Chapter 13: The Nervous System, section 13.12: Lumbar puncture.
» Clinical meningococcaemia (septicaemia) with petechiae/purpura.
  > Confirm with skin scrape, Gram stain and blood culture.

GENERAL AND SUPPORTIVE MEASURES

» Admit to a high or intensive care unit, if appropriate.
» Monitor, where indicated:
  > neurological status,
  > heart rate,
  > blood pressure,
  > acid-base status,
  > blood glucose,
  > fluid balance, i.e. hydration,
  > respiration,
  > body temperature,
  > haematocrit,
  > electrolytes,
  > blood gases,
  > serum and urine osmolality.
» Ensure adequate nutrition by enteral feeding where possible.
  > Use a nasogastric tube if necessary.
  > If enteral feeding is not possible, give intravenous fluids: paediatric or neonatal maintenance solution with dextrose.

MEDICINE TREATMENT

Antibiotic therapy

Empiric treatment:

- Ceftriaxone, IV, 100 mg/kg once daily.

Adjust antimicrobial therapy according to culture and sensitivity.

Treatment duration in culture positive meningitis:

» *N. meningitidis*: 5 days.
» *S. pneumoniae*: 10 days.
» *H. influenzae*: 10 days.
» Other gram-negative bacilli: 21 days.

In stable patients with uncomplicated culture-negative meningitis, 5 days is adequate.

In complicated or non-responsive cases, a longer duration of therapy may be required.
Reassess antimicrobial therapy when blood and CSF culture and sensitivity results become available, or when improvement is not evident within 72–96 hours.
Seek immediate advice on what treatment to start with when ventriculo-peritoneal shunt infection, spread from sinuses, mastoids, or direct penetrating source of infection is present.

For shunts:

- 3rd generation cephalosporin, e.g.:
  - Ceftriaxone, IV, 100 mg/kg once daily.

PLUS

- Vancomycin, IV, 15 mg/kg/dose 6 hourly infused over 1 hour.

PLUS

- Rifampicin, IV, 10 mg/kg 12 hourly.
  - Do not exceed 600 mg/dose (in patients where TB has been excluded).

Fever and headache:

- Paracetamol, oral, 15 mg/kg/dose 6 hourly as required.

Convulsions
See Chapter 13: The Nervous System, section 13.3: Status epilepticus (convulsive).

Raised intracranial pressure or cerebral oedema
Elevate head of bed ~30°.
Maintain P_aCO_2 at 4–5 kPa (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.

Chemoprophylaxis for close contacts
A close contact is defined as someone living in the same household, dormitory, institution, children in the same crèche, or any other 'kissing' contact. Health care workers who have intimate contact should receive prophylaxis.

N. meningitidis

- Ciprofloxacin, oral, as a single dose.
  - If < 12 years of age: 10 mg/kg.
  - If > 12 years of age: 500 mg.

  Note:
  If < 12 years of age and able to swallow, use a a single 250 mg tablet.

OR

- Ceftriaxone, IM, single dose.
  - If < 12 years of age: 125 mg.
  - If > 12 years of age: 250 mg.

Close contacts who are pregnant:

- Ceftriaxone, IM, 250 mg.

H. influenzae prophylaxis for **all** contacts under 5 years who are household contacts (including index case) or day care contacts:

- Rifampicin, oral, 20 mg/kg/dose once daily for 4 days.
  - Maximum dose: 600 mg.
  - Neonatal dose: 10 mg/kg/dose once daily for 4 days.

Check vaccination status of index case and all contacts; and update if necessary – Refer to Primary Health Care Standard Treatment Guidelines and Essential Medicines List, Chapter 13: Immunisation.

REFERRAL

» Where lumbar puncture is deferred due to suspected raised intracranial pressure and/or localising signs, start bacterial and tuberculous meningitis treatment immediately.
» Meningitis with complications.
» All cases of suspected shunt infection. Start treatment immediately before referral.

8.12 MENINGITIS, CRYPTOCOCCAL

G02.1

DESCRIPTION

An uncommon childhood meningitis that may occur in older HIV-infected children with severe CD4 T-cell depletion. Pulmonary and skin involvement can occur.

DIAGNOSTIC CRITERIA

Clinical

» Acute or chronic headache in an older HIV-infected child. Meningism need not be present.
» Often presents with cranial nerve palsy.
» Can occur as result of Immune Reconstitution Inflammatory Syndrome (IRIS) after initiation of antiretroviral therapy.

Investigations

» Test all cerebrospinal fluid (CSF) specimens from HIV-infected children with suspected meningitis.

» CSF: India ink stain, and/or cryptococcal antigen test (more sensitive than India ink stain). Measure CSF opening pressure.
» Fungal culture – CSF, blood and urine.

If indicated:

» Chest X-ray.
» Ophthalmological assessment.

GENERAL AND SUPPORTIVE MEASURES

» Admit to a high or intensive care unit, if appropriate.
» Monitor, where indicated:
  > neurological status,
  > heart rate,
  > blood pressure,
  > haematocrit,
  > acid-base status,
  > fluid balance, i.e. hydration,
  > respiration,
  > body temperature,
  > electrolytes,
  > blood glucose,
  > blood gases,
  > serum and urine osmolality.

» Ensure adequate nutrition by enteral feeding where possible. Use a nasogastric tube if necessary. If enteral feeding is not possible, provide appropriate intravenous fluids.

MEDICINE TREATMENT

Treatment

Preferred initial treatment (2 weeks):

First week:

- Amphotericin B deoxycholate, IV, 1 mg/kg/day as a daily infusion in **5% dextrose water** over 4 hours.
  - Adjust dosing interval in patients with renal impairment.
  - Check serum potassium and magnesium at least 3 times a week.
  - Do not use a bacterial filter with amphotericin B deoxycholate.

Prehydration before administering amphotericin B deoxycholate to prevent renal impairment:

- Sodium chloride 0.9%, IV, 15 mL/kg **plus** potassium chloride, 20 mmol/L infused over 2–4 hours.

PLUS

- 5-Flucytosine 100 mg/kg/day in 4 divided doses.

Second week:

- Fluconazole, IV/oral, 12 mg/kg/day.
  - Maximum dose: 800 mg.

OR

Alternative initial treatment (2 weeks):

- Amphotericin B deoxycholate, IV, 1 mg/kg/day as a daily infusion in **5% dextrose water** over 4 hours.

PLUS

- Fluconazole, IV/oral, 12 mg/kg/day.
  - Maximum dose: 800 mg.

Prehydration before administering amphotericin B deoxycholate to prevent renal impairment:

- Sodium chloride 0.9%, IV, 15 mL/kg plus potassium chloride, 20 mmol/L infused over 2–4 hours.

