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IMCI INTEGRATED MANAGEMENT OF CHILDHOOD ILLNESS

MANAGEMENT OF THE CHILD WITH A SERIOUS INFECTION OR SEVERE MALNUTRITION

Guidelines for care at the first-referral level in developing countries

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Foreword

This manual is for use by doctors, senior nurses and other senior health workers who are responsible for the care of young children at the first referral level in developing countries. It presents up-to-date clinical guidelines, prepared by experts, for both inpatient and outpatient care in small hospitals where basic laboratory facilities and essential drugs and inexpensive medicines are available. In some settings, the manual can be used in large health centres where a small number of sick children can be admitted for inpatient care.

The guidelines require the hospital to have (1) the capacity to carry out certain essential investigations—such as blood smear examinations for malaria parasites, estimations of haemoglobin or packed cell volume and blood glucose, blood grouping and cross-matching, and basic microscopy of CSF and urine—and (2) essential drugs available for the care of seriously ill children (see Appendix 2, page 135). Expensive treatment options, such as new antibiotics or mechanical ventilation, are not described.

The manual focuses on the inpatient management of the major causes of childhood mortality, such as pneumonia, diarrhoea, severe malnutrition, malaria, meningitis, measles, and related conditions. It complements standard, more comprehensive paediatric textbooks, which should be consulted for information on the management of rarer conditions or complications. Details of the principles underlying the guidelines can be found in technical review papers published by WHO (see References, page 123).

This manual is part of a series of documents and tools that support the Integrated Management of Childhood Illness (IMCI). It is consistent with the IMCI guidelines for outpatient management of sick children. They are applicable in most areas of the world and may be adapted by countries to suit their specific circumstances. WHO believes that their widespread adoption would improve the care of children in hospital and lead to lower case fatality rates.

Stages in the management of the sick child

This manual describes a sequential process for managing sick children as soon as they arrive in hospital, the first stage of which is quick screening (***triage***) to identify those who need ***emergency treatment*** and those who are at special risk and should be given ***priority***, such as very young infants and severely malnourished children.

Every child should be fully assessed. ***History*** and ***examination*** should consist of both a general or "core" paediatric history and examination, and a "directed" search for symptoms and signs that are relevant to the presenting problems of the child. The nutritional and immunization status of all children should be checked. Feeding should be assessed in all under-2-year-olds and very low weight-for-age children.

The manual focuses on directed assessment, which must include appropriate ***laboratory investigations***, and highlights the symptoms and signs that are related to the major causes of childhood illness and mortality. It does not cover basic paediatric assessment which is taught in medical schools.

Before reaching a diagnosis, all potential ***differential diagnoses*** should be considered. The manual presents Tables of the most important differential diagnoses and clinical findings that favour ***specific diagnoses***. After deciding the main diagnosis and any secondary diagnoses or problems, ***treatment*** should be planned and started. If there is more than one diagnosis or problem, their treatment recommendations may have to be taken together.

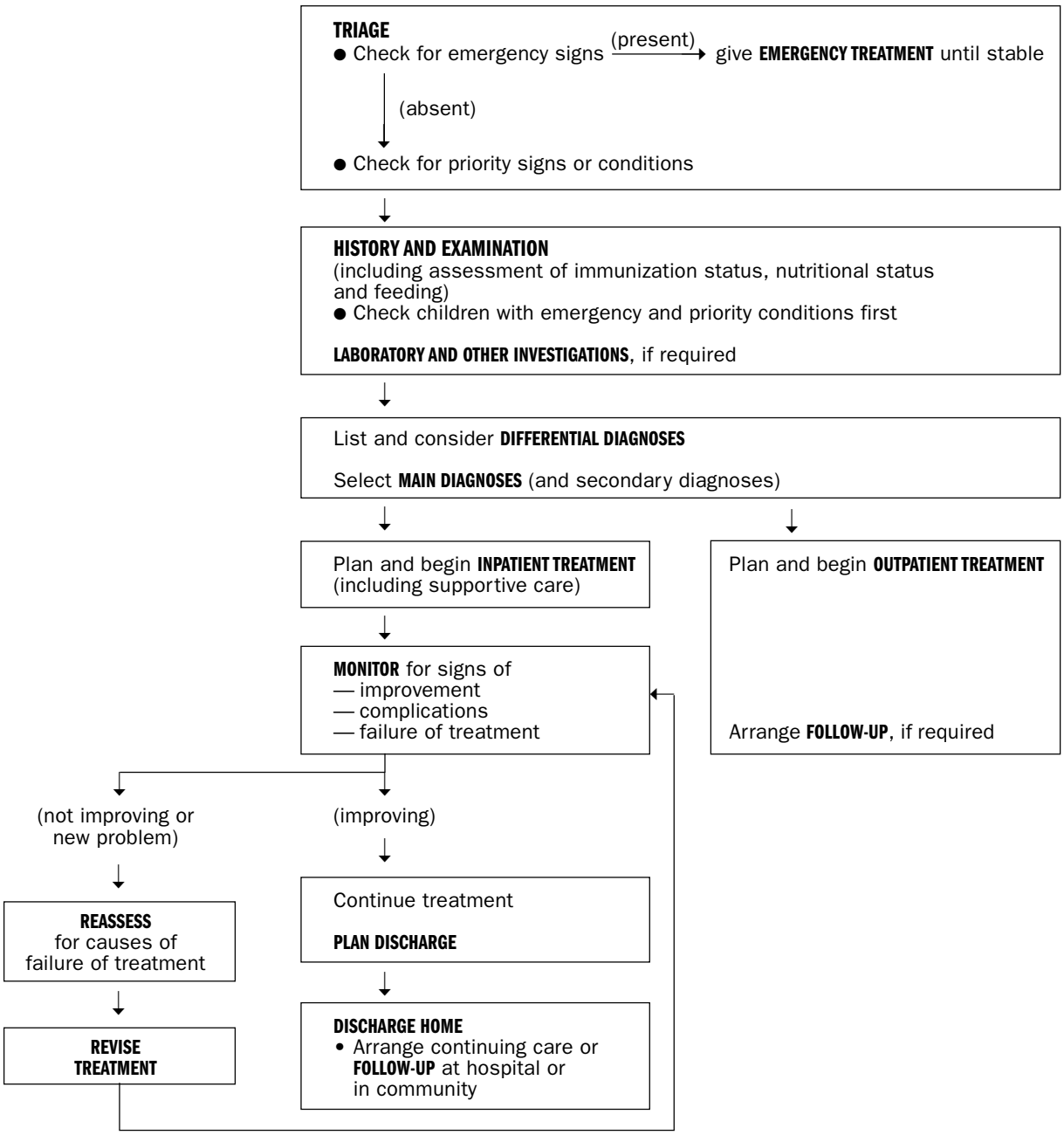
● **If the diagnoses or problems require inpatient care**, the child's ***progress*** in response to treatment in hospital should be ***monitored***. If progress is poor, alternative diagnoses or treatments should be considered.

When the child's condition has improved, a decision should be made on when to ***discharge*** the child—and this should be ***planned*** for accordingly. ***Continuing care*** or ***follow-up*** should be arranged in liaison with first-level or community health workers, where appropriate.

This process is shown in Chart 1 on page x.

● **If the child's diagnoses or problems can be treated with outpatient care**, it is important to ***teach the mother*** how to give all treatments at home and to ***advise her when to return*** with the child in case of an emergency and for follow-up.

Chart 1. **Stages in the management of the sick child admitted to hospital: summary of key elements**



Note: see separate treatment guidelines for young infants and children with severe malnutrition
Note: always check immunization status, nutritional status, feeding, and the mother's understanding of and ability to continue care at home

How the manual is organized

How the manual can be used

This manual can be used for the management of ***children who present with conditions that require admission to hospital***:

- carrying out *triage* of all sick children (Chapter 1)
- giving treatment in common *paediatric emergencies* (Chapter 1)
- reaching the *correct diagnosis* when faced with a child presenting with a specific problem (Chapter 2)
- giving the recommended *treatment* for the most important paediatric medical problems in developing countries (Chapters 3 to 8)
- giving *supportive care* (Chapter 9)
- how to *monitor* the child in hospital (Chapter 10)
- correct *discharge procedures* and *counselling* the mother (Chapter 11).

Sick children who have conditions that can be managed at home often present with their problem in a local hospital, rather than a first-level health facility. The manual gives guidance on their management:

- carrying out medical assessment and treatment (Chapters 2–6, 8, 9 and 11)
- checking nutritional and immunization status (Chapter 11)
- assessment of feeding and nutrition counselling (Chapters 9 and 11)
- counselling the mother on home care and appropriate follow-up (Chapter 11)
- checking paediatric drug dosages (Appendix 2)
- carrying out practical procedures (Appendix 1).

