CHAPTER 2
ALIMENTARY TRACT

2.1 DENTAL AND ORAL DISORDERS

2.1.1 GINGIVITIS, UNCOMPLICATED
K05.1

DESCRIPTION
Inflammation of the gum margin causing the gums to separate from the teeth.
Pockets form between the gums and the teeth where pus and bacteria can collect, eventually causing periodontitis, a disease in the tissue that surrounds and supports the teeth – see section 2.1.2: Periodontitis.

Characteristics of uncomplicated gingivitis:
» change in the normal gum contour,
» redness,
» watery exudate/bleeding,
» may be recurrent.
» may be painful,
» swollen gums,
» gum recession may occur,

GENERAL AND SUPPORTIVE MEASURES
Oral hygiene is usually adequate to prevent superficial mouth and gum infection:
» Oral hygiene after each meal to remove plaque and food debris.
» Frequent thorough brushing of teeth, at least twice daily.
» Dental flossing at least once a day.
» Homemade warm saline rinse. Dissolve ½ teaspoon of table salt (sodium chloride) in ~ 200 mL warm water. Rinse mouth for one minute twice daily but do not swallow.

MEDICINE TREATMENT
- Paracetamol, oral, 15 mg/kg/dose 6 hourly when required to a maximum of 4 doses per 24 hours.
- Chlorhexidine 0.2%, 15 mL as a mouthwash, 2–4 times daily for 5 days; use after brushing and flossing.

2.1.2 PERIODONTITIS
K05.4

DESCRIPTION
Progressive gingivitis to the point where the underlying bone is eroded, is characterised by teeth becoming loose in their sockets.
It is a cause of tooth loss in adults.

GENERAL AND SUPPORTIVE MEASURES

» Advice on improving and maintaining oral hygiene. See section 2.1.1: Gingivitis, uncomplicated. General and supportive measures.

MEDICINE TREATMENT

- Chlorhexidine 0.2%, 15 mL as a mouthwash, 2–4 times daily for 5 days.

REFERRAL

» All cases to a dentist.

2.1.3 NECROTISING PERIODONTITIS

K05.6

DESCRIPTION

An acute very painful infection of the gingival margin characterised by:

» foul smelling breath,
» loss of gingiva and supporting bone around teeth, and
» presence of underlying disease, e.g. HIV.

May lead to loss of surrounding lips and cheeks if not adequately treated.

GENERAL AND SUPPORTIVE MEASURES

» Advice on improving and maintaining oral hygiene. See section 2.1.1: Gingivitis, uncomplicated. General and supportive measures.

MEDICINE TREATMENT

- Amoxicillin/clavulanic acid, oral, 45 mg/kg/dose of the amoxicillin component 12 hourly for 5 days. (See annexure 1: Amoxicillin/Clavulanic weight band dosing table)
- Chlorhexidine 0.2%, 15 mL as a mouthwash, 2–4 times daily 30 minutes after brushing and flossing.
  - Continue for 5 days.

For pain:

- Paracetamol, oral, 15 mg/kg/dose 6 hourly when required, to a maximum of 4 doses per 24 hours.

REFERRAL

For dental treatment:

» No improvement within 5 days.

2.1.4 CANDIDIASIS, ORAL

B37.0

See section 8.6: Candidiasis, systemic and other.

2.1.5 APHTHOUS ULCERS

K12.0

DESCRIPTION

Painful ulcers in the oropharynx. Minor ulcers (< 1 cm diameter) usually heal within 2 weeks. Major ulcers (> 1 cm diameter) are very painful, often very deep and persist.

GENERAL AND SUPPORTIVE MEASURES

» Maintain adequate nutrition and hydration by encouraging fluid and food intake – use bland foods and fluids as they cause less pain.
» For minor aphthous ulcers, use homemade warm saline rinse. Dissolve ½ teaspoon of table salt (sodium chloride) in ~ 200 mL warm water. Rinse mouth but do not swallow.

MEDICINE TREATMENT

For pain:

- Paracetamol, oral, 15 mg/kg/dose 6 hourly when required to a maximum of 4 doses per 24 hours.

REFERRAL

» Major aphthous ulcers for further diagnostic evaluation.
» Aphthous ulcers not resolving in 3 weeks for further evaluation.

2.1.6 HERPES GINGIVOSTOMATITIS

B00.2

DESCRIPTION

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.

DIAGNOSTIC CRITERIA

Clinical

» 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.

GENERAL AND SUPPORTIVE MEASURES

» Maintain adequate nutrition and hydration by encouraging fluid and food intake – use bland foods and fluids as they cause less pain.
» If oral nutrition cannot be maintained use oral/nasogastric and/or IV fluids, if necessary.

MEDICINE 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:

- Aciclovir, oral, 250 mg/m2/dose 6 hourly for 7 days (or per kg dose equivalent below):
  - If > 1 month 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.

LoE III[1]

If very severe infection, consider:

- Aciclovir, IV, 250 mg/m^2/dose 8 hourly for 7 days (per kg dose equivalent below):
  - If > 1 month 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.
  - Change to oral as soon as possible.

For very painful oral herpes in children > 2 years:

- Lidocaine (lignocaine) 2% gel applied every 3–4 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.

2.2 GASTROINTESTINAL DISORDERS

2.2.1 CHOLERA

A00.9
*****Notifiable condition.

DEFINITION

An acute diarrhoeal disease caused by *V. cholerae*.

DIAGNOSTIC CRITERIA

Clinical

» Sudden onset of severe, watery diarrhoea, i.e. 'rice water' diarrhoea.
» Low-grade or no fever.
» Persistent vomiting not associated with nausea.
» Rapid fluid and electrolyte losses with dehydration, acidosis and hypovolaemic shock with/without renal failure.
» History of contact with a cholera case or the presence of cholera in the community.

Investigations

» Positive stool culture.
» Agglutinating or toxin-neutralising antibodies in the serum.

GENERAL AND SUPPORTIVE MEASURES

» Isolate patient and institute barrier nursing.
» Ensure adequate hydration and nutrition.
» Check blood glucose in patients with decreased level of consciousness.

The management of the fluid requirements is the most critical element of treating a patient with cholera.

MEDICINE TREATMENT

First treat shock.
Once shock has resolved, manage as acute diarrhoea. See section 2.2.4: Diarrhoea, acute.

For the management of shock during recognised cholera outbreaks, there may be benefit to replace sodium chloride 0.9% with:

- Ringers Lactate, IV.

Antibiotic treatment

Recommended antibiotics may vary according to susceptibilities of organisms in current epidemics. Consult the NICD for the latest recommendations.
Current recommendations for severe dehydration are:

- Ciprofloxacin, oral, 20 mg/kg as a single dose (maximum 750 mg).

OR

- Azithromycin, oral, 20 mg/kg as a single dose.

LoE III[2]

In all children who are able to take oral medication:

- Zinc (elemental), oral, 10 mg/day for 14 days:

REFERRAL

» Cholera with complications, e.g. persistent shock, renal failure and severe electrolyte disturbances.

2.2.2 CONSTIPATION/FAECAL LOADING

K59.0

DESCRIPTION

Constipation: The infrequent passage of hard stools. This is often due to behavioural retention following previous painful episodes of defaecation (functional constipation), but may also be due to organic causes (metabolic, endocrine, neurogenic, lower bowel abnormalities and medication side effects).

Constipation-associated faecal incontinence: The involuntary leakage of small amounts of soft or watery stools secondary to faecal loading.

DIAGNOSTIC CRITERIA

Rome IV Criteria:

Infants up to 4 years of age should have at least two symptoms for 1 month prior to diagnosis and those over developmental age 4 years should have at least two symptoms present for the previous 2 months:

» Two or fewer defaecations per week.
» At least 1 episode of faecal incontinence per week.
» Retentive posturing or stool retention.
» Painful or hard bowel movements.
» Presence of a large faecal mass in the rectum.
» Large diameter stools that may obstruct the toilet.

LoE III[3,4]

GENERAL AND SUPPORTIVE MEASURES

» Determine and treat the underlying cause.
» Treatment involves 3 steps:
  > initial clearance of stools,
  > prevent re-accumulation of hardened retained stool, and
  > retraining of the gut to achieve regular toilet habits.
» Management is long-term and requires the active involvement of the parents.

MEDICINE TREATMENT

Initial therapy

(Disimpaction if indicated):

- Phosphate-containing enema (sodium phosphate 6 g, sodium biphosphate 16 g/100 mL).
  - Age 2–5 years: 32 mL.
  - Age 5–11 years: 64 mL.
  - Repeat once, if necessary.

OR

- Polyethylene glycol 59 g/L solution with sodium sulphate and electrolytes, oral/ nasogastric tube, 10–25 mL/kg/hour until clear fluid is passed rectally.

Note: No additional ingredient should be added to the solution, e.g.

flavourings or sugar containing cold drinks.

Maintenance therapy
The child and parents should be counselled and educated about behaviour modification (regarding toilet habits) and diet changes (additional natural fibre from fruit, vegetables and bran).

(a) Osmotic laxative:
- Lactulose, oral, 0.5–1 mL/kg/dose once or twice daily.

AND/OR
(b) Stool softener:
- Liquid paraffin, oral, 1–3 mL/kg/day. Single or divided dosage.
- Do not use in children under 1 year or those with neurological conditions or swallowing disorders.

AND/OR
(c) Bulk-forming agent:
- Ispaghula husk, oral, 1.75–3.5 g, stirred in water with breakfast.

If faecal loading was present, maintenance therapy should be continued for months to years.

REFERRAL
» Suspected organic cause, e.g. constipation from birth in a breastfed baby.
» Inadequate response to therapy.

2.2.3 CYSTIC FIBROSIS
E84.9

DESCRIPTION
An autosomal recessive disorder of exocrine glands, mainly affecting the gut, pancreas and lungs.

DIAGNOSTIC CRITERIA
Clinical
» Recurrent infections of the respiratory tract with later bronchiectasis, respiratory failure and cor pulmonale.
» Bulky, greasy and foul-smelling stools.
» Occasionally presents with constipation.
» Malabsorption with weight loss and failure to thrive.
» Meconium ileus.
» Positive family history is uncommon unless cystic fibrosis is present in a sibling.