OR

Additional alternative: Only if Amphotericin B deoxycholate is not available/not tolerated or contraindicated, as this regimen is associated with poorer outcomes. Initial treatment (2 weeks):
First week:

- Fluconazole, IV/oral, 12 mg/kg/day.
  - Maximum dose: 800 mg.

PLUS

- 5-Flucytosine 100 mg/kg/day in 4 divided doses.

Second week:

- Fluconazole, IV/oral, 12 mg/kg/day.
  - Maximum dose: 800 mg.

THEN

Consolidation treatment (8 weeks):

- Fluconazole, oral, 12 mg/kg/day for 8 weeks.
  - Maximum dose: 800 mg.

Secondary prophylaxis (maintenance treatment):

- Fluconazole, oral, 6 mg/kg/day.
  - Maximum dose: 400 mg.

Discontinue secondary prophylaxis:

» Children < 6 years of age, on ART: CD4 count > 25% for at least 6 months.
» Children > 6 years of age, on ART: CD4 count > 200 for at least 6 months.
» Adolescents on ART: CD4 count increases to between 100–200 cells/mm^3 for at least 6 months.
» Re-start prophylaxis if CD4 count drops below thresholds above.

For continued raised intracranial pressure:

» Daily therapeutic lumbar puncture is indicated if initial LP manometric pressure > 25 cm of water in the lateral recumbent position.
» Continue until pressure stabilises below 25 cm of water.
» Remove 10–20 mL daily and obtain a closing pressure.

» Refer for neurosurgical intervention if pressure persistently high and/or above 40 cm water.

REFERRAL

» All cases not responding to initial treatment.
» All patients with IRIS.

8.13 MENINGO-ENCEPHALITIS/ENCEPHALITIS, ACUTE VIRAL

A86

DESCRIPTION

A number of viruses cause infection of the brain and meninges. Herpes simplex is the most important because it is treatable. A high mortality and morbidity is associated with untreated herpes meningo-encephalitis.

Complications include:

» increased intracranial pressure,
» cerebral oedema,
» blindness,
» inappropriate antidiuretic hormone (ADH) secretion.
» permanent neurological deficits,
» seizures,
» deafness,

Clinical

» Severe headache, fever, nausea, vomiting, lethargy and abnormal behaviour.
» Alteration in level of consciousness, i.e. drowsiness, confusion, stupor or coma.
» Generalised and/or focal convulsions.
» Focal neurological deficits.
» Abnormal movements, i.e. basal ganglia involvement.
» Cranial nerve palsies (brainstem involvement), loss of sphincter control, paresis of limbs and segmental sensory loss (spinal cord involvement).
» Some patients may have signs of meningeal irritation.
» Herpes encephalitis may have an acute and fulminant course. It can result from primary infection or reactivation.
» **Herpetic skin lesions are usually NOT present in children with HSV encephalitis.**

Investigations

» Laboratory tests are important in excluding bacterial, fungal or TB meningitis.
» CSF & blood for HSV PCR if the diagnosis is suspected.
» CSF may be normal or reveal:
  > mildly raised protein,
  > normal glucose level, and
  > mild pleocytosis, mostly lymphocytes.

> Red cells are commonly observed with herpes encephalitis.

» CT brain, if focal signs or seizures, unexplained reduced level of consciousness, status epilepticus or diagnostic uncertainty.
> May reveal oedema.
> Herpes simplex preferentially involves the temporal lobes and orbital surfaces of the frontal lobes.
> CT findings may only be apparent after 3–5 days.

» EEG, if focal or prolonged seizures, diagnostic uncertainty, suspected non-convulsive seizures.
> May demonstrate changes suggestive of herpes encephalitis.

GENERAL AND SUPPORTIVE MEASURES

» Admit to a high or intensive care unit, if appropriate.

» Monitor, where indicated:
> neurological status,
> heart rate,
> blood pressure,
> haematocrit,
> acid-base status,
> fluid balance, i.e. hydration,
> respiration,
> body temperature,
> electrolytes,
> blood glucose,
> blood gases,
> serum and urine osmolarity.
> Ensure adequate nutrition, nasogastric feeding if necessary.
> If enteral feeding is not possible, give maintenance intravenous fluids.

MEDICINE TREATMENT

If herpes simplex virus or varicella zoster virus encephalitis suspected:

- Aciclovir, IV, 8 hourly administered over 1 hour.
  If 0–12 years of age: 20 mg/kg/dose.
  If > 12 years of age: 10 mg/kg/dose.
  - Herpes simplex: 14 days.
  - Varicella: 7 days.
  - If an alternative diagnosis is made and CSF PCR is negative, stop acyclovir.

Note: CSF PCR may be negative in the first 3 days of illness.

Acute convulsions

See Chapter 13: The Nervous System, section 13.3: Status epilepticus (convulsive).

Provide adequate analgesia (see Chapter 20: Pain control).

Raised intracranial pressure or cerebral oedema

Elevate head of bed ~ 30°.
Maintain P_aCO_2 at 4–5 kPa; intubate and ventilate, if necessary.
Avoid fluid overload.

- Mannitol, IV, 250 mg/kg administered over 30–60 minutes.
  - Do not repeat without consulting a paediatrician.

REFERRAL

» Deterioration of clinical condition despite adequate treatment.
» Meningo-encephalitis with complications or loss of consciousness.

8.14 MUMPS

B26

See Primary Health Care Standard Treatment Guidelines and Essential Medicines List, Chapter 10: Infections and Related Conditions, section 10.11: Mumps.

8.15 MYCOBACTERIUM AVIUM COMPLEX (MAC) INFECTION

A31.0

DESCRIPTION

Atypical mycobacterium, causing disease in extremely immunocompromised patients.
MAC infection in HIV-infected children usually presents with disseminated disease, often enlarged intra-abdominal lymph nodes and pancytopenia.
Pulmonary, GIT or skin disease is less common.

DIAGNOSTIC CRITERIA

» MAC may be isolated from blood, bone marrow, lymph node, other sterile fluids and tissues.
» Confirm diagnosis with a biopsy for histology and culture **or** 2 culture-positive sputa or gastric aspirates. MAC commonly colonizes the lungs and when isolated is most frequently not of clinical relevance. When diagnosis is in doubt, consult a paediatric infectious disease specialist or microbiologist prior to initiating therapy.
» PCR line probe test can be used for diagnosis.

GENERAL AND SUPPORTIVE MEASURES

If MAC infection is localised to a single enlarged peripheral lymph node, an excision of the lymph node is therapeutic.

MEDICINE TREATMENT

Specialist initiated

Identify and treat predisposing immune suppression.
Therapy consists of a combination of at least 3 medicines:

- Macrolide, e.g.:
  - Clarithromycin, oral, 7.5 mg/kg/dose 12 hourly.