List of abbreviations

AIDS	acquired immunodeficiency syndrome
AVPU	simple consciousness or coma scale (**a**lert, responding to **v**oice, responding to **p**ain, **u**nconscious)
CMV	cytomegalovirus
CSF	cerebrospinal fluid
DHF	dengue haemorrhagic fever
DPT	diphtheria, pertussis, tetanus
DSS	dengue shock syndrome
EBM	expressed breast milk
EPI	expanded programme of immunization
FG	French gauge
HIV	human immunodeficiency virus
HUS	haemolytic uraemic syndrome
IM	intramuscular injection
IMCI	Integrated Management of Childhood Illness
IV	intravenous injection
JVP	jugular venous pressure
LIP	lymphoid interstitial pneumonitis
LP	lumbar puncture
OPV	oral polio vaccine
ORS	oral rehydration salts
ORT	oral rehydration therapy
PCP	*Pneumocystis carinii* pneumonia
PCV	packed cell volume
PPD	purified protein derivative (used in a test for tuberculosis)
ReSoMal	rehydration solution for malnutrition
RDA	recommended daily allowance
SD	standard deviation
SP	sulfadoxine-pyrimethamine
STD	sexually transmitted disease
TB	tuberculosis
TMP	trimethoprim
SMX	sulfamethoxazole
UTI	urinary tract infection
WBC	white blood cell count
WHO	World Health Organization

°C	degrees Celsius
°F	degrees Fahrenheit

CHAPTER 1

Emergency triage assessment and treatment

Deaths in hospital often occur within 24 hours of admission. Many of these deaths could be prevented if very sick children are identified soon after their arrival and treatment is started immediately. This chapter outlines a process of rapid triage to determine whether any emergency or priority signs are present. It then describes emergency treatment.

Triage is the process of rapidly screening sick children when they first arrive in hospital and of placing them in one of the following groups:

— those with ***emergency signs***, who require immediate emergency treatment;

— those with ***priority signs***, who should be given priority while waiting in the queue so that they can be assessed and treated without delay;

— ***non-urgent cases***, who have neither emergency nor priority signs.

Emergency signs include:

- obstructed breathing
- severe respiratory distress
- central cyanosis
- signs of shock (capillary refill longer than 3 seconds; and weak, fast pulse)
- coma
- convulsions
- signs suggesting severe dehydration in a child with diarrhoea (any two of the following: lethargy, sunken eyes, very slow return after pinching the skin)

Children with emergency signs require ***immediate*** treatment to avert death.

The priority signs (see below, page 2) identify children who are at a higher risk of dying. These children should be ***assessed without delay***.

Organization of triage and emergency treatment

Triage should be carried out in the place where the sick child presents at the hospital—*before* any administrative procedures such as registration. This may require reorganizing the sequence usually followed by patients who arrive in the clinic, e.g. children should be triaged even *before* their mothers sit in the waiting area. This calls for a nurse to carry out a rapid assessment of each child before weighing and registration.

It is important to carry out rapid triage of children who arrive in the outpatient clinic, especially when the room for emergency treatment is in a separate location. If sick children are brought directly to the paediatric ward, the nurse there must carry out triage and be prepared to move any child with emergency signs rapidly to where help is available and where treatment can be started.

All clinical staff involved in the initial assessment and care of sick children should be trained to carry out triage and, if possible, to give initial emergency treatment. This treatment is based on the use of a limited number of drugs and procedures which can be given safely by nurses and medical assistants after brief training.

The most experienced doctor or health worker should direct the emergency treatment. As the top priority is to give emergency treatment *without delay*, any trained member of the staff may have to start the emergency treatment while the most experienced person available is called.

After the emergency treatment, the child should be assessed promptly to establish the diagnosis, and given further appropriate treatment (see Chapter 2, page 15, for assessment and diagnosis).

1.1 Summary of steps in emergency triage assessment and treatment

The emergency triage assessment and treatment process is summarized in the Charts on pages 5–14.

First, check for ***emergency signs****. If these signs are found, immediately give the appropriate* ***emergency treatment****. Ask and look for any head/neck trauma before positioning the child or moving the head/neck.*

Check for emergency signs in two steps:

- **Step 1.** Check for any airway or breathing problem. If a problem is found, start immediate treatment to restore breathing.
- **Step 2.** Quickly determine if the child is in shock or unconscious or convulsing, or has diarrhoea with severe dehydration. These assessments can be done very quickly and almost simultaneously. Immediately give emergency treatment if there are positive signs.

These two steps are summarized in Chart 2 on page 5. Most children will not require emergency treatment.

Take careful note if the child is severely malnourished, because this will affect the treatment of shock and dehydration (see section 1.4, page 4, and Chapter 7, page 80).

If emergency signs are found:

- Call an experienced health professional and others to help, but do not delay starting the treatment. The team needs to stay calm and work together efficiently. The person in charge should assign tasks so that assessment can continue and treatment can be initiated quickly. Other health workers may be required to give the treatment, because a very sick child may need several treatments at once. The experienced health professional should continue assessing the child (see Chapter 2), to identify all underlying problems and develop a treatment plan.
- Carry out emergency investigations (blood glucose, blood smear, haemoglobin). Send blood for typing and cross-matching if the child is in shock, or appears to be severely anaemic, or is bleeding significantly.
- After giving emergency treatment, proceed immediately to assessing, diagnosing and treating the underlying problem.

If no emergency signs are found:

- Check for ***priority signs*** that indicate the child needs immediate assessment and treatment. These signs are:
  - — visible severe wasting
  - — oedema of both feet
  - — severe palmar pallor
  - — any sick young infant (<2 months old)
  - — lethargy, drowsiness, unconsciousness
  - — continually irritable and restless
  - — major burns
  - — any respiratory distress
  - — child with urgent referral note from another facility.

These children need prompt assessment to determine what further treatment is needed. They should not be asked to wait in the queue. If a child has trauma or other surgical problems, get surgical help.

If no emergency or priority signs are found:

- Assess and treat the child who will follow the regular queue of non-urgent patients.

1.2 Assessment for emergency and priority signs

■ Assess airway and breathing

Does the child's breathing appear obstructed? Look and listen to determine if there is poor air movement. Obstructed breathing can be due to blockage of the airway by the tongue, a foreign body or severe croup.

Is there respiratory distress? Is the child having trouble getting breath so that it is difficult to talk, eat or breastfeed?

Is there severe respiratory distress? Does the child's breathing appear very laboured? Is the child tiring?

Is there central cyanosis? This is indicated by a bluish/purplish discoloration of the tongue and the inside of the mouth.

■ Assess circulation (for shock)

Is the child's hand cold? If so, check the capillary refill. Is it 3 seconds or longer? Apply pressure to whiten the nail of the thumb or the big toe for 3 seconds. Determine the capillary refill time from the moment of release until total recovery of the pink colour.

If capillary refill is longer than 3 seconds, check the pulse. Is the pulse weak and fast? If the radial pulse is strong and not obviously fast, the child is not in shock. If you cannot feel a radial pulse of an infant (less than 1 year old), feel the brachial pulse or, if the infant is lying down, the femoral pulse. If you cannot feel the radial pulse of a child, feel the carotid. If the room is very cold, rely on the pulse to determine whether the child may be in shock.

■ Assess for coma or convulsions (or other abnormal mental status)

Is the child in coma? The level of consciousness can be assessed rapidly by the AVPU scale: **A**—the child is awake and Alert, or **V**—responds to Voice, or **P**—responds to Pain (e.g. pinching or pulling frontal hair), or **U**—Unconscious. If there is no response, ask the mother if the child has been abnormally sleepy or difficult to wake. If she confirms this, the child is in coma (unconscious) and needs emergency treatment.

Is the child convulsing? Are there spasmodic repeated movements in an unresponsive child?

Is the child lethargic? Does the child appear drowsy and show no interest in what is happening?

Is the child continually irritable or restless? A child who is continually irritable or restless cannot be calmed.

■ **Assess for severe dehydration if the child has diarrhoea**

Does the child have sunken eyes? Do the eyes appear unusually sunken in their sockets? Ask the mother if the child's eyes are more sunken than usual.

Does a skin pinch go back very slowly (longer than 2 seconds)? Pinch the skin of the abdomen halfway between the umbilicus and the side. Pinch for 1 second, then release and observe.

■ **Rapidly assess for severe malnutrition**

Does the child have visible severe wasting? Such children appear very thin and have no fat. Look for severe wasting of the muscles of the shoulders, arms, buttocks and thighs or visible rib outlines.

Does the child have oedema of both feet? Press with the thumb for a few seconds on the top of each foot. The child has oedema if an impression remains in the foot when you lift your thumb.

■ **Assess for severe anaemia**

Look for severe palmar pallor. Look at the palms. Hold the child's palm open by grasping it gently from the side. Do not stretch the fingers backward as this could cause pallor by blocking the blood supply. Compare the colour of the child's palm with your own palm or the palm of the mother. If the skin of the palm is very pale or so pale that it looks white, the child has severe palmar pallor and may have severe anaemia.