Investigations

» Sweat test:
  > Quantitative analysis of sodium and chloride concentrations in sweat collected after stimulation by pilocarpine iontophoresis with chloride > 60 mmol/L.
  > Sweat conductivity tests are more readily available but not as reliable as sweat electrolyte testing. Positive range for conductivity is 90 mmol/L and above.
» DNA analysis. Negative mutation analysis does not exclude cystic fibrosis.
» Stool elastase will be low in cystic fibrosis patients with pancreatic insufficiency.

GENERAL AND SUPPORTIVE MEASURES

» Nutritional support.
» Physiotherapy and postural drainage.
» Psychosocial support.
» Genetic counselling.

MEDICINE TREATMENT

Medicinal treatment is specialised and individualised and should be under the supervision of a subspecialist.

- Pancreatic enzymes (lipase/amylase/protease), with meals according to clinical response.

REFERRAL

» All to a recognised cystic fibrosis centre and/or specialist health facility for confirmation of diagnosis and initiation of treatment.
» Management of exacerbations.

2.2.4 DIARRHOEA, ACUTE

A09.0

DESCRIPTION

Diarrhoea is a serious common childhood illness evidenced by the passing of frequent profuse loose watery stools. Vomiting may or may not be present.

Diarrhoeal disease is often caused by viral infection but may be due to bacterial infection, dietary or other causes.
Dehydration and metabolic disturbances are common if treatment is not instituted early and may result in severe disease, irreversible organ damage and death in children.

Malnutrition is a serious co-morbidity and/or result of diarrhoeal disease and must be managed correctly, employing ongoing feeding. Feeding, minerals, micronutrients and vitamins are continued except during ileus or shock. See section 2.4: Malnutrition.
In severe malnutrition or in the young infant (< 2 months of age) bacterial co-infection is common.

DIAGNOSTIC CRITERIA

Clinical

The assessment of shock and dehydration in children is not always simple. A good initial assessment and frequent reassessments (4 hourly if dehydration is present) are required. In the presence of shock, continuous reassessments with appropriate adjustment of care are vital in the care of these children.

Shock is shown by one or more of the following:
Compensated shock:
» delayed capillary refilling time (CRT) (> 3 seconds),
» rapid, weak pulse rate,
» cool peripheries.

Late (pre-terminal):
» decreased level of consciousness,
» decreased blood pressure,
» decreased pulse volume.

Dehydration **is treated <u>after</u> shock is dealt with:**

Severe dehydration	Some dehydration
Sunken eyes. Very slow skin pinch (≥ 2 seconds). Drinking poorly.	Sunken eyes. Slow skin pinch (< 2 seconds). Drinks eagerly. Irritable/restless.

Other indicators of dehydration may be sought but do not add substantially to assessment, e.g. depressed fontanelle, absent tears, decreased passage of urine.

Also assess for signs of metabolic, nutritional and other co-morbidities:
» severe malnutrition,
» decreased level of consciousness,
» abnormal tone or floppiness,
» abdominal distension,
» decreased bowel sounds,
» increased respiratory rate and chest indrawing,
» persistent or bile stained vomiting,
» urine for leucocytes or nitrites.

Investigations
» After resuscitation, in children with severe dehydration, shock or other signs of metabolic, nutritional or other co-morbidities:
  > sodium, potassium, urea, creatinine, blood acid-base assessment.

» Stool culture if suspected dysentery, typhoid, cholera.
» Urine test strip on fresh/clean urine specimen for leucocytes, nitrites and blood.
» Ascertain HIV status with consent in every child.

GENERAL AND SUPPORTIVE MEASURES

» Adequate initial assessment and frequent reassessment, including weight, is vital.
» Reassess the patient continuously while shock persists.
» If dehydration is present, reassess the patient 4 hourly and immediately correct shock or deterioration.
» Monitor and maintain:
  > hydration and circulation,
  > blood pressure,
  > acid-base status.
  > normal blood glucose,
  > blood electrolytes,
» Monitor urine output, should be at least 1 mL/kg/hour. This may be difficult in small children with diarrhoea, especially in female infants.
» Monitor body mass regularly. Weigh daily, or 6 hourly if unsure of hydration status and child is very ill or small. This can be used to indicate response of hydration.
» Continue oral feeds during period of diarrhoea:
  > if the child is breastfed, continue breastfeeds and encourage the child to feed longer at each feed;
  > if the child is exclusively breastfed, give oral rehydration solution (ORS) in addition to each feed;
  > if the child is not exclusively breastfed, give ORS and other appropriate feeds, e.g. breast milk substitutes or food based fluids;
  > if the child is severely dehydrated or shocked, withhold feeding until stable, usually a few hours only.

MEDICINE TREATMENT

There is no place for antidiarrhoeal medications, i.e. kaolin and pectin, atropine and diphenoxylate, loperamide, or antiemetics in the routine management of acute diarrhoea.

OUTLINE OF PRACTICAL FLUID THERAPY OF DEHYDRATING WATERY DIARRHOEA

With severe malnutrition, the assessment of dehydration is more difficult. Avoid intravenous infusions, if possible.
Treatment of dehydration requires more care/more frequent assessments.

1. First treat shock, if present (if no shock, proceed to section 2 below).

If an IV infusion cannot be set up within 5 minutes, use an intra-osseous infusion. See section 1.1.10: Intra-osseous infusion in emergencies. During treatment of shock and administer oxygen.

- Sodium chloride 0.9%, IV, 10 mL/kg given as a bolus over 20 minutes.
  - After each bolus, reassess for persistence of shock, or evidence of circulatory overload.
  - Repeat the fluid bolus up to 6 times if shock still persists, provided that evidence of circulatory overload is not present.
  - If after the forth bolus, i.e. total of 40 mL/kg has been given and the response is inadequate, a fifth bolus can be started. Move the patient to ICU for CVP monitoring and inotropic support.

Treatment of shock in severe malnutrition

Shock treatment should be more cautious in patients with severe malnutrition due to poor cardiac reserve and high prevalence of gram-negative septicaemia.

- Sodium chloride 0.9%, IV, 10 mL/kg administered over 20 minutes.
  - Up to 4 boluses may be given.
  - Deterioration may be due to fluid overload and shock may be due to septicaemia, not always hypovolaemia.
  - After 4 boluses (40 mL/kg) further treatment should be in a high care unit.
  - Reassess frequently during treatment of shock. Patient's response should guide further fluid therapy.

If pulse and respiratory rate increases, increasing liver span and gallop rhythm are found, suspect fluid overload/cardiac dysfunction and manage appropriately. See section 1.1.8: Shock.

When shock has been treated, proceed to the management of dehydration.

2. Severe dehydration or some dehydration.

2a. If the child has not failed oral rehydration and was not in shock:

- Oral rehydration solution (ORS), oral, 80 mL/kg over 4 hours using frequent small sips (i.e. 5 mL/kg every 15 minutes for 4 hours).
  - Give more if the child wants more.
  - Show the caregiver how to give ORS with a cup and spoon.
  - If child vomits, wait 10 minutes and then continue more slowly.

Nasogastric tube (NGT) rehydration 20 mL/kg/hour over 4 hours can be used as an alternative.

PLUS

» Encourage caregiver to continue feeding the child, especially breastfeeding.
» Oral feeds should be given at normal volumes and times if:
  > the level of consciousness is normal,
  > the child is not in severe distress,
  > not shocked and,
  > has no surgical abdomen.
» Review after 4 hours:
  > general condition,
  > capillary filling time,
  > level of consciousness,
  > skin turgor,
  > sunken eyes.
  > respiratory rate,
  > abdomen (liver span),
  > if passing urine,
  > number/quality of stools,

See *Figure 1: Summary flow chart for correction of dehydration in diarrhoeal disease.*

» Assess response 4 hourly.

2b. If the above treatment (oral/NGT treatment) fails, and patient was in shock or has already failed at primary health care level, then:

Oral rehydration solution

- Oral rehydration solution (ORS), oral, 80 mL/kg over 4 hours using frequent small sips (i.e. 5 mL/kg every 15 minutes for 4 hours) or NGT rehydration 20 mL/kg/hour over 4 hours.

PLUS

Oral feeds at normal feed volumes and times if:
» the level of consciousness is normal,
» the child is not in severe distress,
» is not shocked and,
» has no surgical abdomen.

PLUS

IV fluid*

- Sodium chloride 0.9%/dextrose 5%, IV, 10 mL/kg/hour administered for 4 hours, then reassess.
  - Alternative isotonic fluids can be used, e.g. sodium chloride 0.9% or ringers lactate.

**(This rate is in line with current safety evidence but the need for regular reassessment 4 hourly remains.)*

» Review after 4 hours:
  > general condition,
  > capillary refilling time,
  > respiratory rate,
  > abdomen (liver span),

- level of consciousness,
- skin turgor,
- sunken eyes.
- urine output,
- number/quality of stools,

See Figure 1: Summary flow chart for correction of dehydration in diarrhoeal disease.

3. No visible signs of dehydration on presentation or a child stable with no dehydration after treatment of dehydration.

Show the caregiver how to give ORS with a cup and spoon using frequent small sips.

Encourage caregiver to give 10 mL/kg after each diarrhoeal stool until diarrhoea stops.

Instruct the caregiver on how to make and use ORS/sugar salt solution (SSS) at home.

Homemade sugar and salt solution may be used if oral rehydration formula is not available.

HOMEMADE SUGAR AND SALT SOLUTION (SSS)

½ level medicine measure of table salt
PLUS
8 level medicine measures of sugar
dissolved in 1 litre of boiled (if possible) then cooled water
(1 level medicine measure = approximately 1 level 5 mL teaspoon).

Encourage the caregiver to continue feeding the child, especially breastfeeding.