  OR
  - Azithromycin, oral, 10 mg/kg/day, if currently on efavirenz.

PLUS

- Ethambutol, oral, 20–25 mg/kg once daily.

PLUS

- Rifampicin, oral, 10–20 mg/kg once daily.
  - Max dose: 600 mg.

REFERRAL

» Poor response to treatment should be referred for consideration of a quinolone, amikacin, or rifabutin.

8.16 PERTUSSIS

A37.9

*Notifiable condition

DESCRIPTION

A communicable respiratory infection classically causing a paroxysmal cough followed by an inspiratory whoop (absent in young infants) with associated vomiting. Subconjunctival haemorrhages may be present. The cough can persist for 3 months or longer with the infectious period being between 2 weeks and 3 months. The disease is more severe in young infants where it may present with apnoea rather than an inspiratory whoop.

Classic pertussis is uncommon in the vaccine era and most cases present with non-specific respiratory symptoms.

Incubation period: 7–10 days. Range: 6–21 days.

DIAGNOSIS

» A definitive diagnosis is often not possible and treatment should be initiated in suspected cases prior to microbiological confirmation.
» May have profound leucocytosis, predominantly lymphocytosis, although leucocytosis is often absent, particularly in infants.
» PCR on nasopharyngeal aspirates is the preferred diagnostic modality.
» Cultures are usually negative, even in confirmed cases.
» Serology is of limited value early in the disease.

GENERAL AND SUPPORTIVE MEASURES

» Standard and droplet precautions for 5 days whilst on appropriate antibiotic therapy; for 21 days if not.
» Appropriate respiratory support for apnoea or respiratory distress/failure.
» Encourage oral feeding. If unsuccessful, provide nasogastric feeds.

MEDICINE TREATMENT

If hypoxic:

- Oxygen, 1–2 L/minute via nasal prongs.

- Macrolide e.g.:
  - Azithromycin:
    - < 6 months: 10 mg/kg/day for 5 days.
    - ≥ 6 months: 10 mg/kg (max 500 mg) on day 1, then 5 mg/kg/day (maximum 250 mg) on days 2–5.

Management of contacts

Prophylaxis for all household contacts and for health care workers with close contact:

- Azithromycin: as for treatment above.

REFERRAL

» Children with seizures or encephalopathy for further evaluation.
» Patients requiring intensive care, where none is available on site.

8.17 *PNEUMOCYSTIS JIROVECI* PNEUMONIA (PJP)

B20.6

See Chapter 15: Respiratory System, section 15.1.1.3: Pneumonia in HIV exposed or infected children.

8.18 POLIOMYELITIS (ACUTE FLACCID PARALYSIS)

A80.3
*Notifiable condition.

Also see Chapter 13: The Nervous System, section 13.8.1: Inflammatory polyneuropathy (Guillain-Barré Syndrome).

DESCRIPTION

Poliomyelitis is eradicated in South Africa. Most cases of acute flaccid paralysis (AFP) are caused by Guillain-Barré Syndrome, but all cases of AFP must be notified as the clinical signs are indistinguishable.

DIAGNOSTIC CRITERIA

Clinical

» Suspect in all children with acute flaccid paralysis, often asymmetrical with intact sensation.

Investigations

» Send two stool specimens (on ice) taken 24–48 hours apart to the NICD via the local laboratory.

GENERAL AND SUPPORTIVE MEASURES

» Isolate patient to prevent faecal-oral spread.
» Rehabilitative measures:

> Most patients need physiotherapy and occupational therapy.

REFERRAL

» Discuss all cases with a specialist.
» Children requiring intensive care if none is available on site.

8.19 RABIES

A82.9
*Notifiable condition. (Inform state veterinarian or local veterinary official.)

DESCRIPTION

A viral infection of the central nervous system following transmission of the rabies virus from the saliva of affected animals through bites or contamination of mucosa or skin lesions.
Incubation period 2–8 weeks.

DIAGNOSTIC CRITERIA

Clinical

» Signs and symptoms may begin with:
  > fever,
  > headache,
  > nausea,
  > diarrhoea,
  > irritability.
» Early signs include paraesthesia or itching at the site of the bite in ⅓ of cases.
» The acute neurologic phase interspersed with lucid periods manifests with:
  > agitation,
  > mania,
  > hyperactivity,
  > hallucinations.
» Seizures may be precipitated by auditory or tactile stimuli.
» Hypersalivation, hydrophobia or aerophobia may occur.
» Death is usually due to cardio-respiratory failure.

Investigations

» Testing of animals with suspected rabies: Virus specific fluorescent antigen in brain tissue confirms the diagnosis in animals.
» Preserve brain tissue of the dead animal.
» Testing of humans with suspected rabies: Clinical diagnosis with Rabies RT-PCR of saliva, CSF and/or nuchal skin biopsy.

GENERAL AND SUPPORTIVE MEASURES

» Symptomatic and supportive treatment.
» Prompt cleansing of the bite wound.
» Do not suture puncture wounds.
» Seek advice.

Telephone Hotline	
National Institute of Communicable Diseases	011 386 6337 or 011 386 6000
After hours	082 883 9920

Post exposure prophylaxis

Caution
Start post exposure prophylaxis immediately.
Do not wait for confirmatory laboratory tests in the animal.

Post exposure prophylaxis may be lifesaving and should always be given if there is a reasonable suspicion that the animal may have been rabid.
The decision to give post exposure prophylaxis is based on the risk of rabies transmission, the species and behaviour of the animal and the nature of the bite. Diagnosis is largely clinical.

MEDICINE TREATMENT TO PREVENT INFECTION

Treatment depends on the risk category.

Risk Category	Type of exposure	Action
1.	» Touching or feeding animal. » Licking intact skin.	» None if reliable history.
2.	» Nibbling uncovered skin. » Superficial scratch without bleeding. » Licking broken skin.	» Wound treatment. » Give rabies vaccine. » Do not give rabies immunoglobulin (RIG). Stop vaccination if laboratory tests of animal are negative for rabies or animal, i.e. dog or cat, remains well after 10 days of observation.
3.	» Bites or scratches penetrating skin and drawing blood. » Licking of mucous membranes.	» Wound treatment. » Give rabies vaccine. » Give rabies immunoglobulin (RIG). » Give tetanus toxoid vaccine and antibiotic. Stop vaccination if laboratory tests of animal are negative for rabies or animal, i.e. dog or cat, remains well after 10 days of observation.

Wound treatment

Local wound care:

Flush wound thoroughly and clean with soap and water or sodium chloride 0.9% or chlorhexidine 0.05%.

- Povidone iodine 10%, topical.

For penetrating wounds:

- Tetanus toxoid (TT), IM, 0.5 mL.