■ **Identify all sick young infants (<2 months old)**

■ **Assess for a major burn**

■ **Identify all children urgently referred from another facility**

1.3 Give emergency treatment

The charts that follow comprise a triage chart which presents a summary of the triage process, followed by charts which give detailed guidelines for emergency treatments named in the treatment boxes of the triage chart.

- Triage of sick children (Chart 2, page 5)
  - — How to manage the choking child (Chart 3, page 6)
  - — How to manage the airway in a child with obstructed breathing or who has just stopped breathing (Chart 4, page 7)
- How to give oxygen (Chart 5, page 8)
- How to position the unconscious child (Chart 6, page 9)
- How to give IV fluids rapidly for shock (child not severely malnourished) (Chart 7, page 10)
  - — How to give IV fluids for shock in a child with severe malnutrition (Chart 8, page 11)
- How to give diazepam or paraldehyde rectally for convulsions (Chart 9, page 12)
- How to give IV glucose (Chart 10, page 13)
- How to treat severe dehydration in an emergency setting (Chart 11, page 14)

After giving these emergency treatments to *children with emergency signs*, proceed immediately to assessing, diagnosing and treating the underlying problem. Give the next highest priority for assessment and treatment to *children with priority signs*. Children with neither emergency nor priority signs can wait in the regular queue.

1.3.1 How to manage the airway

Emergency treatment is described in Charts 3 and 4. The treatment differs depending on whether there is a foreign body causing respiratory obstruction (Chart 3) or some other cause for the obstruction or respiratory distress (Chart 4).

If a foreign body is causing the obstruction, the treatment depends on the age of the child.

For infants:

- Lay the infant on one arm or on the thigh in a head-down position.
- Give five blows to the infant's back with the heel of the hand.
- If the obstruction persists, turn the infant over and give five chest thrusts with two fingers, 1 finger's breadth below the nipple level in the midline.
- If the obstruction persists, check the infant's mouth for any obstruction which can be removed.
- If necessary, repeat this sequence with back slaps again.

For older children:

- While the child is sitting, kneeling or lying, give five blows to the child's back with the heel of the hand.

- If the obstruction persists, go behind the child and pass your arms around the child's body; form a fist with one hand immediately below the sternum; place the other hand over the fist and thrust sharply upwards into the abdomen. Repeat this up to five times.
- If the obstruction persists, check the child's mouth for any obstruction which can be removed.
- If necessary, repeat the sequence with back slaps again.

If respiratory obstruction is not caused by a foreign body, then manage the airway as in Chart 4 and assess the child fully to identify the cause of the obstruction. Chart 4 describes action which will open the child's airway and prevent the tongue from falling back to obstruct the pharynx.

The best head positions are "neutral" in the infant and "sniffing" in the child, as shown in Chart 4. Once this has been done, it is important to check the patency of the airway by:

— looking for chest movements

— listening for breath sounds, and

— feeling for breath.

If neck trauma is suspected, the head-tilt/chin-lift manoeuvre may make the cervical spine injury worse. The safest airway intervention is the jaw thrust without head tilt (see figure in Chart 4). Ideally a second health worker should be made responsible for maintaining stabilization of the neck. This can also be achieved as described in Chart 6 by securing the child's head to a firm board after the breathing obstruction has been relieved.

1.3.2 ***Other emergency treatment***

Details of other emergency treatments are given in Charts 5 to 11 and in appropriate sections of other chapters in this manual.

1.4 Give emergency treatment to the child with severe malnutrition

During the triage process, all children with severe malnutrition will be identified as having *priority signs*, which means that they require prompt assessment and treatment. The case-fatality rate in these children can be high, so it is important that they are assessed promptly by an experienced senior health worker and treatment started *as soon as possible*. Chapter 7 (page 80) presents guidelines for the management of severely malnourished children.

A few children with severe malnutrition will be found during triage assessment to have ***emergency signs***.

- Those with emergency signs for *"airway and breathing"* and *"coma or convulsions"* should receive emergency treatment (see charts on pages 6–14).
- Those with signs of *severe dehydration* but not shock should not be rehydrated with IV fluids. This is because the diagnosis of severe dehydration is difficult in severe malnutrition and is often misdiagnosed. Giving IV fluids puts these children at risk of overhydration and death from heart failure. Therefore, these children should be rehydrated *orally* using the special rehydration solution for severe malnutrition (ReSoMal). See Chapter 7 (page 80).
- Those with signs of *shock* are assessed for further signs (*lethargic or unconscious*). This is because in severe malnutrition the usual emergency signs for shock may be present even when there is no shock.

  — If the child is *lethargic or unconscious*, keep warm and give 10% glucose 5 ml/kg IV (see Chart 10, page 13), and then IV fluids (see Chart 8, page 11, and the Note given below).

  — If the child is *alert*, keep warm and give 10% glucose (10 ml/kg) by mouth or nasogastric tube, and proceed to immediate full assessment and treatment. See Chapter 7 for details.

Note: When giving IV fluids, treatment for shock differs from that for a well-nourished child. This is because shock from dehydration and sepsis are likely to coexist and these are difficult to differentiate on clinical grounds alone. Children with dehydration respond to IV fluids (breathing and pulse rates fall, faster capillary refill). Those with septic shock and no dehydration will not respond. The amount of fluid given should be guided by the child's response. Avoid overhydration. Monitor the pulse and breathing at the start and every 5–10 minutes to check if improving or not. Note that the type of IV fluid also differs in severe malnutrition, and the infusion rate is slower.

All severely malnourished children require prompt assessment and treatment to deal with serious problems such as hypoglycaemia, hypothermia, severe infection, severe anaemia and potentially blinding eye problems. It is equally important to take prompt action to prevent some of these problems, if they were not present at the time of admission to hospital.

Chart 2. **Triage of all sick children**

EMERGENCY SIGNS

If any sign positive: give treatment(s), call for help, draw blood for emergency laboratory investigations (glucose, malaria smear, Hb)

TREAT

1. ASSESS: AIRWAY AND BREATHING

- Obstructed breathing *or*
- Central cyanosis *or*
- Severe respiratory distress

ANY SIGN POSITIVE*

IF FOREIGN BODY ASPIRATION
- ➥ Manage airway in choking child (Chart 3)

IF NO FOREIGN BODY ASPIRATION
- ➥ Manage airway (Chart 4)
- ➥ Give oxygen (Chart 5)
- ➥ Make sure child is warm

2. ASSESS: CIRCULATION

Cold hands with:
- Capillary refill longer than 3 seconds, *and*
- Weak and fast pulse

ANY SIGN POSITIVE*
Check for severe malnutrition

- ➥ Stop any bleeding
- ➥ Give oxygen (Chart 5)
- ➥ Make sure child is warm

IF NO SEVERE MALNUTRITION:
- ➥ Insert IV and begin giving fluids rapidly (Chart 7)
  If not able to insert peripheral IV, insert an external jugular or intraosseous line (see pages 127–128)

IF SEVERE MALNUTRITION:
If lethargic or unconscious:
- ➥ Give IV glucose (Chart 10)
- ➥ Insert IV line and give fluids (Chart 8)

If not lethargic or unconscious:
- ➥ Give glucose orally or by NG tube
- ➥ Proceed immediately to full assessment and treatment

COMA CONVULSING

- Coma *or*
- Convulsing (now)

IF COMA OR CONVULSING*

- ➥ Manage airway (Chart 3)
- ➥ If convulsing, give diazepam or paraldehyde rectally (Chart 9)
- ➥ Position the unconscious child (if head or neck trauma is suspected, stabilize the neck first) (Chart 6)
- ➥ Give IV glucose (Chart 10)

SEVERE DEHYDRATION (only in child with diarrhoea)

Diarrhoea plus any two of these:
- Lethargy
- Sunken eyes
- Very slow skin pinch

DIARRHOEA plus TWO SIGNS POSITIVE*
Check for severe malnutrition

- ➥ Make sure child is warm.