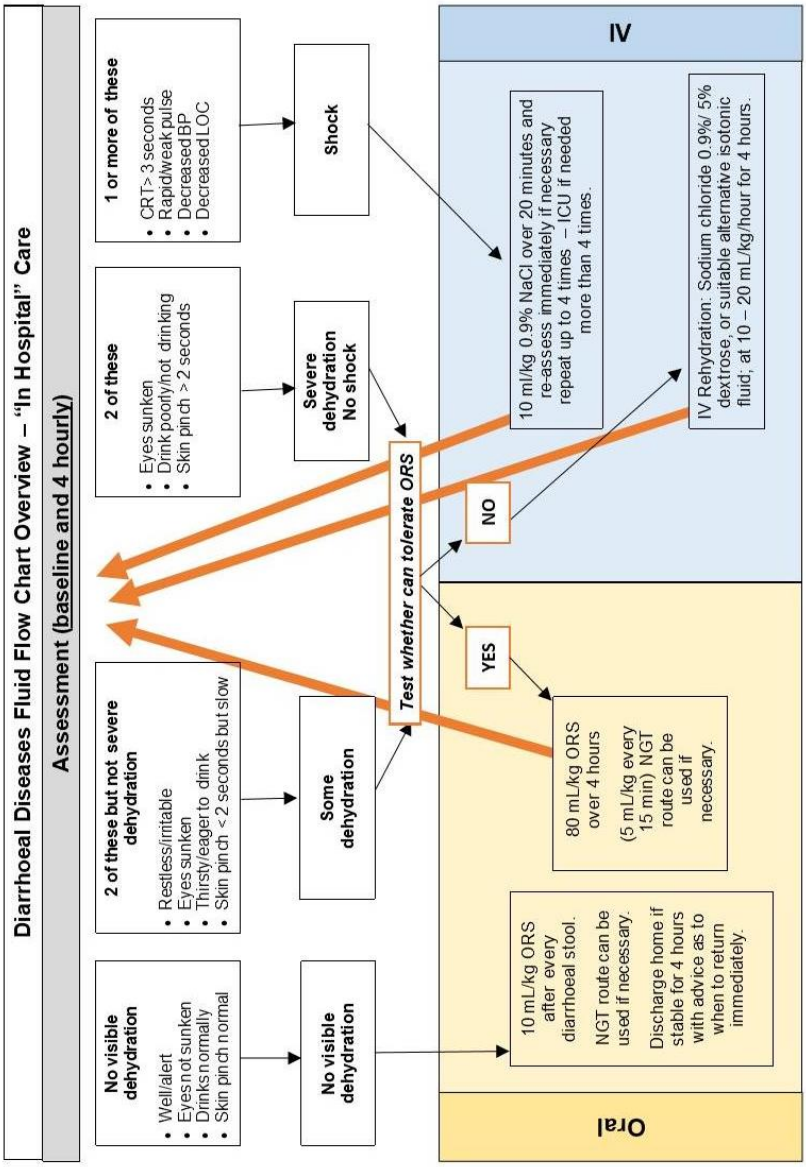
Instruct the caregiver to give the child extra feeds after the diarrhoea has stopped to make up for the period of inadequate intake.

Child should return to hospital immediately if:

- no improvement,
- condition deteriorates,
- poor drinking or feeding,
- slow skin pinch.
- blood in stool,
- fever develops,
- sunken eyes,

Educate caregivers about hygiene, oral rehydration solution and danger signs of diarrhoea.

Figure 1: Summary flow chart for correction of dehydration in diarrhoeal disease.



CRT: Capillary Refilling Time

Metabolic disturbances

Acidosis

Metabolic acidosis will correct with appropriate fluid therapy and does not require additional treatment unless severe, i.e. pH < 7.1, or if the body is unable to correct the deficit, e.g. salicylate poisoning or renal failure.
Additional treatment should only be considered with expert supervision.
Correcting the renal circulation and shock will lead to self-correction in almost all cases.
If correction is necessary: volume of sodium bicarbonate 4.2% required is:

- Sodium bicarbonate 4.2% as a bolus.
    - Dose in mL to be given = 0.3 x base deficit x weight in kg.
    - Review response to assess the need for further correction.

Hypokalaemia

Note: Potassium levels are affected by the degree of acidosis.

If potassium is 2.5 mmol/L to 3.5 mmol/L:

- Potassium chloride, oral, 25–50 mg/kg/dose 8 hourly.

If potassium is < 2.5 mmol/L:

- Potassium IV replacement:

IV potassium only to be used where appropriate monitoring is available which must include continuous ECG and bedside serum potassium/blood gas analysis.
Ensure slow administration, over 4 hours.

    - The maximum concentration of potassium in a litre of fluid is 40 mmol and should not exceed 0.5–1 mmol/kg/hour. For sodium chloride 0.9%/dextrose 5%, the maximum volume of 15% potassium chloride in 1 L is 20 mL. (1 mL 15% potassium chloride has 2 mmol potassium.)
    - Mix well before administration.
    - Run at normal rehydration rate (as above).

Note: In stable patients with severe hypokalaemia, correction with oral potassium supplementation can be considered.

Oral potassium may also be given during this period:

- Potassium chloride, oral, 25–50 mg/kg/dose 8 hourly.

Monitor serum potassium 8–12 hourly. Once above 3.0 mmol/L, stop IV potassium and continue with oral.

Hypernatraemia (> 150 mmol/L)

Severe symptoms usually only develop when the serum sodium is > 160 mmol/L. Symptoms tend to be more severe with acute hypernatraemia (i.e. over a period of hours) while chronic hypernatraemia is often better tolerated because of cerebral compensation.

The true degree of dehydration is often underestimated because the intravascular volume is preserved; signs of intracellular dehydration include lethargy, irritability, 'doughy skin', high-pitched cry, hyperreflexia and seizures.

Too rapid reduction of the serum sodium in hypernatraemia can cause cerebral oedema, convulsions and permanent brain injury. More frequent serum sodium monitoring is needed where hypotonic solutions are used.

Moderate hypernatraemic dehydration (Na 150–169 mmol/L):

» If shock is present resuscitate with boluses of 20 mL/kg of 0.9% sodium chloride (see above: step 1 – treat shock).
» Aim to lower the serum sodium slowly with no more than 0.5 mmol/L/hour (10–12 mmol/L) over 24 hours.
» Fall of sodium levels more than 1 mmol/L/hour on average means the rehydration rate should be reduced.
» Oral rehydration (10 mL/kg/hour) is preferable to IV rehydration.
» If oral rehydration is tolerated, feeding should be continued.
» Because of longer duration of dehydration, continuous nasogastric tube administration is preferable.
» Fluid is calculated as replacement of deficit (50–70 mL/kg) plus maintenance (over 2 days) over 48 hours.

Calculation of maintenance fluid (mL):

≤ 1 year:	120 mL/kg/24 hours
> 1 year = sum of the following: » First 10 kg body weight » Second 10 kg body weight » Additional weight > 20 kg body weight	 100 mL/kg/24 hours 50 mL/kg/24 hours 20 mL/kg/24 hours

If oral/NGT rehydration fails, rehydrate using IV with sodium chloride 0.9%/dextrose 5% over 48 hours.

IV fluid rate

Rate:

- If 2–10 kg: 6 mL/kg/hour
- If > 10–20 kg: 5 mL/kg/hour
- If > 20–40 kg: 4 mL/kg/hour

» Oral rehydration can be continued for ongoing losses (such as profuse diarrhoea).
» Fluid status, ongoing losses and neurological status should be monitored 2 hourly.

Severe hypernatraemic dehydration (sodium > 170 mmol/L (discuss with specialist paediatrician):

This is a medical emergency and referral to an intensive or high care unit should be considered.

» Sodium chloride 0.9%/dextrose 5% plus potassium chloride (see below) is used to correct clinical dehydration for the first 48 hours. Sodium chloride 0.9%/dextrose 5% plus potassium chloride (to 20 mmol/L), IV.
» To every litre 0.9% sodium chloride add 100 mL 50% dextrose and 10 mL 15% KCl [20 mmol potassium]). Infusion rate as above.
» Repeat serum sodium every 8–12 hours to monitor progress.
» Failure to decrease sodium levels usually means the rehydration rate is too slow.
» Frequent clinical reassessment is the key to the safe management of this situation. Serum sodium levels may be done more frequently where this is possible. Adjust the drip rate according to response.
» If convulsions are considered likely, (decreased level of consciousness, hyper-irritable child), in the setting of high serum sodium, consider the use of prophylactic anticonvulsants:
  - Phenobarbitone, IV, 20 mg/kg as a single dose.

  OR

  If IV phenobarbitone not available:
  - Phenobarbitone, oral, 20–30 mg/kg as a single dose.

Hyponatraemia

The correction of hyponatraemia is usually only necessary where the serum sodium is significantly decreased (i.e. < 120 mmol/L), or if the patient is symptomatic.

Use sodium chloride 0.9% and add potassium chloride and dextrose as indicated below.

Give at the rate indicated for dehydration and expect correction to have occurred after the following estimated volume:

Volume of sodium chloride 0.9% (mL) = (130 - Na) x body weight in kg x 4.

- Administer sodium chloride 0.9%, 200 mL plus potassium chloride 15%, 2 mL plus dextrose 50%, 20 mL into the fluid bag.
  - Mix well before administration.
- Oral rehydration solution (ORS), oral, at the required rate.

Antibiotic therapy

Note:

» Antibiotics are not routinely used for diarrhoeal disease.
» During diarrhoea, absorption of antibiotics may be impaired due to intestinal hurry. Give antibiotics orally if administered for intra-luminal effect.
» Other antibiotics for systemic action are best administered parenterally.
» Consider a urinary tract infection, or septicaemia in children with severe malnutrition, the immunocompromised and infants < 2 months old.

Dysentery

Treat initially as Shigella dysentery:

- Ceftriaxone, IV, 100 mg/kg as a single daily dose for 5 days.

OR

- Ciprofloxacin, oral, 15 mg/kg/dose 12 hourly for 3 days.

For *Entamoeba histolytica* (if demonstrated on stool microscopy, or strongly suspected – this is now a relatively uncommon condition in children in South Africa).

- Metronidazole, oral, 15 mg/kg/dose 8 hourly for 7 days.
  - Severe disease: treat for 10 days.

Cholera

Treat according to susceptibilities of organisms in current epidemics.
See section 2.2.1: Cholera.

Typhoid

- Ceftriaxone, IV, 100 mg/kg once daily for 10–14 days.

Severe malnutrition

See section 2.4.1: Malnutrition, severe acute.

- Ampicillin, IV, 50 mg/kg/dose 6 hourly for 5 days.

PLUS

- Gentamicin, IV, 6 mg/kg as a single daily dose for 5 days.
  - Confirm normal renal function before second dose.

Very young infants < 2 months

- Ampicillin, IV, 25–50 mg/kg/dose 6 hourly for 5 days.

PLUS

- Gentamicin, IV, 6 mg/kg as a single daily dose for 5 days.
  - Confirm normal renal function before second dose.

Mineral and micronutrient supplementation

All children with diarrhoea.

- Zinc (elemental), oral, 10 mg/day for 14 days.

- Potassium chloride, oral, 8 hourly.
  - If < 6 months: 125 mg.
  - If > 6 months: 250 mg.
  - Do not give if patient is hyperkalaemic or anuric.