Pre-emptive antibiotic only if hand is bitten or for extensive wounds or human bites. Data does not support the use of antibiotics in minor animal bites.

- Amoxicillin/clavulanic acid, oral, 30 mg/kg/dose of amoxicillin component 8 hourly.

Rabies Vaccine

Must be given for category 2 and 3 bites.

Vaccine is administered on days 0, 3, 7, 14. Vaccine is ideally given as soon as possible after exposure, but should still be given if patient presents some time after the exposure. An additional dose on day 28 may be appropriate for immune compromised patients.

If vaccine administration is delayed > 48 hours, a double dose should be given initially.

Rabies vaccine is given IM but **never in the buttock**. Give into the deltoid muscle in older children & adolescents and antero-lateral aspect of the thigh in infants (dose as per available product instructions).

Rabies Immunoglobulin (RIG)

Must be given for all category 3 exposures.

In HIV-infected children also give for category 2 exposures.

Give rabies vaccine first.

Immunoglobulin must be given as soon as possible after exposure, but may be administered up to 7 days after the first vaccine is given.

Do not give RIG if the patient has previously received pre- or post-exposure prophylaxis.

- Rabies immunoglobulin (RIG).
  - Human RIG: 20 IU/kg.
    - Infiltrate as much as anatomically feasible around the wound.
    - Administer remaining immunoglobulin into deltoid muscle opposite to vaccine administration site.
    - If multiple wounds, dilute in sodium chloride 0.9% to 2–3 times so that **all** wounds are infiltrated.
    - **Do not** exceed maximum dose as antibody production to the vaccine is inhibited.
    - If unavailable, **do not** delay active immunisation.

REFERRAL

» Where prophylactic treatment is not immediately available.

» All cases of human clinical rabies for appropriate palliative care.

8.20 TETANUS

A35
*Notifiable condition.

DESCRIPTION

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.

Complications include:

- » asphyxia,
- » dehydration,
- » hyperpyrexia,
- » inability to suck, chew and swallow.
- » bronchopneumonia,
- » respiratory failure,
- » laryngospasm,

DIAGNOSTIC CRITERIA

The diagnosis is made on clinical grounds.

Clinical

- » Unimmunised/incompletely immunised child.
- » History of wound/trauma or unhygienic care of umbilical cord/stump.
- » Trismus
- » 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.

GENERAL AND SUPPORTIVE MEASURES

- » Admit to a high or intensive care unit, if available.
- » Ventilatory support, if needed.
- » Monitor:
  - > temperature,
  - > respiration,
  - > heart rate,
  - > blood gases,
  - > S_aO_2.
  - > 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.

MEDICINE TREATMENT

For hypoxia:

- Oxygen 100% by nasal cannula.

- Tetanus immunoglobulin, IM, 3000 IU as a single dose.

- Tetanus toxoid (TT), IM, 0.5 mL.
  - Not required in immunised patients who have received a booster within the past 5 years.

- Metronidazole, IV, 7.5 mg/kg/dose 8 hourly for 10 days duration.

For control of muscle spasms:

- Diazepam, IV, 0.1–0.2 mg/kg/dose 4–6 hourly, titrated according to response.
  - Do not exceed 10 mg/dose.
  - After improvement, use enteral form in a high care setting.
  - For ventilation and muscle relaxants, see Chapter 23: Paediatric Intensive Care, section 23.1: Rapid Sequence Induction.

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

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 immunised patients who have received a booster within the past 5 years.

For more severe wounds

If a child with a penetrating wound is not completely immunised:

- Tetanus immunoglobulin (TIG), IM.
  - If < 5 years of age: 75 IU.
  - If 5–10 years of age: 125 IU.
  - If > 10 years of age: 250 IU.

- Tetanus toxoid (TT), IM, 0.5 mL.
  - Not required in immunised patients who have received a booster within the past 5 years.

REFERRAL

» All cases.

8.21 TICK BITE FEVER

A79.9

DESCRIPTION

A tick-borne febrile illness caused by *Rickettsia conorii* or *africae.*
The rash appears on days 3–5 of the illness. It spreads from the extremities to the trunk, neck, face, palms, and soles within 36 hours.
The lesions progress from macular to maculopapular and may persist for 2–3 weeks.
Atypical cutaneous findings may occur.

Complications include:

- vasculitis,
- thrombosis,
- myocarditis,
- thrombocytopenia.
- encephalitis,
- renal failure,
- pneumonitis, and

DIAGNOSTIC CRITERIA

The diagnosis is made on clinical grounds.

Clinical

- Fever, headache, malaise, myalgia and arthralgia.
- Maculopapular rash that may involve the palms and soles.
- Eschar at the site of the tick bite is associated with regional lymphadenopathy and splenomegaly.

Investigations

- Initiate treatment empirically.
- If diagnostic uncertainty: PCR on blood sample or on swab from base of eschar.
- Do not perform serology.

GENERAL AND SUPPORTIVE MEASURES

- Remove tick as soon as possible after detection.

MEDICINE TREATMENT

Antibiotic therapy

Treatment must be started before confirmation of diagnosis.

Severe disease:

- Doxycycline, oral.
  - If < 50 kg: 4 mg/kg/24 hours in 2 divided doses on the first day, then 2 mg/kg/24 hours in 2 divided doses for second day.
  - If > 50 kg: 100 mg 12 hourly for 2 days.

Then switch to:

- Azithromycin, IV/oral, 10 mg/kg daily for 3 days.

Mild to Moderate disease:

- Azithromycin, IV/oral, 10 mg/kg daily for 3 days.

REFERRAL

» Patients not responding to adequate therapy.
» Patients with complications.

8.22 TOXOPLASMOSIS

B58.9

DESCRIPTION

Rarely occurs in children caused by infection with *Toxoplasma gondii*
Usually presents as encephalitis, with focal neurological abnormalities occurring in association with headache.
Ocular and pulmonary disease is also seen.

DIAGNOSTIC CRITERIA

Investigations

» Diagnosis may be made on blood and CSF serology.
» CSF PCR for toxoplasmosis may also be helpful.
» CT scan brain usually reveals multiple bilateral, focal, hypodense ring-enhancing lesions.

REFERRAL

» All cases.

8.23 TYPHOID

A01.1
*Notifiable condition.

DESCRIPTION

A systemic disease caused by *Salmonella typhi*.

DIAGNOSTIC CRITERIA

Clinical

» fever,
» headache,
» diarrhoea or constipation,
» abdominal pain or tenderness,
» cough,
» delirium,
» meningismus,
» anorexia,
» vomiting,
» ileus,
» epistaxis,
» hepatomegaly and/or splenomegaly,
» stupor.