IF NO SEVERE MALNUTRITION:
- ➥ Insert IV line and begin giving fluids rapidly following Chart 11 and Diarrhoea Treatment Plan C in hospital (Chart 12, page 48)

IF SEVERE MALNUTRITION,
- ➥ Do **not** insert IV
- ➥ Proceed immediately to full assessment and treatment (see section 1.4, page 4)

PRIORITY SIGNS **These children need prompt assessment and treatment**

- Visible severe wasting
- Oedema of both feet
- Severe palmar pallor
- Any sick young infant (< 2 months of age)
- Lethargy
- Continually irritable and restless
- Major burn
- Any respiratory distress or
- An urgent referral note from another facility

Note If a child has trauma or other surgical problems, get surgical help or follow surgical guidelines*

** Check for head/neck trauma before treating child—do not move neck if cervical spine injury possible.*

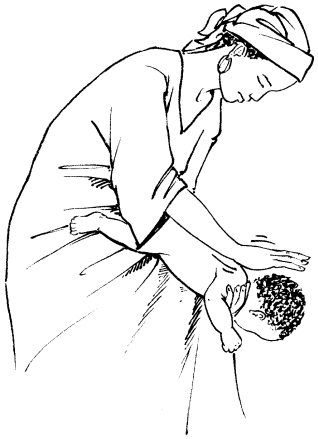
NON-URGENT

Proceed with assessment and further treatment according to the child's priority

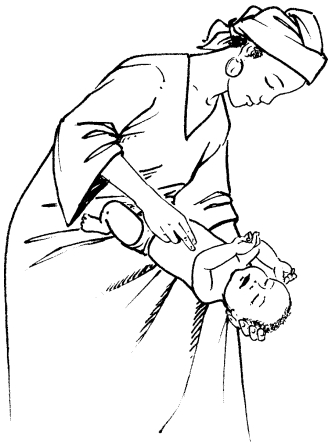
Chart 3. How to manage the airway in a choking child (foreign body aspiration with increasing respiratory distress)

Infants

- lay the infant on your arm or thigh in a head down position
- give 5 blows to the infant's back with heel of hand
- if obstruction persists, turn infant over and give 5 chest thrusts with 2 fingers, one finger breadth below nipple level in midline (see diagram)



Back slaps



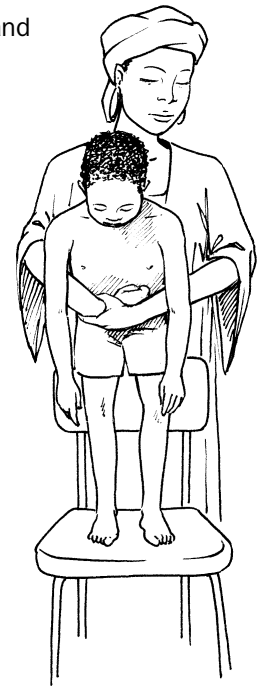
Chest thrusts

- if obstruction persists, check infant's mouth for any obstruction which can be removed
- if necessary, repeat sequence with back slaps again

Children

- give 5 blows to the child's back with heel of hand with child sitting, kneeling or lying
- if the obstruction persists, go behind the child and pass your arms around the child's body; form a fist with one hand immediately below the child's sternum; place the other hand over the fist and pull upwards into the abdomen (see diagram); repeat this Heimlich manoeuvre 5 times

Slapping the back to clear airway obstruction in a choking child

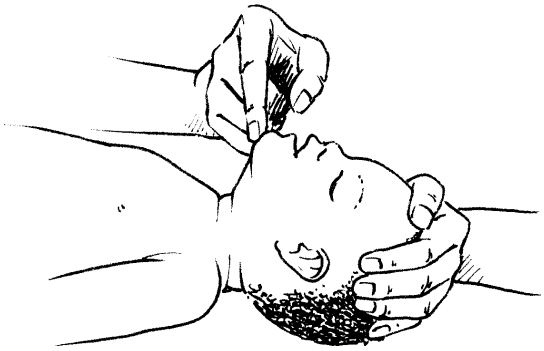


Heimlich manoeuvre in a choking older child

- if the obstruction persists, check the child's mouth for any obstruction which can be removed
- if necessary, repeat this sequence with back slaps again

Chart 4. How to manage the airway in a child with obstructed breathing (or who has just stopped breathing)

■ No neck trauma suspected



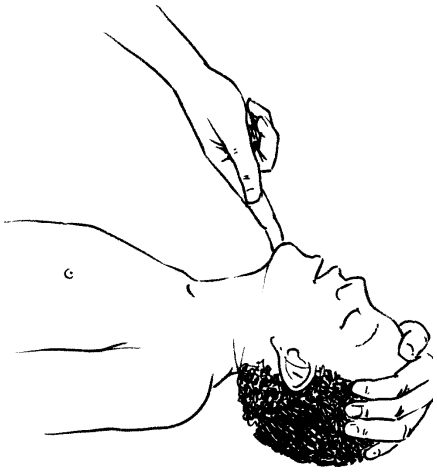
Neutral position to open the airway in an infant

Child conscious

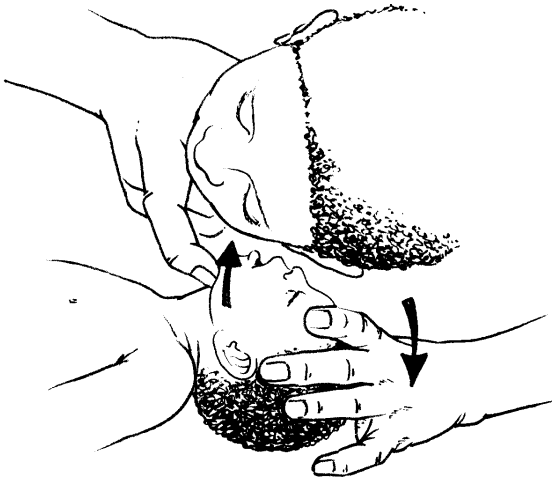
1. inspect mouth and remove foreign body, if present
2. clear secretions from throat
3. let child assume position of maximal comfort

Child unconscious

1. tilt the head as shown



Sniffing position to open the airway in an older child

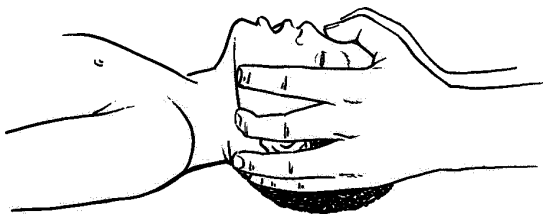


Look, listen and feel for breathing

2. inspect mouth and remove foreign body, if present
3. clear secretions from throat
4. check the airway by looking for chest movements, listening for breath sounds and feeling for breath

■ Neck trauma suspected (possible cervical spine injury)

1. stabilize the neck, as shown in Chart 6
2. inspect mouth and remove foreign body, if present
3. clear secretions from throat
4. check the airway by looking for chest movements, listening for breath sounds, and feeling for breath



Use jaw thrust without head tilt

If the child is still not breathing after carrying out the above, ventilate with bag and mask

Chart 5. **How to give oxygen**

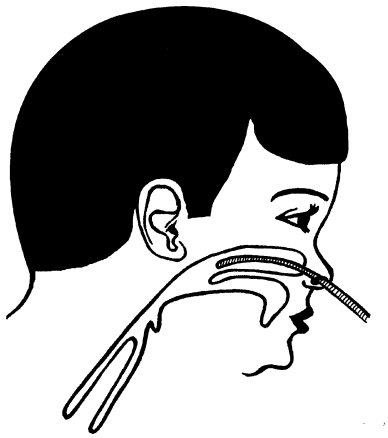
Give oxygen through nasal prongs or a nasal catheter:

Nasal Prongs

➥ Place the prongs just inside the nostrils and secure with tape.

Nasal Catheter

➥ Use an 8 F size tube
➥ Measure the distance from the side of the nostril to the inner eyebrow margin with the catheter
➥ Insert the catheter to this depth
➥ Secure with tape

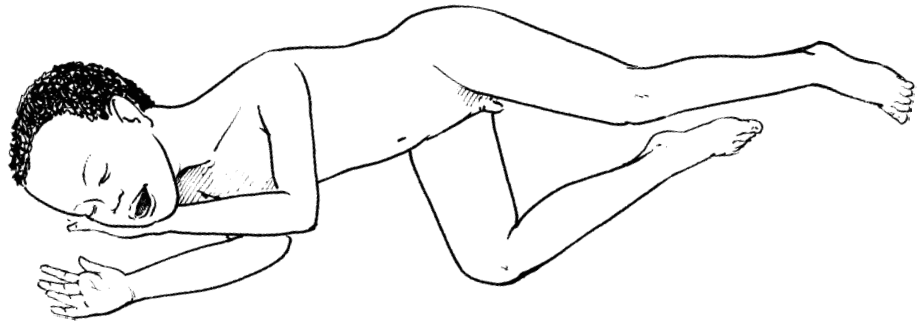


Start oxygen flow at 1–2 litres/minute ***(see page 110)***

Chart 6. **How to position the unconscious child**

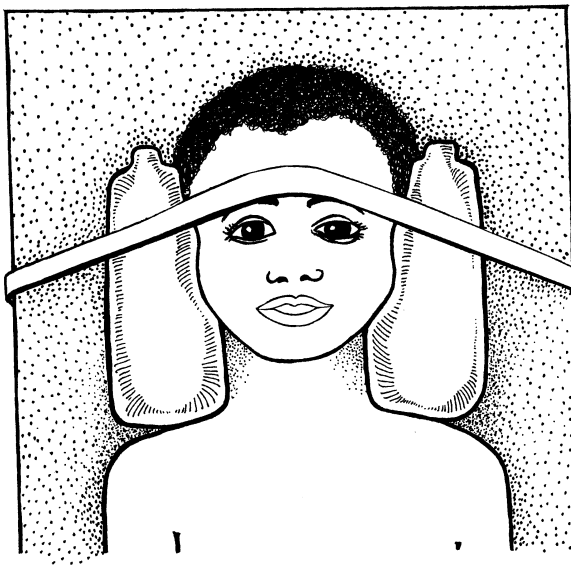
■ If neck trauma is not suspected:

➥ Turn the child on the side to reduce risk of aspiration.
➥ Keep the neck slightly extended and stabilize by placing cheek on one hand
➥ Bend one leg to stabilize the body position



■ If neck trauma is suspected:

➥ Stabilize the child's neck and keep the child lying on the back:
➥ Tape the child's forehead to the sides of a firm board to secure this position
➥ Prevent the neck from moving by supporting the child's head (e.g. using litre bags of IV fluid on each side)



➥ If vomiting, turn on the side, keeping the head in line with the body.