REFERRAL

» Inability to correct/treat shock/dehydration.
» Metabolic complications: non-responsive acidosis, severe hypernatraemia (> 170 mmol/L) and symptomatic hypokalaemia.

2.2.5 PERSISTENT DIARRHOEA

DESCRIPTION

Persistent diarrhoea is a diarrhoeal episode of presumed infectious aetiology that begins acutely but has a prolonged duration lasting more than 14 days.

GENERAL AND SUPPORTIVE MEASURES

Treatment strategy includes a stepwise approach with modification of the diet, which are not mutually exclusive and are applied according to local resources.

» Monitor hydration, stools, nutritional status, weight gain, growth and other nutritional parameters such as serum proteins.
» Nutritional support:
  > Aim to provide at least 460 kJ/kg/day orally within 3 days to protect the nutritional state.

STEP-WISE EMPIRIC PROTOCOL FOR MANAGEMENT OF DIARRHOEA

Commence management at the most appropriate step according to previous management – many infants with persistent diarrhoea will already have failed the 'day 1–2' stage and will commence management on 'day 3–7'.

Day 0 (presentation at Health Care Facility with acute diarrhoea):

» Rehydration according to figure above. Recommence breast or formula feeds within 4–6 hours, and additional oral rehydration solution (ORS) to maintain hydration.

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.
» If diarrhoea resolves, discharge if possible on semi-elemental feeds for at least 2 weeks. If this is not possible, a trial of lactose-free feeds before discharge should be given and if successful, the child should be discharged on this feed.

If Giardia is not excluded:

- Metronidazole, oral, 7.5 mg/kg/dose 8 hourly for 5 days.

In HIV-infected children: *Cystoisospora belli* and *Cyclospora cayetanensis*:

- Co-trimoxazole, oral, 5 mg/kg/dose of trimethoprim 12 hourly for 10 days.

If diarrhoea persists, the child should be referred for further investigations and/or intravenous alimentation.

> Where the stepwise approach is not possible:
Under 4 months:
Encourage exclusive breastfeeding if lactose intolerance is not severe.
If not exclusive breastfeeding, use breast milk substitutes that are low in lactose, e.g. yoghurt or amasi or specialised formulae or lactose-free milk formula.

Children aged 4 months and older:
Feeding should be restarted as soon as the child can eat, with small meals 6 times a day.

> Nasogastric feeding may be required in children who eat poorly.
> If the response is good, give additional fruit and well-cooked vegetables to children who are responding well.
> After 7 days of treatment with an effective diet, resume an appropriate diet for age, including milk, which provides at least 460 kJ/kg/day.
> Follow up regularly to ensure recovery from diarrhoea, continued weight gain and adherence to feeding advice.

MEDICINE TREATMENT

CAUTION
Antidiarrhoeal and anti-emetic agents are NOT recommended.

Antibiotic therapy
Antibiotics are only indicated when specific infections are suspected or where they are used in the Step-Wise Based Empiric Protocol for Management of Diarrhoea.

All persistent diarrhoea with blood in stool should be treated as dysentery. See section 2.2.7: Dysentery.

For *Campylobacter*:
- Azithromycin, oral, 10 mg/kg/day for 3 days.

LoE III[5]

For *G. lamblia*:
- Metronidazole, oral, 7.5 mg/kg/dose 8 hourly for 5–7 days.

For *Y. enterocolitica*:
- Ceftriaxone, IV, 100 mg/kg/dose once daily.

OR
- Cefotaxime, IV, 50 mg/kg/dose 6 hourly.

For *Cryptosporidium*:
- No effective treatment available in the presence of HIV-related immunosuppression.

For *Cystoisospora belli*:
- Co-trimoxazole, oral, 5 mg/kg/dose of trimethoprim component 12 hourly for 10 days.

For *Cyclospora cayetanensis*:
- Co-trimoxazole, oral, 5 mg/kg/dose of the trimethoprim component 6 hourly for 5 days.

For *Microsporidia*:
- Albendazole, oral, 7.5 mg/kg/dose 12 hourly. (Specialist supervision.)

LoE III[6]

After success as indicated by weight gain, return of appetite and decrease of diarrhoea, less elemental diets can be judiciously and slowly re-introduced.

Mineral and micronutrient deficiencies
- Zinc (elemental), oral, 10 mg/day.

Provide nutritional support.

2.2.6 DIARRHOEA, CHRONIC OTHER THAN POST INFECTIOUS

K52.9

DESCRIPTION

Chronic diarrhoea: diarrhoea for longer than two weeks.

Chronic diarrhoea results in significant morbidity and mortality associated with poor nutrition.

Chronic diarrhoea is most frequently due to:

» Temporary loss of disaccharidase activity in the intestinal microvillous brush border, e.g. lactase loss; or luminal infection/infestation, which may be non-specific bacterial overgrowth.
» Rare causes include food allergies, cystic fibrosis and coeliac disease.

DIAGNOSTIC CRITERIA

Clinical

» Chronic diarrhoea without weight loss or dehydration – consider toddler's diarrhoea.
» Chronic diarrhoea with weight loss and dehydration – consider small bowel mucosal injury with multiple pathophysiological mechanisms, e.g. lactose intolerance, small bowel bacterial overgrowth and immunosuppression.
» Chronic diarrhoea with weight loss but no dehydration – consider a malabsorption syndrome, e.g. coeliac disease, allergic enteropathy, cystic fibrosis, etc.
» Consider the possibility of HIV infection.
» In the presence of abdominal pain, bloody stools, weight loss, perianal disease or extraintestinal features such as arthritis or uveitis, consider inflammatory bowel disease and refer to an appropriate specialist.

Investigations

Where weight gain falters, dehydration recurs, the child is ill or the diarrhoea continues:

» Full blood count.
» Serum proteins.
» Urine and stool microscopy, culture and sensitivity tests (MCS).
» Positive stool-reducing substances if on a lactose-containing diet. Stool pH < 5.5 also suggests carbohydrate malabsorption.
» Faecal elastase.

REFERRAL

» Inability to maintain hydration (persisting watery diarrhoea even when fasting).
» Lack of local resources to support the stepwise protocol at any step.

» All cases not responding by day 12–13 of the stepwise protocol.
» If cystic fibrosis, allergic enteropathy or coeliac disease is suspected, but difficult to diagnose due to lack of local resources.

2.2.7 DYSENTERY

A03.9

DESCRIPTION

Passage of blood and mucus in the stools.
Shigella infection is the most common serious cause in children in South Africa.
Complications include:

» dehydration,
» shock,
» acidosis,
» renal failure, and
» convulsions,
» toxic megacolon,
» rectal prolapse,
» haemolytic uraemic syndrome.

DIAGNOSTIC CRITERIA

Clinical

» Sudden onset.
» Abdominal cramps, peritonism, urgency, fever and diarrhoea with blood and mucus in the stools.
» Meningismus and convulsions may occur.
» Exclude intussusception. Evidence of intussusception includes:
  > pain or abdominal tenderness,
  > bile-stained vomitus,
  > red currant jelly-like mucus in stool,
  > appearance of the intussusceptum through the anus.

Investigations

» Stool culture to confirm diagnosis of Shigellosis.
» Polymorphs and blood on stool microscopy.
» Immediate microscopy of warm stool to diagnose amoebic dysentery.

GENERAL AND SUPPORTIVE MEASURES

» Monitor fluid and electrolyte balance.
» Ensure adequate nutrition and hydration.

MEDICINE TREATMENT

Fluid and electrolyte replacement

See section 2.2.4: Diarrhoea, acute.

Antibiotic therapy

Treat as Shigella during an epidemic of Shigellosis, or if the child is febrile, 'toxic'-looking, has seizures or if Shigella is cultured from the stool and the child is still ill.

- Ciprofloxacin, oral, 15 mg/kg/dose 12 hourly for 3 days.

Where oral medication cannot be used:

- Ceftriaxone, IV, 100 mg/kg as a single daily dose for 5 days.

For *Entamoeba histolytica* (only if demonstrated on stool microscopy, or strongly suspected):

- Metronidazole, oral, 15 mg/kg/dose 8 hourly for 7 days.

REFERRAL

» Dysentery with complications, e.g. persistent shock, haemolytic uraemic syndrome and toxic megacolon.

2.2.8 GASTRO-OESOPHAGEAL REFLUX DISEASE (GORD)

K21

DESCRIPTION

Gastro-oesophageal reflux is repetitive regurgitation/reflux of gastric contents into the oesophagus.

It is termed 'Complicated GOR' or 'GORD' if associated with the diagnostic criteria below.

It should be differentiated from 'Uncomplicated GOR' if the only symptom is frequent small vomits, in which case no further investigation or treatment is needed. Parents should be reassured that regurgitation improves spontaneously during the first year of life.

DIAGNOSTIC CRITERIA

» GORD should be suspected if there is recurrent vomiting or regurgitation and any of the following:
  - respiratory symptoms, i.e. recurrent wheeze or cough, chronic obstructive airway disease, recurrent aspiration/pneumonia, stridor, apnoea and an apparent life-threatening event;
  - faltering of growth; and
  - abnormal posturing or opisthotonus (Sandifer syndrome).

Consider other causes of vomiting and faltering of growth, such as pyloric stenosis or cow's milk allergy.

Investigations

Note: Routine investigations are seldom indicated. Discuss with a specialist prior to performing investigations.

GENERAL AND SUPPORTIVE MEASURES

» Postural treatment: lying on the left side is currently recommended.
» Dietary measures such as feed thickeners. If not breastfeeding, frequent small volume feeds or specialised anti-reflux infant formula.

MEDICINE TREATMENT

Note: Evidence in support of the following recommendations is weak.

Specialist initiated:

- Omeprazole, oral, 0.7–1.4 mg/kg/day once daily, on an empty stomach for 4 weeks, then stop therapy. If symptoms re-occur and persist for 3–4 days after stopping, consider reinitiating.
  - Maximum dose: 20–40 mg/dose.
    If 1 month–2 years: 5 mg once daily.
    If > 2–6 years: 10 mg once daily.
    If > 7–12 years: 20 mg once daily.

REFERRAL

» For diagnostic investigations, if not available locally.
» GORD not responding to treatment.