Investigations

» Leucopenia, anaemia and thrombocytopenia.
» Positive cultures from blood (1st week), stool (after 1st week), urine and bone marrow.
» Serology not recommended.

GENERAL AND SUPPORTIVE MEASURES

» Isolate patient until eradication confirmed.
» Correct and maintain fluid and electrolyte status.

Collect 3 stool samples: 1 week after completion of treatment and every 48 hours thereafter.

MEDICINE TREATMENT

Note:
Relapse and carrier state may occur despite adequate therapy.

Initiate therapy with:

- Ceftriaxone 100 mg/kg daily for 10 days, consider 14 days for more severe cases.
  - Maximum: 2 g/dose.

Once patient is stable, consider switching to oral ciprofloxacin based on clinical response and susceptibility testing results:

- Ciprofloxacin 15 mg/kg/dose 12 hourly for 7–10 days.

Retreatment

If any one of the 3 follow-up stool samples are positive for *S. typhi*: retreat and repeat stool sampling 1 week later.
If any of these 3 samples are positive for *S. typhi*: treat for carriage (ciprofloxacin x 4–6 weeks).
Check stool cultures monthly.

REFERRAL

» Inadequate response to treatment.
» Patients with complications.
» Chronic carriers (stool positive x ≥ 12 months).

8.24 NON-TYPHOID SALMONELLA (NTS)

A02.9

DESCRIPTION

Present as:

» gastroenteritis, or
» extra-intestinal (invasive) disease.

DIAGNOSTIC CRITERIA

Clinical

» Self-limiting mucosal intestinal disease presenting with diarrhoea and vomiting in immunocompetent patients.
» Young infants (< 3 months) and immunodeficient children (especially HIV-infected children) are prone to invasive, often recurrent disease.
» Invasive disease includes bacteraemia (fever), osteomyelitis and meningitis.
» There is also an association of invasive NTS with malaria and severe anaemia.

Investigations

» Positive blood cultures, less commonly, stool, urine and bone biopsy.

GENERAL AND SUPPORTIVE MEASURES

» Correct and maintain fluid and electrolyte status.

MEDICINE TREATMENT

Note:
Relapse may occur despite adequate therapy. Antibiotic therapy in NTS gastroenteritis may prolong excretion of Salmonella.

Antibiotic therapy is **not** generally recommended for non-invasive disease. However, in infants < 3 months of age and severely immunocompromised children at high risk of developing invasive disease, treat as for invasive disease.

Invasive disease

If < 1 month of age:

- Cefotaxime, IV/IM.

Gestational age	Postnatal age	Dose
< 32 weeks	< 14 days	50 mg/kg/dose every 12 hours
	14–28 days	50 mg/kg/dose every 8 hours
≥ 32 weeks	≤ 7 days	50 mg/kg/dose every 12 hours
	8–28 days	50 mg/kg/dose every 8 hours

OR

If > 1 month of age:

- Ceftriaxone, IV, 100 mg/kg once daily, (maximum 4 g/day).
  Duration:
  - Bacteraemia: 10–14 days.
  - Acute osteomyelitis: 4–6 weeks.
  - Meningitis: 4 weeks.

If cephalosporin resistance reported, treat according to sensitivity.

REFERRAL

» Inadequate response to treatment.
» Patients with complications.

8.25 VARICELLA (CHICKEN POX)

B01

DESCRIPTION

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,
» necrotising fasciitis,
» pneumonia,
» 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.

GENERAL AND SUPPORTIVE MEASURES

» Isolate the patient.
» Maintain adequate hydration.

MEDICINE TREATMENT

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):

- Aciclovir, 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:

- Aciclovir, IV, 8 hourly administered over 1 hour for 7 days.
  - If < 12 years: 20 mg/kg/dose 8 hourly.
  - If > 12 years: 10 mg/kg/dose 8 hourly.

For encephalitis:
See section 8.13: Meningo-encephalitis/encephalitis, acute viral.

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

- Cephalexin, oral, 12.5 mg/kg/dose, 6 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:

- Aciclovir, 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:

- Aciclovir, 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).

- Varicella-zoster vaccine, IM, 0.5 mL given within 72 hours of exposure.

OR

- Aciclovir, oral, 20 mg/kg/dose 8 hourly for 10 days given in the second week after exposure.

REFERRAL

» Patients with complications.

8.26 ZOSTER

B02

DESCRIPTION

A vesicular eruption in a dermatomal pattern, due to reactivation of varicella-zoster virus.

Occurs commonly in immunocompromised children and occasionally in immunocompetent children.

DIAGNOSTIC CRITERIA

Usually made on clinical grounds.

Investigations

» Confirm diagnosis by varicella-zoster PCR.

GENERAL AND SUPPORTIVE MEASURES

» Isolate the patient.

MEDICINE TREATMENT

Within 24 hours of the appearance of the rash for less severe cases:

- Aciclovir, oral, 20 mg/kg/dose 6 hourly for 7 days.
  - Maximum dose: 800 mg/dose.

If oral treatment cannot be taken and for severe cases:

- Aciclovir, IV, 8 hourly administered over 1 hour for 7 days.
  - < 12 years: 20 mg/kg/dose.
  - > 12 years: 10 mg/kg/dose.

For post-herpetic neuralgia, see Chapter 20: Pain Control.

REFERRAL

» Disseminated zoster.

8.27 SEPSIS

A41.9

For neonatal sepsis, see Chapter 19: Prematurity and Neonatal Conditions, section 19.5.2: Septicaemia of the newborn.

DESCRIPTION

Severe sepsis is an uncontrolled inflammatory response as a result of suspected or proven infection.

DIAGNOSTIC CRITERIA

Clinical

» A 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 ºC or > 38.5 ºC,
  > tachycardia,
  > tachypnoea,
  > elevated leucocyte count.

  PLUS one of the following:
  > cardiovascular dysfunction,
  > acute respiratory distress syndrome, or
  > ≥ 2 other organ dysfunctions.

Investigations

» Blood culture and identify focus of infection, e.g. osteomyelitis, abscess.
» Investigate for malaria, especially in endemic areas, or if there is a relevant travel history.
» Where meningitis due to meningococcus is suspected, i.e. with petechial rash, lumbar puncture is contraindicated (see Chapter 13: The Nervous System, section 13.12: Lumbar puncture). Do petechial scrapes and blood culture to confirm diagnosis.

GENERAL AND SUPPORTIVE MEASURES

» For suspected meningococcaemia: Notifiable condition and requires isolation for 24 hours after commencement of appropriate antibiotics.
» Admit to a high care area.
» Early recognition and treatment of septic shock.
» Antimicrobials do not penetrate necrotic tissue or abscesses, so debridement, incision and drainage are essential aspects of care.