Chart 7. How to give IV fluids rapidly for shock (child not severely malnourished)

- ➥ Check that the child is not severely malnourished (in the child with severe malnutrition see section 1.4, page 4 and Chart 8)
- ➥ Insert an intravenous line (and draw blood for emergency laboratory investigations).
- ➥ Attach Ringer's lactate or normal saline—make sure the infusion is running well.
- ➥ Infuse 20 ml/kg as rapidly as possible.

Age/weight	Volume of Ringer's lactate or normal saline solution (20 ml/kg)
2 months (<4 kg)	75 ml
2–<4 months (4–<6 kg)	100 ml
4–<12 months (6–<10 kg)	150 ml
1–<3 years (10–<14 kg)	250 ml
3–<5 years (14–19 kg)	350 ml

Reassess child after appropriate volume has run in

Reassess after first infusion:	If no improvement, repeat 20 ml/kg as rapidly as possible.
Reassess after second infusion:	If no improvement, repeat 20 ml/kg as rapidly as possible.
Reassess after third infusion:	If no improvement, give blood 20 ml/kg over 30 minutes.
Reassess after fourth infusion:	If no improvement, see treatment guidelines.

After improvement at any stage (pulse slows, faster capillary refill), go to Chart 11, page 14.

If the child is severely malnourished, the fluid volume and rate are different—see Chart 8.

Chart 8. How to give IV fluids for shock in a child with severe malnutrition

Give this treatment only if the child has signs of shock ***and is lethargic or has lost consciousness***:

➥ Insert an IV line (and draw blood for emergency laboratory investigations)

➥ Weigh the child (or estimate the weight) to calculate the volume of fluid to be given

➥ Give IV fluid 15 ml/kg over 1 hour. Use one of the following solutions (in order of preference):

— Ringer's lactate with 5% glucose (dextrose); or

— half-normal saline with 5% glucose (dextrose); or

— half-strength Darrow's solution with 5% glucose (dextrose); or, if these are unavailable,

— Ringer's lactate.

Weight	Volume IV fluid	Weight	Volume IV fluid
	Give over 1 hour (15 ml/kg)		Give over 1 hour (15 ml/kg)
4 kg	60 ml	12 kg	180 ml
6 kg	90 ml	14 kg	210 ml
8 kg	120 ml	16 kg	240 ml
10 kg	150 ml	18 kg	270 ml

➥ Measure the pulse and breathing rate at the start and every 5–10 minutes.

If there are signs of improvement (pulse and breathing rates fall):

— give repeat IV 15 ml/kg over 1 hour; then

— switch to oral or nasogastric rehydration with ReSoMal (see page 83), 10 ml/kg/h up to 10 hours;

— initiate refeeding with starter F-75 (see page 85).

If the child fails to improve after the first 15 ml/kg IV, assume the child has septic shock:

— give maintenance IV fluid (4 ml/kg/h) while waiting for blood;

— when blood is available, transfuse fresh whole blood at 10 ml/kg *slowly* over 3 hours (use packed cells if in cardiac failure); then

— initiate refeeding with starter F-75 (see page 85).

If the child deteriorates during the IV rehydration (breathing increases by 5 breaths/min or pulse by 25 beats/min), stop the infusion because IV fluid can worsen the child's condition.

Chart 9. How to give diazepam (or paraldehyde) rectally for convulsions

Give diazepam rectally:

- ➥ Draw up the dose from an ampoule of diazepam into a tuberculin (1 ml) syringe. Base the dose on the weight of the child, where possible. Then remove the needle.
- ➥ Insert the syringe into the rectum 4 to 5 cm and inject the diazepam solution.
- ➥ Hold buttocks together for a few minutes.

	Diazepam given rectally **10 mg/2ml solution**	**Paraldehyde given rectally**
Age/weight	**Dose 0.1ml/kg**	**Dose 0.3–0.4 ml/kg**
2 weeks to 2 months (< 4 kg)*	0.3 ml	1.0 ml
2–<4 months (4–<6 kg)	0.5 ml	1.6 ml
4–<12 months (6—<10 kg)	1.0 ml	2.4 ml
1–<3 years (10–<14 kg)	1.25 ml	4 ml
3–<5 years (14–19 kg)	1.5 ml	5 ml

If convulsion continues after 10 minutes, give a second dose of diazepam rectally (or give diazepam intravenously if IV infusion is running).

If convulsion continues after another 10 minutes, give a third dose of diazepam or give paraldehyde rectally (or phenobarbital IV or IM).

If high fever:

- ➥ Sponge the child with room-temperature water to reduce the fever.
- ➥ Do not give oral medication until the convulsion has been controlled (danger of aspiration).

* Use phenobarbital (200 mg/ml solution) in a dose of 20 mg/kg to control convulsions in infants <2 weeks of age:
Weight 2 kg—initial dose: 0.2 ml, repeat 0.1 ml after 30 minutes
Weight 3 kg—initial dose: 0.3 ml, repeat 0.15 ml after 30 minutes
} if convulsions continue

Chart 10. **How to give IV glucose**

- ➥ Insert IV line and draw blood rapidly for emergency laboratory investigations
- ➥ Check blood glucose. If low (<2.5 mmol/litre (45 mg/dl) in a well nourished or <3 mmol/litre (55 mg/dl) in a severely malnourished child) or if dextrostix is not available:
- ➥ Give 5 ml/kg of 10% glucose solution rapidly by IV injection

Age/weight	**Volume of 10% glucose solution to give as bolus (5 ml/kg)**
Less than 2 months (<4 kg)	15 ml
2–<4 months (4–<6 kg)	25 ml
4–<12 months (6–<10 kg)	40 ml
1–<3 years (10–<14 kg)	60 ml
3–<5 years (14–<19 kg)	80 ml

- ➥ Recheck the blood glucose in 30 minutes. If it is still low, repeat 5 ml/kg of 10% glucose solution.
- ➥ Feed the child as soon as conscious.

  If not able to feed without danger of aspiration, give:

  — IV containing 5–10% glucose (dextrose), or

  — milk or sugar solution via nasogastric tube.

  To make sugar solution, dissolve 4 level teaspoons of sugar (20 grams) in a 200-ml cup of clean water.

Note: 50% glucose solution is the same as 50% dextrose solution or D50. If only 50% glucose solution is available: dilute 1 part 50% glucose solution to 4 parts sterile water, or dilute 1 part 50% glucose solution to 9 parts 5% glucose solution.

Note: For reliable results, take great care with the dextrostix test. The strip must be stored in its box, at 2–3 °C, avoiding sunlight or high humidity. A drop of blood should be placed on the strip (it is necessary to cover all the reagent area). After 60 seconds, the blood should be washed off gently with drops of cold water and the colour compared with the key on the bottle or on the blood glucose reader. (The exact procedure will vary with different strips.)

Chart 11. How to treat severe dehydration in an emergency setting

If the child is in shock, first follow the instructions in Charts 7 and 8 (pages 10 and 11). Switch to the present chart when the child's pulse becomes slower or the capillary refill is faster.

Give 70 ml/kg of Ringer's lactate solution (or, if not available, normal saline) over 5 hours in infants (aged <12 months) and over 2 1/2 hours in children (aged 12 months to 5 years).

	Total volume IV fluid (volume per hour)	
Weight	**Age <12 months Give over 5 hours**	**Age 12 months to 5 years Give over 2 1/2 hours**
<4 kg	200 ml (40 ml/h)	—
4–<6 kg	350 ml (70 ml/h)	—
6–<10 kg	550 ml (110 ml/h)	550 ml (220 ml/h)
10–<14 kg	850 ml (170 ml/h)	850 ml (340 ml/h)
14–<19 kg	1200 ml (240 ml/h)	1200 ml (480 ml/h)

Reassess the child every 1–2 hours. If the hydration status is not improving, give the IV drip more rapidly.

Also give ORS solution (about 5 ml/kg/hour) as soon as the child can drink; this is usually after 3–4 hours (in infants) or 1–2 hours (in children).