2.2.9 PEPTIC ULCER DISEASE

K27

DESCRIPTION

Varying degrees of gastritis or frank ulceration of the stomach or duodenum due to acid and pepsin-laden stomach contents on the gastric and duodenal mucosa in the face of inability of mucosal defence mechanisms to prevent these effects.
Peptic ulcers may be primary (e.g. *Helicobacter pylori* related) or secondary, (e.g. stress related or associated with NSAID use).

DIAGNOSTIC CRITERIA

Clinical

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

Investigations

» Endoscopy to confirm diagnosis.

GENERAL AND SUPPORTIVE MEASURES

» Manage circulation and anaemia, as required.
» Stop all non-steroidal anti-inflammatory agents.
» Remove all stressors identified.

MEDICINE TREATMENT

- Proton pump inhibitor, e.g.:
  - Omeprazole, oral, 0.7–1.4 mg/kg/day once daily. Specialist initiated.
    - Maximum dose: 20–40 mg/dose.
      If 1 month–2 years: 5 mg once daily.
      If > 2–6 years: 10 mg once daily.
      If > 7–12 years: 20 mg once daily.

LoE III [7]

PLUS

If *Helicobacter pylori* positive: (Not routinely.)

- Metronidazole, oral, 7.5 mg/kg/dose 12 hourly for 14 days.

PLUS

- Amoxicillin, oral, 25–30 mg/kg/dose 12 hourly for 14 days.

LoE III [7]

Penicillin allergy

In case of severe penicillin allergy, replace amoxicillin with:

- Azithromycin, oral, 10 mg/kg daily for 5 days.

REFERRAL

» Poor response to treatment.
» Suspicion of underlying cause.

2.3 HEPATIC DISORDERS

2.3.1 CIRRHOSIS

K74.6

DESCRIPTION

The end result of irreversible damage to the liver tissue, causing a widespread, diffuse process of fibrosis with regenerating nodule formation. The fibrosis and abnormal portosystemic vascular connections that result cause ongoing damage. The progression rate is variable, but ultimately results in liver failure.

Causes are divided into biliary cirrhosis due to bile duct obstruction and post necrotic cirrhosis where the lesion is hepatocellular.

Complications include:
» fat malabsorption,
» liver failure,
» portal hypertension, and
» ascites secondary to portal hypertension.

DIAGNOSTIC CRITERIA

Clinical

» Clubbing may be present.
» Jaundice
» Hepatomegaly and/or splenomegaly and/or ascites.
» Signs and symptoms of complications.

Investigations

» Liver enzymes may be normal.
» FBC may show signs of hypersplenism with reduced circulating red cells, white cells and platelets.
» Prolonged prothrombin time/INR.
» Hypo-albuminaemia.
» Ultrasound of the liver and spleen may be abnormal.
» Liver biopsy confirms cirrhosis.

GENERAL AND SUPPORTIVE MEASURES

» Ensure adequate nutrition:
  > Consult dietician, if available.
» If not encephalopathic:
  > High protein diet, i.e. 3 g/kg/day and medium chain triglyceride supplementation (if cholestatic jaundice).
  > High carbohydrate diet, supplement with glucose polymers.
  > If high serum cholesterol or if xanthelasma: low cholesterol diet.

MEDICINE TREATMENT

- Multivitamin, oral, 5 mL as a single daily dose.

If INR is abnormal, consider a trial of vitamin K and if no response, stop.

- Vitamin K1 (phytomenadione), oral, 2–5 mg three times weekly.
  - Monitor INR and titrate dose accordingly.
  - In the presence of cholestatic jaundice vitamin K should be given parenterally.

REFERRAL

» All children with suspected cirrhosis should be referred to determine a possible cause.

2.3.2 CHRONIC CHOLESTASIS

DESCRIPTION

Impairment of bile formation and/or bile flow, which may present with pruritis and/or jaundice. It is classified as intrahepatic (e.g. chronic hepatitis, paucity of bile ducts) or extrahepatic (e.g. biliary atresia).

GENERAL AND SUPPORTIVE MEASURES

Diet supplemented with medium-chain triglycerides.

MEDICINE TREATMENT

For pruritus of cholestasis:

- Colestyramine, oral, 240 mg/kg/day in 3 divided doses with meals.
  - Mix with water or other fluids.
  - Other medications should be given 1 hour before or 4–6 hours after colestyramine use.

For sedation:

- Chlorphenamine, oral, 0.1 mg/kg/dose up to 6 hourly.

2.3.3 PORTAL HYPERTENSION

K76.6

DESCRIPTION

Increased portal venous pressure above vena cava pressure. Most commonly secondary to cirrhosis, but causes without cirrhosis may be divided into prehepatic portal vein obstruction, intra-hepatic (pre-or post-sinusoidal) and post-hepatic causes.

DIAGNOSTIC CRITERIA

Clinical

» Splenomegaly with ascites, variceal haemorrhage or hypersplenism.

Investigations

» FBC may show hypersplenism.
» Doppler assisted ultrasound and angiography.
» Investigations as listed under cirrhosis.

GENERAL AND SUPPORTIVE MEASURES

» Determine and manage underlying cause.

REFERRAL

» All children with portal hypertension should be referred.

2.3.3.1 BLEEDING OESOPHAGEAL VARICES

I85.0

DESCRIPTION

Presentation with haematemesis (fresh blood) or melaena in a patient who has a spontaneous bleed from varices at the oesophageal-gastric junction. The patient may or may not have been known to have chronic liver disease and portal hypertension. This bleeding may be hard to control and be life threatening.

GENERAL AND SUPPORTIVE MEASURES

» Resuscitation and blood transfusion as required.
» For local control of acute bleeds that are not controlled with medicine treatment: Sengstaken tube.
» For secondary prophylaxis after a bleed: refer for endoscopic injection sclerotherapy or variceal banding every 2 weeks until eradicated.
» If either or both treatments fail: surgical over-sewing.

MEDICINE TREATMENT

- Octreotide, IV, bolus, 1–2 mcg/kg immediately, then 1–5 mcg/kg/hour by infusion. Specialist initiated.

LoE III[8]

Post bleed prophylactic management

- Proton pump inhibitor, e.g.:
  - Omeprazole, oral, 0.7–1.4 mg/kg/day once daily. Specialist initiated.
    - Maximum dose: 20–40 mg/dose.
      If 1 month to < 2 years: 5 mg once daily.
      If 2 to < 7 years: 10 mg once daily.
      If 7 to12 years: 20 mg once daily.

LoE III [7]

AND

- Propranolol, oral, 2 mg/kg daily in 3 divided doses.
  - If needed, increase dose to 8 mg/kg/24 hours.
  - Aim to reduce the resting pulse rate by 25%.

REFERRAL

» All, to establish diagnosis and initiate treatment.
» Bleeding varices: only after commencement of resuscitation and octreotide, if available.

2.3.3.2 ASCITES, DUE TO PORTAL HYPERTENSION

R18

GENERAL AND SUPPORTIVE MEASURES

» Restrict sodium intake, 1–2 mmol/kg/24 hours.
» Restrict fluids if serum sodium < 130 mmol/L.

MEDICINE TREATMENT

- Spironolactone, oral, 1–3 mg/kg as a single daily dose. Can increase dosage slowly to 4–6 mg/kg/day.
  - Continue for as long as needed to control ascites.
  - Monitor serum potassium.

If insufficient response, add:

- Furosemide, oral, 1–3 mg/kg as a single daily dose.

Note: Spironolactone to furosemide ratio should be 2.5:1.

OR (do not give furosemide and hydrochlorothiazide together)

- Hydrochlorothiazide, oral, 1 mg/kg/dose 12–24 hourly.
  - Maximum dose: 25 mg daily.

Therapeutic paracentesis may be performed to relieve the cardiorespiratory and gastrointestinal manifestations of tense ascites. The upper abdomen, surgical scars, the bladder and collateral vessels should be avoided when inserting the paracentesis needle. 50 mL/kg ascites can be tapped over an hour with IV albumin 1 g/kg to prevent circulatory dysfunction.

LoE III[9]

REFERRAL

» **Urgent:** Refractory ascites interfering with respiration.
» For determination of the underlying cause of the cirrhosis, portal hypertension and initiation of treatment.
» Cirrhosis, portal hypertension and/or liver failure not responding to adequate therapy.
» Hepatic encephalopathy.

2.3.4 HEPATITIS, VIRAL, ACUTE

B17.9
*Notifiable condition

DESCRIPTION

Acute inflammation of the liver with varying degrees of hepatocellular necrosis caused by Hepatitis A, B and less commonly C, and E viruses.

DIAGNOSTIC CRITERIA

Clinical

» Prodromal phase:

- nausea,
- vomiting,
- fever, and
- malaise,
- anorexia,
- right upper quadrant abdominal pain.

» Jaundice, tender hepatomegaly and dark urine.

Investigations

» Raised transaminases and bilirubin.
» Serological evidence of hepatitis virus infection. See section 2.3.5: Hepatitis B, chronic, for Hepatitis B interpretation chart.

GENERAL AND SUPPORTIVE MEASURES

» Isolate patient if Hepatitis A for 7–10 days after the onset of jaundice.
» Inform patient of infectivity risk if Hepatitis B, or C.
» Bed rest does not alter the course of the disease.
» Hepatitis B is vaccine preventable, see Primary Health Care STGs and EML, Chapter 13: Immunisation.

MEDICINE TREATMENT

» If Hepatitis B treatment is being considered, discuss with a specialist.
» See section below for chronic Hepatitis B.

REFERRAL

» Acute hepatitis with bleeding tendency and altered level of consciousness – isolation recommended.
» Prolonged jaundice or raised transaminases.
» Chronic hepatitis with/without cirrhosis.

2.3.5 HEPATITIS B, CHRONIC

B18.1

DESCRIPTION

Persistently elevated transaminases after Hepatitis B infection.

DIAGNOSTIC CRITERIA

» Transaminases are double upper limit of normal.
» Liver biopsy is characteristic.
» Hepatitis B serology positive.

Interpretation of Hepatitis B Serological Test Results

- Susceptible:

HBsAg	negative
Anti-HBc	negative
anti-HBs	negative
IgM anti-HBc	negative

- Immune due to vaccination:

HBsAg	negative
Anti-HBc	negative

anti-HBs positive > 10 milli-units/mL

- Immune from natural infection:
  - HBsAg negative
  - Anti-HBc positive
  - anti-HBs positive
- Acute infection:
  - HBsAg positive
  - Anti-HBc positive
  - anti-HBs negative
  - IgM anti-HBc positive
- Chronic infection:
  - HBsAg positive
  - Anti-HBc positive
  - anti-HBs negative
  - IgM anti-HBc negative

Four possible interpretations:

1. Recovering from acute HBV infection.
2. Distantly immune anti-HBs level too low to detect.
3. Susceptible with false positive anti-HBc.
4. Chronic infection with HBsAg levels too low to detect.
   - HBsAg negative
   - Anti-HBc positive
   - anti-HBs negative

REFERRAL

» For confirmation of diagnosis and initiation of treatment.