MEDICINE TREATMENT

Empiric antibiotic therapy

Choice of antibiotic depends on the severity of the condition and predisposing factors.

- Ceftriaxone, IV, 100 mg/kg, once daily for 7 days.

Confirmed meningococcal septicaemia

- Benzylpenicillin (Penicillin G), IV, 100 000 units/kg/dose immediately, then 4 hourly for 7 days.

Suspected staphylococcal infection (e.g. osteomyelitis)

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

PLUS

- Ceftriaxone, IV, 100 mg/kg, once daily.

Reconsider choice and descalation of antibiotics, aiming for monotherapy where possible, when the results of cultures become available or if the child does not improve.

Continue IV antibiotics until there is a good clinical response and laboratory markers of infection improve (usually less than a week). Oral antibiotics are then appropriate.

See section 8.28: Staphylococcal septicaemia, for management of invasive *S. aureus* infections.

Nosocomial sepsis: Manage according to the background microbiological flora within your institution.

Septic shock

See Chapter 1: Emergencies and Trauma, section 1.1.8: Shock.

REFERRAL

» Septicaemia with complications.
» Patients requiring intensive care.
» Patients requiring debridement of necrotic areas or drainage of collections.

8.28 STAPHYLOCOCCAL SEPTICAEMIA

A41.2

DESCRIPTION

Staphylococci cause disease by direct invasion of tissues with liberation of toxins. Septicaemia may occur when haematogenous dissemination occurs from a focus of infection.

DIAGNOSTIC CRITERIA

Clinical

Features of septicaemia should raise an index of suspicion of staphylococcal infection.

Suggestive features of staphylococcal infection include:
» presence of abscesses,
» erythema of palms and soles,
» drip site infections,
» osteomyelitis,
» septic arthritis, and
» endocarditis.

Investigations
» Send pus for culture and sensitivity.
» Blood cultures are frequently negative in serious staphylococcal infection, a finding that highlights the need for performing cultures on other specimens.

GENERAL AND SUPPORTIVE MEASURES
» Surgical drainage or aspiration of pus.
» If infection is associated with a foreign body, such as an intravenous catheter, remove the catheter and submit the tip for culture and sensitivity.

MEDICINE TREATMENT
When *S. aureus* isolates are likely to be the cause of infection, the most appropriate agents to administer for empiric treatment are based on the relative frequency of community associated – methicillin resistant staphylococcus aureus (CA-MRSA) isolates in the particular community.

Sensitive staphylococcal bacteraemia:
- Cloxacillin, IV, 50 mg/kg/dose 6 hourly for at least 14 days; longer courses often required.

Sensitive staphylococcus (bone and joint):
- Cloxacillin, IV, 50 mg/kg/dose 6 hourly. Can transition to oral therapy once there is sustained clinical improvement, resolution of fever and CRP < 30 mg/L.
  - Septic arthritis: 2–4 weeks of treatment.
  - Acute osteomyelitis: 4–6 weeks of treatment.
  - Infective endocarditis: see Chapter 4: Cardiovascular System, section 4.3: Endocarditis, infective.

Methicillin resistant staphylococci (proven/suspected):
- Vancomycin, IV, 15 mg/kg/dose, 6 hourly infused over 1 hour.
  - Where available, therapeutic drug level monitoring recommended:
    - Check vancomycin trough level within 1 hour before 4th or 5th dose.
    - Adjust dose to keep trough level within recommended range (severe infections 15–20 µg/mL, less severe infections 10–15 µg/mL).

REFERRAL

» Severe sepsis with organ dysfunction.
» Septic shock after resuscitation.
» Staphylococci resistant to above antibiotics.
» Patients requiring debridement of necrotic areas or drainage of collections.

8.29 ARTHRITIS, SEPTIC (PYOGENIC)

M00.9

DESCRIPTION

Septic arthritis may occur as a result of haematogenous seeding of the synovium during transient periods of bacteraemia.

Septic or pyogenic arthritis is often part of a generalised septicaemia which may involve more than one joint and is caused by pyogenic micro-organisms. The organisms involved vary:

» Neonates – *S. aureus*, Group B Streptococci, *E. coli*, fungi.
» Infants/children – *S. aureus*, *H. influenzae*, Group A Streptococci, *S. pneumoniae, Kingella kingae.*
» Adolescents (sexually active) – *N. gonorrhoea.*
» Chronic septic arthritis – *Brucella*, tuberculosis, atypical mycobacteria, fungi and other uncommon organisms.

DIAGNOSTIC CRITERIA

The diagnosis is largely clinical and confirmed by finding pus in the joint space.

CAUTION
Do not carry out needle aspiration in haemophiliacs.

Clinical

» Fever, local pain, loss of function and toxic looking child.
» Subtle, non-specific signs of sepsis early in the course of the disease, especially in neonates.
» Local tenderness, warmth, swelling at a joint with restriction of passive and active movement.
» Malaise, irritability, feeding problems and pseudo-paralysis.
» If lower extremities are involved, development of a limp or refusal to bear weight.

Investigations

» Blood cultures prior to antibiotic administration.
» Aspiration of pus from the joint space under ultrasound guidance, if possible, and submit for microscopy, Gram stain, culture and sensitivity.
» Raised CRP and white cell count and/or ESR.

GENERAL AND SUPPORTIVE MEASURES

» Septic arthritis of the hip (emergency) requires prompt open surgical drainage at the time of presentation, in consultation with an orthopaedic surgeon.
» Manage most infections of other sites by repeated aspiration or open drainage (not antibiotic instillation), if frank pus is obtained on initial diagnostic aspiration.
» Immobilise affected limb in position of function.
» Identify other effects of septicaemia or haematogenous spread and treat appropriately.
» Supportive and symptomatic care.

MEDICINE TREATMENT

Antibiotic therapy

» Minimum duration of therapy: 4–6 weeks.

IV antibiotics

Initiate IV antibiotic treatment immediately.
Adjust antibiotic therapy based on culture results or if response to empiric antibiotic treatment is unsatisfactory.
Continue with IV antibiotics until there is evidence of good clinical response and laboratory markers of infection improve. Once clinical improvement and inflammatory markers are normalising, patients can be switched to oral antibiotic therapy.

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.

Gestational age	Postnatal age	Dose
< 32 weeks	< 14 days	50 mg/kg/dose every 12 hours
	14–28 days	50 mg/kg/dose every 8 hours
≥ 32 weeks	≤ 7 days	50 mg/kg/dose every 12 hours
	8–28 days	50 mg/kg/dose every 8 hours

1 month to < 3 months:

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

PLUS

- Ceftriaxone, IV, 100 mg/kg, once daily.

Infants > 3 months and children:

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

If gram-negative organisms are seen on Gram stain, or when clinically suspected, e.g. sickle cell disease:

ADD

- Ceftriaxone, IV, 100 mg/kg, once daily.