Weight	Volume ORS solution per hour
<4 kg	15 ml
4–<6 kg	25 ml
6–<10 kg	40 ml
10–<14 kg	60 ml
14–<19 kg	85 ml

Reassess after 6 hours (infants) and after 3 hours (children). Classify dehydration. Then choose the appropriate diarrhoea treatment plan (A, B, or C, pages 52, 50, 48) to continue treatment.

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

CHAPTER 2

Assessment and diagnosis

After triage assessment for emergency and priority signs, every child should be fully assessed by taking a history and carrying out an examination and appropriate investigations. In addition to a general (or "core") paediatric history and examination as taught in medical schools, particular attention should be paid to "directed" signs and symptoms relating to the most common childhood illnesses. This chapter presents the key symptoms and signs to look for in children with specific problems. It focuses on directed symptoms and signs, which are particularly useful in deciding between different possible diagnoses. Once the diagnosis or diagnoses have been made, the treatment guidelines in Chapters 3 to 8 should be consulted.

Relationship to the IMCI approach

The guidelines presented in this manual follow the same sequence as the IMCI (Integrated Management of Childhood Illness) training materials on caring for outpatient sick children. Thus, the guidelines on managing a lethargic or unconscious child or children with convulsions (IMCI's "general danger signs") are followed by guidelines for children with cough or difficult breathing, diarrhoea, and fever. The diagnoses also closely match the IMCI classifications, except that the expertise and investigative capabilities in a hospital setting allow classifications like "very severe disease" or "very severe febrile disease" to be defined more precisely, making possible such diagnoses as very severe pneumonia, severe malaria, and meningitis. Classifications for conditions such as pneumonia and dehydration follow the same principles as the IMCI. Young infants (aged 1 week to 2 months) are considered separately (see Chapter 6), as in the IMCI approach. The severely malnourished child is also considered separately (see Chapter 7), because these children require special attention and treatment if the high mortality is to be reduced.

Examination

All children must be examined fully so that no important sign will be missed.

Laboratory investigations

The following five basic laboratory investigations should be available in all small hospitals which provide paediatric care in developing countries:

- haemoglobin or packed cell volume (PCV)
- blood smear for malaria
- blood glucose
- microscopy of CSF and urine
- blood grouping and cross-matching.

For hospitals that care for sick newborns (under 1 week old), *blood bilirubin* would also be an essential investigation.

Indications for these tests are outlined in the appropriate sections of this manual. Other investigations (such as chest X-ray and stool microscopy) are not considered essential, but could help in complicated cases.

Differential diagnoses

After the assessment has been completed and before making the diagnosis or diagnoses, consider the various conditions that could cause the child's illness. A list of possible differential diagnoses should be drawn up. This helps to ensure that wrong assumptions are not made, a wrong diagnosis is not chosen, and rare problems are not missed. Remember that a sick child often has more than one diagnosis or clinical problem requiring treatment.

The Tables in this chapter list the differential diagnoses for common problems and give details of the symptoms, examination findings and results of laboratory investigations, which can be used to determine the main diagnosis and any secondary diagnoses.

The four most common presenting acute problems are:

- a child who is ***unconscious***, ***lethargic*** or ***convulsing*** (page 16)
- a child with ***cough*** or ***difficult breathing*** (page 18), plus assessment of conditions presenting with wheeze or presenting with stridor
- a child with ***diarrhoea*** (page 23)

- a child with ***fever*** (page 25).

The common problems that present less acutely are:

- a child with a ***chronic cough*** (30 days or more) (page 22)
- a child with ***fever lasting longer than 7 days*** (page 26).

For some conditions such as pneumonia and dehydration, the Tables will help to assess their severity because this determines the treatment and whether the child should be admitted to hospital or treated at home. These Tables on classification by severity should be used in the same manner as in the IMCI outpatient guidelines—first consider whether the child's clinical signs fit in the top row of the Table. If the child has signs compatible with more than one row, select the more severe classification.

Where appropriate, some sections give separate attention to problems specific to ***young infants***. The treatment of children with ***severe malnutrition*** is considered separately (see Chapter 7, page 80), because there are some important differences in their treatment and care.

After the main diagnosis and any secondary diagnoses or problems have been determined, treatment should be planned and started. Once again, if there is more than one diagnosis or problem, the treatment recommendations for all of them may have to be taken together. It may be necessary to review the list of differential diagnoses again at a later stage after observing the response to treatment, or in the light of new clinical findings.

Table 1 ***Differential diagnosis of the child presenting with lethargy, unconsciousness or convulsions.***

DIAGNOSIS or underlying cause	In favour
Meningitis[a]	— Lumbar puncture (LP) positive[b] — If LP not possible, stiff neck or bulging fontanelle — Petechial rash (meningococcal meningitis only)
Cerebral malaria (only in children exposed to *P. falciparum* transmission; often seasonal)	— Blood smear positive for malaria parasites — Jaundice — Severe anaemia — Convulsions — Hypoglycaemia
Febrile convulsions (not likely to be the cause of unconsciousness)	— Prior episodes of short convulsions when febrile — Conscious soon after convulsion stops — High fever — LP normal — Age 6 months to 5 years — Blood smear normal
Hypoglycaemia (always seek the cause, e.g. severe malaria, and treat the cause to prevent a recurrence)	— Blood glucose low; responds to glucose treatment[c]
Head injury	— Signs or history of head trauma
Poisoning	— History of poison ingestion or drug overdose
Shock (can cause lethargy or unconsciousness, but is unlikely to cause convulsions)	— Signs of shock — Petechial rash — Signs of severe dehydration
Acute glomerulonephritis with **encephalopathy**	— Raised blood pressure — Peripheral or facial oedema — Blood/protein/red cell casts in urine
Diabetic ketoacidosis	— High blood sugar — History of polydipsia and polyuria — Acidotic (deep, laboured) breathing

[a] The differential diagnosis of meningitis may include encephalitis, cerebral abscess or tuberculous meningitis. If these are common in your area, consult a standard textbook of paediatrics for further guidance.

[b] A lumbar puncture should be delayed if there are signs of raised intracranial pressure (see pages 62, 74). A positive lumbar puncture is one where CSF examination shows an abnormal number of white cells (>100 polymorphonuclear cells per ml). A cell count should be carried out, if possible. However, if this is not possible, then a cloudy CSF on direct visual inspection could be considered positive. (Confirmation is given by a low CSF glucose (<1.5 mmol/litre), high CSF protein (>0.4 g/litre), organisms identified by Gram stain or a positive culture, where these are available.)

[c] Low blood glucose is <2.5 mmol/litre (45 mg/dl), or <3.0 mmol/l (54 mg/dl) in a severely malnourished child.

2.1 Child presenting with lethargy, unconsciousness or convulsions

Special attention should be given to a child who presents with lethargy, unconsciousness or convulsions, as described below.

History

Determine if there is a history of:

- head injury
- drug overdose or toxin ingestion
- convulsions: How long do they last? Have there been previous febrile convulsions?

In the case of an *infant less than 1 week old*, consider:

- birth asphyxia
- birth injury.

Examination

General

- jaundice
- severe palmar pallor
- peripheral oedema
- level of consciousness
- petechial rash.

Head/neck

- stiff neck
- signs of head trauma, or other injuries
- pupil size and reactions to light
- tense or bulging fontanelle
- abnormal posture.

Laboratory investigations

If meningitis is suspected and the child has no signs of raised intracranial pressure (unequal pupils, rigid posture, paralysis of limbs or trunk, irregular breathing), perform a lumbar puncture.

In a malarious area, prepare a blood smear.

If the child is unconscious, check the blood glucose. Check the blood pressure (if a suitable paediatric cuff is available) and carry out urine microscopy if possible (see Table 1, page 16).

It is important to determine the length of time a child has been unconscious and his/her AVPU score (see page 2). This coma scale score should be monitored regularly. In young infants (less than 1 week old), note the time between birth and the onset of unconsciousness.

Other causes of lethargy, unconsciousness or convulsions in some regions of the world include dengue haemorrhagic fever, typhoid, and relapsing fever (see below, Fever—differential diagnosis, page 25).

Young infants

In young infants (less than 2 months old), consider the following differential diagnoses (Table 2):

Table 2 ***Differential diagnosis of the young infant (less than 2 months) presenting with lethargy, unconsciousness or convulsions.***

DIAGNOSIS or underlying cause	In favour
Birth asphyxia **Hypoxic ischaemic encephalopathy** **Birth trauma**	— Onset in first 3 days of life
Intracranial haemorrhage	— Onset in first 3 days of life in low-birth-weight or preterm birth
Haemolytic disease of the newborn, kernicterus	— Onset in first 3 days of life — Jaundice — Pallor — Serious bacterial infection
Neonatal tetanus	— Onset at age 3–14 days — Irritability — Difficulty in breastfeeding — Trismus — Muscle spasms — Convulsions
Meningitis	— Lethargy — Apnoeic episodes — Convulsions — High-pitched cry — Tense/bulging fontanelle
Sepsis	— Fever or hypothermia — Shock — Seriously ill with no apparent cause

Treatment

Unconscious, convulsing or lethargic children need immediate treatment and admission to hospital—except for children with febrile convulsions, who can often be sent home after recovery and after other causes are excluded. If meningitis is suspected and a lumbar puncture could not be carried out owing to signs of raised intracranial pressure, start antibiotic treatment immediately.