2.3.6 HEPATITIS C, CHRONIC

B17.1

DESCRIPTION

A chronic inflammation of the liver caused by vertical (perinatal) transmission of Hepatitis C virus from an infected mother. The disease is mostly mild in childhood and in up to 25% the virus can be spontaneously cleared from age 2 up to 7 years.

DIAGNOSTIC CRITERIA

» Anti-HCV ELISA which detects IgG antibodies. Transplacental maternal IgG antibodies may persist up to age 18 months.
» HCV RNA (quantitative).
» HCV genotyping is only done if treatment is considered.

REFERRAL

All children with positive HCV RNA.

2.3.7 HEPATITIS, TOXIN INDUCED, ACUTE

K71.6

DESCRIPTION

Liver damage attributed to a toxin or medicine. The most common herbal toxin in South Africa is atractyloside (*Impila)*, which causes a Reye's-like syndrome, with liver failure. *Senecio* ingestion is also seen but this causes endothelial damage in hepatic veins, resulting in hepatic sinusoidal obstruction syndrome with secondary cirrhosis and portal hypertension.

There are many medicines that are hepatotoxic. The commonest are:

- » anticonvulsants,
- » cytotoxics,
- » analgesics,
- » antiretrovirals.
- » immunosuppressants,
- » anti-inflammatories,
- » antituberculous medication,

DIAGNOSTIC CRITERIA

- » Depends on the toxin, but the history is usually diagnostic.
- » *Impila* poisoning, given orally or rectally, may result in anicteric hepatic encephalopathy.
- » Presents with onset of severe vomiting, followed by anuria and then rapid depression of level of consciousness, progressing to seizures and/or coma within a day.

GENERAL AND SUPPORTIVE MEASURES

- » Stop all potentially hepatotoxic medication, including paracetamol.
- » Education regarding herbal toxins, if appropriate.

MEDICINE TREATMENT

For paracetamol poisoning:
See section 18.1.11: Paracetamol poisoning.

Acute liver failure/Hepatic encephalopathy:
See section 2.3.9: Liver failure, acute.

REFERRAL

- » All cases of hepatic encephalopathy due to toxin ingestion.
- » All cases in which re-challenge of medication is considered.

2.3.8 HEPATITIS, CHRONIC, AUTOIMMUNE

K75.4

DESCRIPTION

Autoimmune induced hepatitis.

DIAGNOSTIC CRITERIA

Clinical

» Jaundice.
» Hepatosplenomegaly.
» Cutaneous features of chronic liver disease.
» Extrahepatic manifestations of the autoimmune process.

Investigations

» Elevated bilirubin and transaminases.
» Hypoalbuminaemia and prolonged prothrombin time/INR.
» Auto-immune marker screen.
» Total serum globulin or gammaglobulin or IgG greater than 1.5 times upper normal limit.
» Diagnosis confirmed on liver biopsy.

MEDICINE TREATMENT

Induction therapy:

- Corticosteroids. Specialist initiated.

Maintenance therapy:

- Azathioprine. Specialist initiated.

REFERRAL

» All for confirmation of diagnosis and initiation of treatment.

2.3.9 LIVER FAILURE, ACUTE

K72.0

DESCRIPTION

Acute liver failure is a devastating clinical syndrome, which has a high mortality. It results from massive necrosis of liver cells leading to the development of hepatic encephalopathy. The clinical appearance can be deceptive and it is easy to underestimate how critically ill these patients are. Refer patients early to a secondary or tertiary hospital. Paediatric acute liver failure is said to be present once the INR is greater than 2 (not correctable with vitamin K), or greater than 1.5 in the presence of encephalopathy.

The following complications can occur:

» coagulopathy,
» cerebral oedema,
» encephalopathy,
» metabolic acidosis, and
» hypoglycaemia,
» renal failure,
» cardiorespiratory failure,
» sepsis.

DIAGNOSTIC CRITERIA

Clinical

Appears deceptively well in the early stages. Progressive features include:

- malaise,
- stupor,
- encephalopathy,
- bleeding tendency,
- jaundice.
- vomiting,
- anorexia,
- foetor hepaticus,
- ascites, and

The absence of jaundice suggests another process, such as Reye syndrome, which also leads to hepatic encephalopathy.

Investigations

- Raised or low liver enzymes, low serum albumin, raised bilirubin, raised blood ammonia, hypoglycaemia.
- Prolonged prothrombin time/INR.
- Low fibrinogen.

GENERAL AND SUPPORTIVE MEASURES

- Admit to a high care or intensive care unit.
- Monitor:
  - blood pressure,
  - heart rate,
  - respiration,
  - haematocrit,
  - acid-base status,
  - urine output,
  - neurological state,
  - gastro-intestinal bleeding,
  - blood glucose – 3 hourly if comatosed,
  - liver and renal functions,
  - coagulation competence (INR),
  - electrolytes: sodium, potassium, calcium and phosphate, magnesium.
- Maintain hydration.
- With encephalopathy, aim to reduce ammonia production by the gut and optimise renal excretion.
- Withdraw protein intake completely initially followed by restricted intake if level of consciousness improves, i.e. 0.5–1 g/kg/24 hours.
- Stop sedatives, diuretics and hepatotoxic medicines, if possible.

MEDICINE TREATMENT

To reduce intestinal protein absorption:

- Lactulose, oral, 1 g/kg/dose (1.5 mL/kg/dose) 4–8 hourly via nasogastric tube, then adjust dose to produce 2–3 soft stools daily.

OR

- Polyethylene glycol 59 g/L solution with sodium sulphate and electrolytes, oral/ nasogastric tube, 10–25 mL/kg/hour until clear fluid is passed rectally (about 4–6 hours).
  - No additional ingredient should be added to the solution, e.g. flavourings or sugar containing cold drinks.
  - Follow with regular lactulose to keep stool loose.

- Gentamicin, oral, 12.5 mg/kg/dose 6 hourly for 5 days.
  - The intravenous formulation can be given orally.

Cerebral oedema:
For management of cerebral oedema, see section 13.3: Status epilepticus (convulsive).
For pre-operative use or with active bleeding:

- Fresh frozen plasma, IV, 20 mL/kg administered over 2 hours.

OR

- Lyophilised plasma (fresh dried plasma), IV, 20 mL/kg administered over 2 hours.

- Vitamin K_1 (phytomenodione), IV, 2.5–10 mg daily.
  - Monitor response to vitamin K_1 with INR and PTT.

If platelet count < 10 x 10^9/L or if < 50 x 10^9/L and with active bleeding:

- Platelet transfusion.

For gastrointestinal bleeding:

- Omeprazole, oral, 0.7–1.4 mg/kg/day once daily. Specialist initiated.
  - Maximum dose: 20–40 mg/dose.

    If 1 month to < 2 years: 5 mg once daily.
    If 2 to < 7 years: 10 mg once daily.
    If 7 to12 years: 20 mg once daily.

LoE III [7]

For hypoglycaemia:

- Dextrose 10%, IV bolus, 5 mL/kg.
  - Administer maintenance as below.

Maintenance of fluids until enteral feeding resumed:

- Sodium chloride 0.9%/dextrose 5%, IV, 60–80 mL/kg/day.
  - Ensure a minimum of 3–6 mmol/kg/day of potassium.
  - Avoid diuretics.

For anaemia:

- Packed red cells, 10 mL/kg over 3 hours if haemoglobin < 7 g/dL.

For shock:
See section 1.1.8: Shock.

For sedation, if essential:

- Midazolam, IV, 0.1 mg/kg.
  - Benzodiazepines are poorly metabolised in liver failure and may result in prolonged sedation.
  - Do not repeat without clinical indication.

Seizures are often subclinical or subtle. For seizures:

- Diazepam, IV, 0.2 mg/kg.
  - Repeat dose if not controlled in 5 minutes.
  - Benzodiazepines are poorly metabolised in liver failure and may result in prolonged sedation.
  - Do not repeat without clinical indication.

Antibiotic therapy

Where sepsis is suspected, prevent and treat aggressively with intravenous broad spectrum antibiotics. Empiric antibiotic therapy until culture results known.

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

PLUS

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

REFERRAL

» All for determination of the underlying cause after initiation of treatment.
» Combined hepato-renal failure.
» Failure to contain bleeding.

2.4 MALNUTRITION

E40–E46

2.4.1 MALNUTRITION, SEVERE ACUTE

E40–E43

Z-scores

» For practical purposes a 'z-score' is the number of standard deviations (SD) below or above the mean.
» 2 SD or 2 z-scores above the mean (+2) equates fairly closely to the 97th percentile and 2 SD or 2 z-scores below the mean (-2) equates fairly closely to the 3rd percentile.
» 3 SD or 3 z-scores above or below the mean would be regarded as severe deviation from normal.
» In deviation below normal, consider if a reasonable explanation exists, e.g. severe low birth weight with adequate growth profile subsequently.

Admit all cases with complicated severe acute malnutrition.

Uncomplicated cases may be managed with 'ready to use therapeutic food' (RUTF) in ambulatory settings where this service is established.

DESCRIPTION

Severe Acute Malnutrition (SAM)

A multi-deficiency state of severe undernutrition of essential nutrients exacerbated by acute/chronic infection and metabolic disturbances. Severe Acute Malnutrition (SAM) includes but is not restricted to the clinical entities of bilateral pitting oedema or severe wasting. It is associated with a high but significantly modifiable mortality.

Criteria for ambulatory treatment of severe acute malnutrition

All of the following must apply:

» Children over the age of 6 months with no pitting oedema.

PLUS

» Alert and feeding well.

PLUS

» None of the IMCI danger signs/nor those listed below.

PLUS

» Exclusion of other morbidity, TB and HIV infection.