Special Circumstances

If MRSA, replace cloxacillin with vancomycin.

- Vancomycin IV, 15 mg/kg/dose administered over 1 hour given 6 hourly.
  - Where available, vancomycin doses should be adjusted on the basis of therapeutic drug levels.
    - Trough levels (taken immediately prior to next dose), target plasma level 15–20 µg/mL.

Oral antibiotics

- Can transition to oral therapy once there is sustained clinical improvement, resolution of fever and CRP < 30 mg/L.
  - Duration: 2–4 weeks of treatment.

Antibiotics according to sensitivities:

- Clindamycin, oral, 6 mg/kg/dose 6 hourly.

OR

For children able to swallow a capsule:

- Flucloxacillin, oral, 12.5–25 mg/kg/dose, 6 hourly.

PLUS

Corticosteroids

- Dexamethasone, IV, 0.15 mg/kg 6 hourly for 4 days.

LoE I[3]

For pain and inflammation:
See Chapter 20: Pain control.

REFERRAL

» Multi-organ involvement.
» Failure to achieve progressive improvement on treatment.
» Rehabilative care including occupational and physiotherapy.

8.30 ARTHRITIS, JUVENILE IDIOPATHIC

M08.0

See Chapter 12: Rheumatology and Vasculitides, section 12.2: Juvenile idiopathic arthritis (JIA).

8.31 OSTEITIS/OSTEOMYELITIS, ACUTE

M86.1

DESCRIPTION

Most cases result from haematogenous deposition of organisms in the bone marrow after a transient bacteraemic 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.

The organisms involved vary:

» 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, leucopenia: *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

Diagnostic

» Aspiration of pus for microscopy, Gram stain, culture and sensitivity.
» **Blood culture and full blood count –** raised white cell count.
» CRP

The following may be helpful:

» X-ray after 2 weeks.
» Bone scan (Tc99).
» MRI

GENERAL AND SUPPORTIVE MEASURES

» Immobilise affected limb in position of function.
» Supportive and symptomatic care.

MEDICINE TREATMENT

Antibiotic therapy

Minimum duration of therapy: 4–6 weeks.

IV antibiotics

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 are normalising, 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.

Gestational age	Postnatal age	Dose
< 32 weeks	< 14 days	50 mg/kg/dose every 12 hours
	14–28 days	50 mg/kg/dose every 8 hours
≥ 32 weeks	≤ 7 days	50 mg/kg/dose every 12 hours
	8–28 days	50 mg/kg/dose every 8 hours

Infants and children:

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

PLUS

- Ceftriaxone, IV, 100 mg/kg, once daily.

Special Circumstances

If MRSA, replace cloxacillin with vancomycin.

- Vancomycin, IV, 15 mg/kg/dose administered over 1 hour, given 6 hourly.
  - Where available, vancomycin doses should be adjusted on the basis of therapeutic drug levels.
    - Trough levels (taken immediately prior to next dose), target plasma level 15–20 µg/mL.

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.

- Where available, gentamicin doses should be adjusted on the basis of therapeutic drug levels.
  - Trough levels (taken immediately prior to next dose), target plasma level < 1 mg/L.
  - Peak levels (measured 1 hour after commencement of IV infusion or IM/IV bolus dose), target plasma level > 8 mg/L.

Oral antibiotics

- Can transition to oral therapy once there is sustained clinical improvement, resolution of fever and CRP < 30 mg/L.
  - 4–6 weeks of treatment.

ANTIBIOTICS ACCORDING TO SENSITIVITIES

- Clindamycin, oral, 6 mg/kg/dose 6 hourly.

OR

For children able to swallow a capsule:

- Flucloxacillin, oral, 25 mg/kg/dose, 6 hourly.

For pain and inflammation:
Refer to Chapter 20: Pain control.

REFERRAL

» Refer to specialist for confirmation of diagnosis, and consideration of surgical drainage.
» Multi-organ involvement.
» Failure to achieve progressive improvement on treatment.

8.32 COVID-19 IN CHILDREN

U07.1
*Notifiable condition.

Also see:
» National Department of Health – Guide to antigen testing for SARS-CoV-2 in South Africa, revision. January 2023.[4]

DESCRIPTION

SARS-CoV-2 infections range from asymptomatic to severe.
Case definition of COVID-19 (NICD/NDOH):
» A suspected COVID-19 case includes any person presenting with an acute (≤ 14 days) respiratory tract infection (cough, sore throat, shortness of breath, anosmia or dysgeusia) or other clinical illness compatible with COVID-19 including fever, weakness, myalgia or diarrhoea, or an asymptomatic person who is a close contact of a confirmed case.

Many children with COVID-19 will have no respiratory symptoms or fever, therefore, clinicians should consider COVID-19 in all acutely ill patients, especially those requiring admission.

DIAGNOSTIC CRITERIA

Testing

» Rapid antigen tests or PCR-based tests are both acceptable options to use for diagnosis. Rapid antigen tests may be performed on all patients for whom the PCR test is indicated in situations where no PCR tests are available, or when the PCR turnaround time limits the clinical or public health response utility.
» Upper respiratory tract (nasopharyngeal or oropharyngeal) samples should be sent on all patients. Sputum can be sent when available.
» A single positive rapid or PCR test is sufficient proof of COVID-19 infection.
» A negative rapid test should be followed up by a PCR test if the patient has symptoms compatible with COVID-19 or if the patient has had a recent exposure to a confirmed case.
» Due to poor sensitivity within the first 1–2 weeks after symptom onset, serology (antibody test) is not recommended for the diagnosis of acute COVID-19 infection.
» All healthcare workers should wear appropriate personal protective equipment (PPE) for both contact and respiratory precautions when obtaining specimens.
» Record and report and notify all confirmed COVID-19 cases.

Consider testing individuals suspected of having COVID-19 AND:

» Admitted to hospital with symptoms suggestive of COVID-19 disease.
» At high risk of severe disease (e.g. those with co-morbidities or immune-compromised).
» Suspected multisystem inflammatory syndrome in children (MIS-C).
» As the pandemic matures and evolves, testing recommendations may change – please consult NICD and NDoH sources for current recommendations.