Treatment guidelines for the most common important medical causes of unconsciousness, lethargy and convulsion in the young child in developing countries are indicated below:

- meningitis (pages 62)
- cerebral malaria (page 59)
- hypoglycaemia (pages 13, 60 and 82)
- shock (pages 10, 11)
- meningitis or neonatal sepsis in young infant (pages 75, 76)

For details on management of other diagnoses (e.g. acute glomerulonephritis, poisoning, head injury, encephalitis, cerebral abscess, neonatal tetanus), see a standard paediatrics textbook.

2.2 Child presenting with cough or difficult breathing

2.2.1 Conditions presenting without wheeze, stridor or chronic cough

Most episodes of cough are due to the common cold, with each child having several episodes a year. The commonest severe illness presenting with cough or difficult breathing is pneumonia, which should be considered first in any differential diagnosis. However, there are other important causes of cough or difficult breathing which should not be forgotten (Table 3). The conditions listed in this section generally present without wheeze, stridor or chronic cough.

History

Pay particular attention to the following:

- cough
  - — duration in days
  - — paroxysms with whoops or vomiting or central cyanosis
- exposure to someone with tuberculosis (or chronic cough) in the family
- immunization history: DPT, measles, BCG
- history of choking or sudden onset of symptoms
- known HIV infection
- personal or family history of asthma.

Examination

General

- central cyanosis
- grunting
- nasal flaring
- severe palmar pallor
- head nodding (a movement of the head synchronous with inspiration indicating use of accessory muscles in severe respiratory distress)
- raised jugular venous pressure (JVP)
- wheeze
- stridor.

Chest

- respiratory rate (make a count during 1 minute when the child is calm)
  fast breathing: <2 months old: ≥60 breaths
  aged 2–12 months: ≥50 breaths
  aged 12 months to 5 years: ≥40 breaths
- lower chest wall indrawing
- apex beat displaced/trachea shifted from midline
- gallop rhythm of heart on auscultation
- percussion signs of pleural effusion (stony dullness) or pneumothorax (hyper-resonance)
- auscultation—coarse crackles or bronchial breath sounds.

Note: lower chest wall indrawing occurs when the lower chest wall goes in when the child breathes in; if only the soft tissue between the ribs or above the clavicle goes in when the child breathes, this is not lower chest wall indrawing

Abdomen

- lymphadenopathy
- enlarged liver or spleen.

Laboratory investigation

- blood smear
- haemoglobin.

An infant under 1 week of age can have severe respiratory distress without cough, see section 6.1, page 74.

Young infants

In the young infant consider, in addition, the following differential diagnosis (see Table 4, page 20).

Assessing the severity of pneumonia

The severity of pneumonia in children aged 1 week to 5 years must be assessed in order to decide on treatment (see Table 5, page 20).

Table 3 ***Differential diagnosis of the child presenting with cough or difficult breathing.***

DIAGNOSIS	In favour
Pneumonia	— Cough with fast breathing — Lower chest wall indrawing — Fever — Coarse crackles on auscultation — Nasal flaring — Grunting — Head nodding
Malaria	— Fast breathing in febrile child — Blood smear: high parasitaemia — Lives in or travelled to a malarious area — In severe malaria: deep (acidotic) breathing/lower chest wall indrawing — Chest clear on auscultation
Severe anaemia	— Severe palmar pallor — Haemoglobin <6 g/dl
Cardiac failure	— Gallop rhythm — Raised jugular venous pressure — Basal fine crackles — Apex beat displaced — Enlarged palpable liver — Heart murmur
Congenital heart disease	— Central cyanosis — Difficulty in feeding or breastfeeding — Enlarged liver — Heart murmur
Tuberculosis	— Chronic cough (more than 30 days) — Poor growth/wasting or weight loss — Positive contact history with tuberculosis patient — Diagnostic chest X-ray such as primary complex or miliary tuberculosis
Pertussis	— Paroxysms of cough followed by whoop, vomiting, cyanosis or apnoea — No fever — No history of DPT immunization
Foreign body	— History of sudden choking — Sudden onset of stridor or respiratory distress — Focal areas of wheeze or reduced breath sounds
Empyema	— Stony dullness to percussion
Pneumothorax	— Sudden onset — Hyper-resonance on percussion on one side of the chest — Shift in mediastinum
Pneumocystis pneumonia	— 2–6-month-old child with central cyanosis — Hyper-expanded chest — Fast breathing — Finger clubbing — Chest X-ray changes, but chest clear on auscultation — Enlarged liver, spleen, lymph nodes — Wasting — HIV test positive

Treatment

Treatment guidelines for the most common important medical causes of cough or difficult breathing in a young child in developing countries are indicated below:

For a child aged 2 months to 5 years:

- pneumonia (pages 29–32)
- malaria (pages 58–61)
- severe anaemia (pages 88 and 109)
- cardiac failure (page 43)
- tuberculosis (page 41)
- pertussis (page 39)
- foreign body (page 42)
- empyema (page 33)
- pneumonia with severe malnutrition (page 84)
- pneumocystis pneumonia (page 94).

For the young infant aged <2 months, see Chapter 6, page 74.

Table 4 ***Differential diagnosis of the young infant presenting with cough or difficult breathing.***

DIAGNOSIS	In favour
Respiratory distress syndrome (hyaline membrane disease)	— Pre-term birth — Onset within 1 hour of birth — Lower chest wall indrawing — Fast breathing — Grunting — Difficulty in breastfeeding
Sepsis	— Difficulty in breastfeeding — Lethargy — Hyper- or hypothermia — Difficult breathing
Meningitis	— Lethargy — Apnoeic episodes — Convulsions — High-pitched cry — Tense/bulging fontanelle
Neonatal tetanus	— Onset at age 3–14 days — Irritability — Difficulty in breastfeeding — Trismus — Muscle spasms — Convulsions

2.2.2 Conditions presenting with wheeze

In the first 2 years of life, wheezing is mostly caused by acute viral respiratory infections such as bronchiolitis or coughs and colds. After 2 years of age, most wheezing is due to asthma. Sometimes children with pneumonia present with wheeze. It is important always to consider pneumonia as a diagnosis, particularly in the first 2 years of life. In a child who has a more chronic illness, a tuberculous abscess causing pressure on the child's airway may cause wheeze. Table 6 presents the differential diagnosis.

Table 5 ***Classification of the severity of pneumonia.***

Sign or symptom	Classification	Treatment
— Central cyanosis — Severe respiratory distress (e.g. head nodding) — Not able to drink	**Very severe pneumonia**	— Admit to hospital — Give chloramphenicol — Give oxygen — Manage the airway — Treat high fever if present
— chest wall indrawing	**Severe pneumonia**	— Admit to hospital — Give benzylpenicillin — Manage the airway — Treat high fever if present
— Fast breathing *≥60 breaths/minute in a child aged <2 months;* *≥50 breaths/minute in a child aged 2–12 months;* *≥40 breaths/minute in a child aged from 12 months to 5 years* — Definite crackles on auscultation	**Pneumonia**	— Home care — Give appropriate antibiotic for 5 days — Soothe the throat and relieve cough with a safe remedy — Advise the mother when to return immediately — Follow up in 2 days
— No signs of pneumonia, or severe or very severe pneumonia	**No pneumonia: cough or cold**	— Home care — Soothe the throat and relieve cough with safe remedy — Advise the mother when to return — Follow up in 5 days if not improving — If coughing for more than 30 days, follow chronic cough instructions (see page 22)

History

- previous episodes of wheeze
- response to bronchodilators
- asthma diagnosis or long-term treatment for asthma.

Examination

- wheezing on expiration
- prolonged expiration
- resonant percussion note
- hyperinflated chest
- rhonchi on auscultation.

Response to rapid-acting bronchodilator

If the cause of the wheeze is not clear, or if the child has fast breathing or chest indrawing in addition to wheeze, give a rapid-acting bronchodilator and assess after 30 minutes. Response to a rapid-acting bronchodilator helps to determine the underlying diagnosis and treatment.

Give the rapid-acting bronchodilator by one of the following methods:

- nebulized salbutamol
- salbutamol by a metered dose inhaler with spacer device
- if neither of the above methods is available, give a subcutaneous injection of epinephrine (adrenaline).

See page 36 for details of how to administer the above.

Assess the response after 30 minutes. Signs of improvement are:

- less respiratory distress (easier breathing)
- less lower chest wall indrawing
- improved air entry.