DIAGNOSTIC CRITERIA

SAM in children aged 6–60 months:

Indicator	Measure	Cut-off
Severe wasting	Weight-for-height	z–score less than -3
	Mid upper arm circumference (MUAC)	Less than 11.5 cm
Bilateral pedal oedema	Clinical sign	

Where a suitable measuring device is not available, the following less sensitive findings would also indicate the need to manage as severe acute malnutrition:

» **Severe underweight:**
  > weight for age z-score less than -3 (usually clinically reflective of marasmus) where no other reasonable explanation is present, and/or
  > clinically visible severe wasting (usually clinically reflective of marasmus – thin arms, thin legs, 'old man' appearance, baggy pants folds around buttocks, wasted buttocks).

» **Nutritional oedema** (usually clinically reflective of kwashiorkor – bilateral pedal oedema usually supported by findings of skin changes, fine pale sparse hair, enlarged smooth soft liver, moon face).

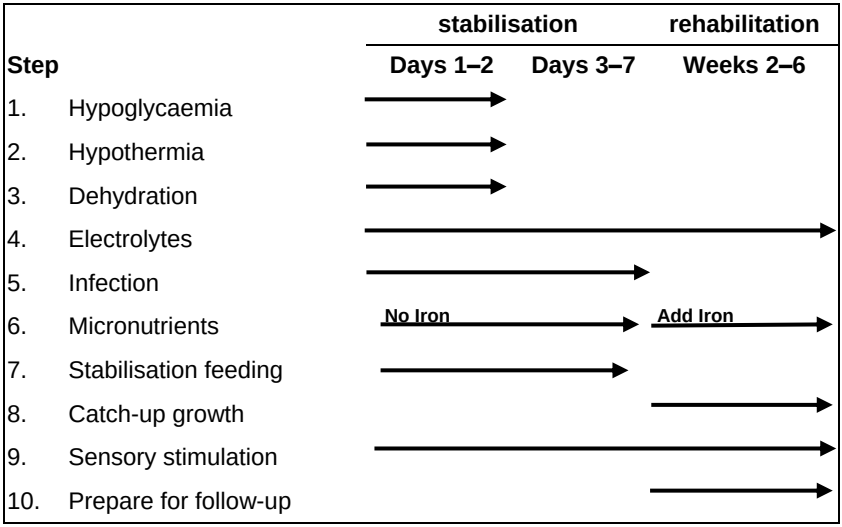
Danger signs:

» Lethargy
» Shock
» Refusing feeds.
» Hypoglycaemia
» Jaundice
» Dehydration

- » Weeping skin lesions.
- » Hypothermia
- » Convulsions
- » Respiratory distress.
- » Bleeding
- » Vomiting everything.

Note: Any of these danger signs indicate the need for more intensive inpatient management.

Time-frame for inpatient management of severe acute malnutrition



The general approach to the inpatient management of severe acute malnutrition is encapsulated in the 10-step approach illustrated above.
Within this approach, the first days are involved in achieving metabolic and physical stability and this phase usually moves to the rehabilitation phase somewhere between the 3rd and 7th day of admission.

Stabilisation phase:

- » feeding,
- » preventing/treating hypoglycaemia,
- » preventing/treating hypothermia,
- » treating infections,
- » giving minerals, vitamins and trace elements, and
- » preventing/treating dehydration.
- » Dietician referral.

Rehabilitation phase:

- » continued feeding,
- » catch up growth,
- » management of chronic infections/infestations,

» continued administration of minerals and vitamins (including commencing iron),
» play and love; stimulation, and
» preparation for discharge.
» Dietician and occupational therapy referral.

Step 1: Hypoglycaemia (Blood glucose < 3 mmol/L)

Prevention

Feed child with severe acute malnutrition immediately (within 30 minutes of presentation) and then ensure every feed is given by day and at night. See step 7: Stabilisation feeding.
Keep the child warm. See step 2: Hypothermia.

Detection and treatment

Test blood glucose level 3 hourly in severely ill child for first 24 hours and until stable (longer if the child is very ill).

Asymptomatic hypoglycaemia:
If blood glucose < 3 mmol/L in asymptomatic child, give immediately (oral bolus):

- Stabilisation/F75 formula, oral, 15 mL/kg.

OR

- Dextrose, 10%, oral, 10 mL/kg.
  - Dextrose 10% = Dextrose 50%, 2 mL/kg with water for injection 8 mL/kg.

OR

- Sugar solution, oral, 10 mL/kg.
  - 1 rounded teaspoon of sugar in 50 mL or 3½ tablespoons of water.

Check blood glucose after 30 minutes and maintain it above 3 mmol/L. Continue feeds.

If symptomatic or persistent hypoglycaemia:

- Dextrose, 10%, IV, 5 mL/kg.

Continue feeds once responsive.

- Change feeds to 2 hourly if hypoglycaemia has occurred. See step 7: Stabilisation feeds.

These children have poor cardiac reserves and are easily volume overloaded. Do not start or maintain IV infusions unless absolutely necessary.

Step 2: Hypothermia (Axillary temperature < 35 ºC)

Prevent hypothermia

Care for the child in a warm area, i.e. 25–30 ºC room temperature.
Ensure the child's body, especially the head, is covered at all times, particularly at night.
Avoid drafts and change wet napkins/clothing.
Avoid exposure, e.g. bathing.
Feed immediately and 2–3 hourly as this provides energy to generate heat.
Allow the child to sleep with mother/carer at night for warmth.

Treat hypothermia

Check axillary (underarm) temperature, 3 hourly.
Axillary temperature < 36 ºC indicates an urgent need to warm child.
Allow the child to sleep with mother/carer at night for warmth. Use mother-child skin-skin contact, i.e. Kangaroo care, to keep child warm and wrap both with blankets.
Place heater nearby. If a radiant heater is used for warming, check temperature at least every ½ hour.
If severely hypothermic and not improving, use other heating measures but do not apply direct heat to the skin as this may burn the child.
Check temperature 2 hourly until > 36.5 ºC.
Consider and treat for infection and sepsis. See step 5: Infection.

Step 3: Dehydration

See section 2.2.4: Diarrhoea, acute.
Continue feeds and other care of severe malnutrition.

Step 4: Electrolytes (hypokalaemia, hypomagnesaemia, hypophosphataemia and hypernatraemia)

All severely malnourished children have excess body sodium even though the plasma sodium may be low. Oedema is partly due to these imbalances, not fluid overload.

Giving high sodium load fluids is dangerous.
Do **NOT** treat oedema with a diuretic.

Potassium

Serum potassium does not indicate total body potassium status. Potassium supplementation is required unless frank hyperkalaemia exists.
Feeds made with combined mineral and vitamin complex contains potassium. When this is used, do not add further potassium.

If the formula is made without combined mineral and vitamin complex**, add** potassium:

- Potassium chloride solution, 25–50 mg/kg/dose, oral, 8 hourly until oedema subsides:
  - If < 10 kg: 250 mg.
  - If > 10 kg: 500 mg.

Magnesium

Feeds made with combined mineral and vitamin complex or trace element mix contains magnesium. If formula is made without either of these additives, **add** magnesium:

- Trace element mix, oral, daily.
  - If < 10 kg: 2.5 mL.
  - If > 10 kg: 5 mL.

OR

- Magnesium sulphate 50%, oral, 0.2 mL/kg as a once daily dose for at least 2 weeks. The IV preparation can be given orally.

Refeeding syndrome may occur at any stage during the stabilisation phase. Regular phosphate level monitoring is advisable and cautious feeding with slow feed advancement is encouraged.

Phosphate (enema administered orally)

- If serum phosphate 0.73–0.96 mmol/L give 0.32 mmol/kg (0.25 mL/kg) in divided dosages orally.
- If serum phosphate 0.51–0.72 mmol/L give 0.64 mmol/kg (0.5 mL/kg) in divided dosages orally.
- If serum phosphate less than 0.5 mmol/L give 1.0 mmol/kg (0.75 mL/kg) in divided dosages orally.

Phosphate enemas (administered orally) have 1.38 mmol/mL phosphate.

Step 5: Infection

Antibiotics

Start antibiotics on the first day, at admission.

If the child has no danger signs, is alert and feeding well:

- Amoxicillin, oral, 45 mg/kg/dose 12 hourly for 5 days.

All other children:

- Ampicillin, IV/IM, 50 mg/kg/dose 6 hourly for 7 days.
  - Avoid IV infusions, if possible. Use a 'heparin lock' to avoid fluid overload because of poor cardiac reserves.

PLUS

- Gentamicin, IV, 6 mg/kg once daily for 7 days.

As soon as there is a response and patient can tolerate oral medication change ampicillin to amoxicillin and continue with gentamicin:

- Amoxicillin, oral, 30 mg/kg/dose 8 hourly for a further 5 days.

PLUS

- Gentamicin, IV/IM, 6 mg/kg once daily for 7 days.

If the child is severely ill or fails to improve after 48 hours:

- Third generation cephalosporin, e.g.:
  - Ceftriaxone, IV/IM, 100 mg/kg/dose once daily.
    - If meningitis suspected: use 80 mg/kg/dose.

If child does not improve after 5 days, or deteriorates:
Refer to a higher level of care.

Intestinal worm infestation
Treat after the acute phase:
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.

HIV and TB
In children with HIV and TB, good recovery from malnutrition is possible but may take longer. Treatment failure of malnutrition may be more common.

» Actively investigate for TB and HIV as soon as possible. TB is difficult to diagnose and confirm.
» Ask about contacts, symptoms, do a tuberculin skin test (TST) and chest X-ray. If TST negative, repeat just before discharge.
» If TB is clinically likely, presumptive TB treatment is often reasonable, but once begun, should be completed. See Chapter 10: Tuberculosis, section 10.2: Tuberculosis, pulmonary.

HIV is relatively simple to diagnose and confirm:
» Children < 18 months: HIV PCR and confirm with a second HIV PCR test; children 18–24 months: rapid antibody test/ELISA, if positive confirm with an HIV PCR test.
» Children > 24 months: rapid antibody test/ELISA, if positive confirm with different rapid antibody test/ELISA.

Once the child enters the rehabilitative phase, commence antiretroviral therapy without delay if HIV-infected. See Chapter 9: Human Immunodeficiency Virus Infection, section 9.1: Human immunodeficiency virus infections.

Step 6: Micronutrients
Vitamins

- Vitamin A, oral, as a single dose:

Age	Dose	No. of capsules
Infants < 6 months:	50 000 IU	1 capsule
Infants 6–11 months:	100 000 IU	1 capsule
Children 12 months to 5 years:	200 000 IU	1 capsule

Record doses in the Road-to-Health booklet.