Assessment

Use the following criteria to assess and classify the severity of the child's condition:

	MILD	MODERATE	SEVERE
Mental status	Normal	Restless	Irritable/lethargic
Feeding	Finishes feed	Does not finish feed	Unable to feed
Talking	Full sentences	Interrupted sentences	Unable to talk
Respiratory rate	< 40 < 1 year	40–60 < 2 months 40–50 2–12 months	> 60 < 2 months > 50 2–12 months

	MILD	MODERATE	SEVERE
(breaths/ minute)	< 30 1–5 years < 20 > 5 years	30–40 1–5 years 20–30 > 5 years	> 40 1–5 years > 30 > 5 years
Respiratory signs	No distress	Lower-wall indrawing	Lower-wall indrawing Grunting
SpO_2	≥ 95% in room-air	< 92% in room-air	< 92% in room-air Central cyanosis

GENERAL AND SUPPORTIVE MEASURES

Isolation

Isolation is recommended for laboratory-confirmed COVID-19 disease for 7 days from onset of symptoms or, if asymptomatic, from the date of testing.

MEDICINE TREATMENT

Ensure holistic care and review the immunization, nutritional, HIV and TB risk status of the child.

Exclude other differential diagnoses.

» Mild disease:
  > Provide symptomatic treatment at home.
  > Provide caregiver with a patient information pamphlet.
  > Implement suitable infection prevention and control practices.
  > Special investigations and imaging are not routinely indicated.
  > Routine micronutrient and vitamin supplementation are not recommended.
  > Do not prescribe steroids unless indicated for a concomitant non-COVID-19 condition, e.g. asthma exacerbation, croup.

» Moderate/Severe disease:
  > Admit for supportive in-patient care and consult/refer.
  > For pneumonia – see Chapter 15: Respiratory System, section 15.1.1: Pneumonia.
  > In addition, children with hypoxic pneumonia can be considered for corticosteroid therapy (discuss with specialist).
  > For acute diarrhoea – see Chapter 2: Alimentary Tract, section 2.2.4: Diarrhoea, Acute.

REFERRAL

Consult with a specialist for advice prior to referral when a child requires supportive care that cannot be safely and effectively provided at the current facility, including:

» Prior to prescribing corticosteroids.
» When the child requires ≥ 40% oxygen to maintain SpO_2 above 92%.
» If the child's clinical condition worsens.
» If the child meets criteria for Multisystem Inflammatory Syndrome in Children, (MIS-C) associated with COVID-19 (see below).

Discharge/De-isolation

Children can be discharged from hospital once they no longer require supplementary oxygen, are feeding well and can be safely cared for at home. They can be de-isolated when they are no longer likely to be shedding virus:

Mild disease	7 days from onset of symptoms.
Moderate/Severe disease	7 days after they are clinically stable, i.e. cessation of oxygen or return to baseline if receiving oxygen prior to SARS-CoV-2 infection.

8.32.1 MULTISYSTEM INFLAMMATORY SYNDROME IN CHILDREN (MIS-C)

U10.9

*Notifiable condition.

DESCRIPTION

A rare but serious inflammatory syndrome has been linked to COVID-19. Also known as Paediatric Inflammatory Multisystem Syndrome Temporally associated with SARS-CoV-2 infection (PIMS-TS) or Kawasaki-like syndrome. The syndrome occurs after resolution of acute COVID-19 or following asymptomatic SARS-CoV-2 infection.

DIAGNOSTIC CRITERIA

Clinical presentation varies but the condition should be considered in children and adolescents (0–19 years of age) with fever ≥ 3 days **AND** 2 of the following:

» Rash or bilateral non-purulent conjunctivitis or mucocutaneous inflammation signs (oral, hands or feet).
» Hypotension or shock.
» Features of myocardial dysfunction, pericarditis, valvulitis, or coronary abnormalities (including ECHO findings or elevated troponin/NT-proBNP).
» Evidence of coagulopathy (by PT, PTT, elevated D-dimers).
» Acute gastrointestinal problems (diarrhoea, vomiting, or abdominal pain).
AND
» Elevated markers of inflammation such as ESR, C-reactive protein, or procalcitonin.
AND
» No other obvious microbial cause of inflammation, including bacterial sepsis, staphylococcal or streptococcal shock syndromes.
AND
» Evidence of COVID-19 (RT-PCR, antigen test or IgG serology positive), or likely contact with patients with COVID-19.

TREATMENT

» If the child meets the above case definition, evaluate for shock and manage accordingly (see Chapter 1: Emergencies and Trauma, section 1.1.8: Shock).
» Consult a tertiary centre for advice and referral.

REFERRAL

» All cases.

8.32.2 NEONATAL ISSUES RELATED TO COVID-19

DESCRIPTION

» Most neonates born to mothers with COVID-19 will not be seriously affected, although prematurity seems to be more common.
» Vertical and breast milk associated transmission are exceedingly rare.

GENERAL AND SUPPORTIVE MEASURES

» Preferably, do not separate babies from their mothers.
» Encourage breastfeeding unless contra-indicated for other medical reasons.
» Medical care, if required, should preferably be offered without separating babies from their caregivers (e.g. phototherapy, naso-gastric feeds, blood sugar monitoring, parenteral antibiotics) – the ability to do this will depend on local circumstances.
» If separation is unavoidable, keep isolated in a closed incubator with appropriate non-pharmaceutical infection control measures until discharge, 7 days from onset of mother's symptoms or from birth (whichever comes first).
» Routine neonatal testing for SARS-CoV-2 infection is unnecessary, however, if symptoms not explained by other neonatal diseases develop, then nasopharyngeal sampling for SARS-CoV-2 PCR testing is appropriate.

MEDICINE TREATMENT

Concomitant neonatal conditions: As per existing neonatal guidelines (see Chapter 19: Neonatal Conditions).

» For suspected/confirmed COVID-19: supportive therapy as needed.

References

[1] Fluconazole dose: South African Medicines Formulary. 12th Edition. 2016.

2 Artesunate, IV (dosing for < 20 kg): Hendriksen IC, Mtove G, Kent A, Gesase S, Reyburn H, Lemnge MM, et al. Population pharmacokinetics of intramuscular artesunate in African children with severe malaria: implications for a practical dosing regimen. Clin Pharmacol Ther. 2013 May;93(5):443-50. https://pubmed.ncbi.nlm.nih.gov/23511715/

Artesunate, IV (dosing for < 20 kg): WHO Guidelines for malaria, 25 November 2022. Geneva: World Health Organization; 2022 (WHO/UCN/GMP/2022.01 Rev.3). License: CC BY-NC-SA 3.0 IGO.

[3] Dexamethasone: Odio CM, *et. al*. Double blind, randomized, placebo-controlled study of dexamethasone therapy for hematogenous septic arthritis in children. Pediatr Infect Dis J. 2003, 22:883-886; Harel L, *et. al.* Dexamethasone therapy for septic arthritis in children. J Pediatr Orthop. 2011; 31:211-215.

[4]National Department of Health. Guide to antigen testing for SARS-CoV-2 in South Africa, revision. January 2023. https://sacoronavirus.co.za/wp-content/uploads/2023/01/Covid-19-updated-testing-guidelines-PROF-NDJEKA.pdf