All children with clinical signs of severe vitamin A deficiency (eye changes: xerophthalmia, corneal ulceration, Bitot's spots, corneal clouding) **and** severe measles:

- Vitamin A, oral, 3 doses.
  - First dose, immediately; second dose on day 2 and third dose after 14 days.
  - Record the dose given in prescription and the Road-to-Health booklet.

If on feeds with combined mineral and vitamin complex:

- Folic acid, oral, 2.5 mg as a single dose.

If not on feeds with combined mineral and vitamin complex:

- Folic acid, oral, 2.5 mg as a single daily dose.

PLUS

- Multivitamin, oral, 5 mL as a single daily dose.

Anaemia in malnourished children

Non-acute management:

Although anaemia is common, do NOT give iron initially but wait until the child has a good appetite and starts gaining weight (usually by the second week).

Treat severe anaemia with blood transfusion, if:

» Symptomatic anaemia (Hb usually below 4 g/dL).

OR

» If there is respiratory distress with a low Hb.

- Packed red cells, IV, 5 mL/kg administered over 3 hours.

PLUS

- Furosemide, IV, 1 mg/kg at the start of the transfusion.

Repeat only if severe anaemia or respiratory distress persists and the haemoglobin is still low.

Once gaining weight and oedema has resolved:

- Iron, oral, 2 mg/kg elemental iron per dose 8 hourly with meals.
  - Continue for at least 2 months to replace iron stores.

Step 7: Stabilisation feeding

Immediate: stabilisation phase:

Begin feeding immediately – do not miss feeds.

Give F75/'stabilising' feed at 130 mL/kg/day divided into 3 hourly feeds, i.e. 8 times daily. Give all feeds including that at 03h00.

If child has gross oedema, i.e. if the oedema is up to or beyond the knee or anasarca, give 100 mL/kg initially and increase progressively.

Monitor and record intake carefully.

F75 formula/Stabilisation	
Fresh cow's milk	300 mL
Sugar	100 g
Vegetable oil	20 g
Combined mineral and vitamin complex*	As indicated by insert
Water to make up to:	1000 mL

**If no combined mineral and vitamin complex:*

- Trace element mix, oral, 20 mL daily.

If danger signs, hypothermia or hypoglycaemia present, feed the same daily volume but divided into 2 hourly feeds, i.e. 12 times daily. Give all feeds including those at 02h00 and 04h00.

Give from a cup. Very weak children may be fed by spoon, dropper or syringe.

If feeds refused/not finished (i.e. less than 80% of daily amount taken) give all feeds via nasogastric tube.

Weigh daily and plot weight gain.

Readiness to enter the rehabilitation phase is signalled by a return of appetite, usually about one week after admission.

Step 8: Transition feeding and catch-up growth

Feeding (rehabilitation phase)

» For the first two days replace the initial feeds with equal amounts of 'rebuilding'/'catch-up'/F100 formula. Gradually increase the volume by 10 mL/feed until some formula remains unfinished, usually ~200 mL/kg/day.

» When appetite returns, introduce a modified diet. Balance the intake by giving 3 modified meals and 5 feeds of F100. Prepare food without adding salt.

F100 formula/Rebuilding formula (catch-up)	
Fresh cow's milk	880 mL
Sugar	75 g
Vegetable oil	20 mL
Combined mineral and vitamin complex*	As indicated by insert
Water to make up to:	1000 mL

**If no combined mineral and vitamin complex:*

- Trace element mix, oral, 20 mL.

Monitor progress after the transition by assessing the rate of weight gain.
Weigh child each morning before feeding and plot the weight.
Each week calculate and record weight gain as g/kg/day.

If weight gain is:

» Poor (< 5 g/kg/day) – child requires full reassessment.
» Moderate (5–10 g/kg/day) – check whether intake targets are being met, or if infection has been overlooked.
» Good (> 10 g/kg/day) – continue to praise staff and mothers.

Step 9: Sensory stimulation

Stimulation and loving care

» Provide tender loving care.
» Help and encourage mothers to comfort, feed and play with their children.
» Involve occupational therapist, if available, for structured play otherwise arrange this as best possible in the ward.
» Provide a stimulation program in the ward.

Step 10: Prepare for follow up

Preparation for discharge

» Obtain information on household food security, family background and socio-economic status and refer appropriately.
» Instruct mothers how to modify family foods, how often to feed, what and how much to give.
» Ready to Use Therapeutic Foods (RUTF) may be supplied to facilitate earlier discharge where this is indicated and available. See the National Department of Health Integrated Management of Children with Acute Malnutrition in South Africa – Operational Guidelines.
» Advise caregiver on nutrient and energy-dense food options – see table 1 below.
» Involve mother in discharge planning and follow up plans.
» Social assessment: Before discharge, ensure parent/caregiver is able to access food for the child, ensure all financial supports and grants have been accessed. A social worker may assist in ensuring this. The social worker should also assess for other social risks.
» Make follow-up arrangements. Link patient to PHC systems and Family Health Teams/Community Care Workers for close follow-up and monitoring of feeding and compliance with therapeutic feeding program.
» Ensure all immunisations are up to date.
» Do not discharge any malnourished child without having adequately investigated for TB and HIV infection. Repeat TST before discharge as immunity may have returned to normal.
» Write full clinical summary in Road-to-Health booklet.

Table 1: Sample meal combinations

Starch	Protein	Fat	Other
» Bread	» Peanut butter (counted as fat and protein).	» Margarine	» Syrup/jam
» Pap/Potato	» Peanut butter (counted as fat and protein). » Milk (FC milk/milk powder) » Eggs » Sardines/Pilchards » Liver » Chicken » Beef » Mutton » Pork		» Sugar
» Rice/Samp	» Beans		
» Vegetables	» Peanut butter.		» Sugar

Discharge criteria

» good appetite,
» no infection,
» no oedema,
» continuous good weight gain for last 5 days,
» playful and alert, and
» all preparation in place for discharge.

Feed volume charts

Initial stabilisation/F75 formula volumes at 130 mL/kg/day.
Use 2 hourly if child very sick or has hypoglycaemia or hypothermia.

Child's weight (kg)	Amount to feed		If total volume taken in a day is less than the below figure change to nasogastric feeding
	Every 3 hours 8 times a day	Every 2 hours 12 times a day	
2.0	35	25	210
2.1	35	25	220
2.2	35	25	230
2.3	40	25	240
2.4	40	25	250
2.5	40	25	260
2.6	40	30	270
2.8	45	30	290
3.0	50	30	310
3.2	50	35	330
3.4	55	35	350
3.6	60	40	370
3.8	60	40	400

4.0	65	45	420
4.2	70	45	440
4.4	70	50	460
4.6	75	50	480
4.8	80	50	500
5.0	80	55	520
5.2	85	55	540
5.4	90	60	560
5.6	90	60	580
5.8	95	65	600
6.0	100	65	620
6.5	105	70	670
7.0	115	75	730
7.5	120	80	780
8.0	130	90	830
8.5	140	90	880
9.0	150	100	940
9.5	150	100	990
10.0	160	110	1050

If severe oedema, decrease volume by 25% per feed initially and then increase progressively to above volumes.

2.5 RICKETS

E55.0

DESCRIPTION

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.

DIAGNOSTIC CRITERIA

Clinical

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

Investigations

» Elevated alkaline phosphatase.
» Serum calcium and/or phosphate abnormalities.
» 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.

MEDICINE TREATMENT

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, 5000 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.

REFERRAL

» Rickets presenting in children older than 2 years.
» No radiological response to treatment after 6–8 weeks.
» Incomplete radiological response.
» Rickets secondary to other disease processes.

2.6 WORM BOLUS

B77

DESCRIPTION

Partial or complete obstruction of the bowel by a 'knot' of *Ascaris lumbricoides* curled around each other. Usually presents with cramping abdominal pain with/without other evidence of obstruction. May occasionally lead to local necrosis and perforation of the small bowel.

DIAGNOSTIC CRITERIA

Clinical

Cramping abdominal pain associated with/without a palpable worm mass, which may also be identified on X-ray abdomen straight or with contrast (when considered safe).

Exclusion of other causes of acute abdomen or acute abdominal pain.

GENERAL AND SUPPORTIVE MEASURES

» Maintain fluid, electrolyte and nutritional needs – IV route may be needed.
» Nil per mouth and free drainage, where clinically indicated.
» Observe for failure of resolution, complete obstruction or evidence of necrosis/perforation.
» Surgery for complete obstruction, evidence of necrosis or perforation.
» Identify possible iron deficiency.
» Be alert for possible worm aspiration.

MEDICINE TREATMENT

Once the bolus resolves, treat the ascaris:
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.

REFERRAL

» Inability to manage surgical problems, if present.
» Obstruction not relieved after 48 hours.

2.7 RECURRENT ABDOMINAL PAIN

R10.4

DESCRIPTION

Recurrent abdominal pain for which no cause can be found occurring at least monthly for 3 consecutive months with severity that interferes with routine function of the child.

DIAGNOSTIC CRITERIA

Clinical

» Peri-umbilical pain associated with belching, bloating with negative findings on clinical evaluation and no response to acid-blocking medication **OR** pain below the umbilicus accompanied by abdominal cramps, bloating and distension and with an altered bowel pattern that are consistent with Irritable Bowel Syndrome in adults.
» Either of the above syndromes with the exclusion of organic disease with appropriate investigation.
» Avoid excessive investigation where the diagnosis is strongly suspected in the presence of a normal clinical evaluation.
» Exclude the following:
  > Urinary tract infections, urinary tract anomalies, renal disease.

- GIT infection, infestation or inflammation.
- Chronic abdominal conditions such as tumours or infections, e.g. TB abdomen.
- Gall bladder disease.
- Pancreatic disease.

GENERAL AND SUPPORTIVE MEASURES

- Manage psychological stressors, anxiety or depression, where present, appropriately.
- Reassure child and family.
- Counselling to avoid the reinforcement of the symptoms with secondary gain.
- Adequate dietary fibre in children with irritable bowel syndrome-type condition.

MEDICINE TREATMENT

Manage constipation, where present. See section 2.2.2: Constipation/faecal loading.

Manage comorbid anxiety or depression appropriately. See Chapter 14: Child and Adolescent Psychiatry, section 14.4.1: Depression in childhood and adolescence and section 14.5: Anxiety disorders.

REFERRAL

- Failure to respond to management.
- For appropriate psychiatric/psychological management, if not locally available.

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