Children who still have signs of hypoxia (i.e. central cyanosis, not able to drink due to respiratory distress, severe lower chest wall indrawing) or have fast breathing should be admitted to hospital for treatment.

Treatment

Treatment guidelines for various causes of wheeze are indicated below:

- bronchiolitis (page 34)
- asthma (page 35)
- cough and cold (page 37)
- pneumonia (pages 29–33)
- foreign body (page 42).

Table 6 ***Differential diagnosis of the child presenting with wheeze.***

DIAGNOSIS	In favour
Asthma	— History of recurrent wheeze, some unrelated to coughs and colds — Hyperinflation of the chest — Prolonged expiration — Reduced air entry (if very severe, airway obstruction) — Good response to bronchodilators
Bronchiolitis	— First episode of wheeze in a child aged <2 years — Wheeze at time of peak seasonal bronchiolitis — Hyperinflation of the chest — Prolonged expiration — Reduced air entry (if very severe, airway obstruction) — Poor/no response to bronchodilators
Wheeze associated with cough or cold	— Wheeze always related to coughs and colds — No family or personal history of asthma/eczema/hay fever — Prolonged expiration — Reduced air entry (if very severe, airway obstruction) — Good response to bronchodilators — Tends to be less severe than wheeze associated with asthma
Foreign body	— History of sudden onset of choking or wheezing — Wheeze may be unilateral — Air trapping with hyper-resonance and mediastinal shift — Signs of lung collapse: reduced air entry and dull percussion note — No response to bronchodilators
Pneumonia	— Cough with fast breathing — Lower chest wall indrawing — Fever — Coarse crackles — Nasal flaring — Grunting

Table 7 ***Differential diagnosis of the child presenting with stridor.***

DIAGNOSIS	In favour
Viral croup	— Barking cough — Respiratory distress — Hoarse voice — If due to measles, signs of measles (see pages 64–67)
Diphtheria	— Bull neck appearance due to enlarged cervical nodes and oedema — Red throat — Grey pharyngeal membrane — Blood-stained nasal discharge — No evidence of DTP vaccination
Foreign body	— Sudden history of choking — Respiratory distress
Congenital anomaly	— Stridor present since birth

2.2.3 ***Conditions presenting with stridor***

The major causes of severe stridor are viral croup (caused by measles or other viruses), diphtheria, foreign body, and trauma to the larynx (Table 7).

Bacterial tracheitis and acute epiglottitis are very rare in developing countries. In a child who has a more chronic illness, a tuberculous abscess causing pressure on the child's upper airway may cause stridor.

History

- first episode or recurrent episode of stridor
- history of choking
- stridor present soon after birth.

Examination

- bull neck appearance
- grey pharyngeal membrane
- blood-stained nasal discharge
- stridor present even when the child is quiet.

Treatment

Treatment guidelines for various causes of stridor are indicated below:

- viral croup (page 37)
- diphtheria (page 38)
- measles croup (pages 64–67)
- foreign body (page 42).

2.2.4 ***Conditions presenting with chronic cough***

Chronic cough is one that lasts for 30 days or more.

History

- duration of coughing
- nocturnal cough
- paroxysmal cough or associated severe bouts ending with vomiting or whooping
- persistent fever
- close contact with a known case of sputum-positive tuberculosis or with pertussis
- history of attacks of wheeze and a family history of allergy or asthma
- history of choking or inhalation of a foreign body
- child suspected or known to be HIV-infected.

Examination

- fever
- lymphadenopathy (e.g. in the neck)
- wasting
- wheeze/prolonged expiration
- apnoeic episodes
- subconjunctival haemorrhages
- signs associated with foreign body aspiration:
  - — unilateral wheeze
  - — area of decreased breath sounds which is either dull or hyper-resonant on percussion
  - — deviation of the trachea or apex beat.
- signs associated with HIV infection (see page 92).

Table 8 presents the differential diagnoses.

Treatment guidelines for the causes of chronic cough are indicated below:

- tuberculosis (page 41)
- asthma (page 35)
- foreign body (page 42)
- pertussis (pages 39, 40)
- HIV (pages 93–95).

For details on the management of other diagnoses (such as acute epiglottitis, lung abscess, bronchiectasis and congenital anomalies in the respiratory tract), see a standard paediatrics textbook.

Table 8 ***Differential diagnosis of the child presenting with chronic cough.***

DIAGNOSIS	In favour
Tuberculosis	— Weight loss — Anorexia, night sweats — Enlarged liver and spleen — Chronic or intermittent fever — History of exposure to infectious tuberculosis — Signs of fluid in chest (dull to percussion/reduced breath sounds)
Asthma	— History of recurrent wheeze, unrelated to coughs and colds — Hyperinflation of the chest — Prolonged expiration — Reduced air entry (in very severe airway obstruction) — Good response to bronchodilators
Foreign body	— Sudden onset of choking — Respiratory distress
Pertussis	— Paroxysms of cough followed by whoop, vomiting, cyanosis or apnoea — Subconjunctival haemorrhages — No history of DPT immunization
HIV	— Known or suspected maternal or sibling HIV infection — History of blood transfusion — Failure to thrive — Oral thrush — Chronic parotitis — Skin infection with herpes zoster (past or present) — Generalized lymphadenopathy — Chronic fever — Persistent diarrhoea — Finger clubbing
Bronchiectasis	— History of tuberculosis or aspirated foreign body — Poor weight gain — Purulent sputum, bad breath — Finger clubbing
Lung abscess	— Reduced breath sounds over abscess — Poor weight gain/chronically ill child — Typical chest X-ray appearance

2.3 Child presenting with diarrhoea

History

A careful feeding history is essential in the management of a child with diarrhoea. Also, inquire into the following:

- diarrhoea
  - — number of days
  - — blood in stools
- local reports of cholera outbreak
- recent antibiotic or other drug treatment
- attacks of crying with pallor in infant.

Examination

Look for:

- signs of some dehydration or severe dehydration:
  - — restlessness or irritability
  - — lethargy/reduced level of consciousness
  - — sunken eyes
  - — skin pinch returns slowly or very slowly
  - — thirsty/drinks eagerly, or drinking poorly or not able to drink
- blood in stool
- signs of severe malnutrition
- abdominal mass
- abdominal distension.

Diarrhoea in an infant less than 1 week of age is seldom an isolated problem. It should always be considered as a sign of neonatal sepsis (see section 6.1, page 74).

In managing a child with diarrhoea it is important to remember typhoid fever (see section 5.5, page 67), surgical conditions such as intussusception, antibiotic-associated diarrhoea and colitis.

Table 9 presents the differential diagnoses.

Young infants

In young infants, blood in the stools may indicate a surgical condition (see standard textbook of paediatrics). Consider also the following:

Table 9 ***Differential diagnosis of the child presenting with diarrhoea.***

DIAGNOSIS	In favour
Acute (watery) diarrhoea	— More than 3 stools per day — No blood in stools
Cholera	— Diarrhoea with severe dehydration during cholera outbreak — Positive stool culture for *V. cholerae* 01 or 0139
Dysentery	— Blood in stool (seen or reported)
Persistent diarrhoea	— Diarrhoea lasting 14 days or longer
Diarrhoea with severe malnutrition	— Any diarrhoea with signs of severe malnutrition (see page 83)
Diarrhoea associated with recent antibiotic use	— Recent course of broad-spectrum oral antibiotics
Intussusception	— Blood in stool — Abdominal mass (check with rectal examination) — Attack of crying with pallor in infant
DIAGNOSIS:	**In favour:**
Haemorrhagic disease of the newborn (vitamin K deficiency)	— Blood in stool in first 5 days of life

Assessing dehydration

In all children with diarrhoea, decide if dehydration is present and give appropriate treatment (see Table 10).

Treatment

Treatment guidelines for the most common important types of diarrhoea in the young child in developing countries are indicated below:

- acute (watery) diarrhoea (page 45)
- dysentery (pages 54, 55)
- cholera (page 46)
- persistent diarrhoea (pages 52–54)

Children with severe malnutrition who have diarrhoea require different management (see section 7.2.3, page 83).

For details on the management of other causes of diarrhoea (e.g. acute intussusception, antibiotic-related diarrhoea, and haemorrhagic disease of the newborn), see a standard paediatrics textbook.

2.4 Child presenting with fever

Special attention should be paid to the following in children presenting with fever:

History

- duration of fever
- residence in or recent travel to an area with *Plasmodium falciparum* transmission
- skin rash

Table 10 ***Classification of the severity of dehydration in children with diarrhoea.***

CLASSIFICATION	Signs or symptoms	Treatment
Severe dehydration	***Two*** or more of the following signs: — lethargy/unconsciousness — sunken eyes — unable to drink or drinks poorly — skin pinch goes back *very* slowly (≥2 seconds)	— Give fluid for severe dehydration (see Diarrhoea Treatment Plan C in hospital, page 48)
Some dehydration	***Two*** or more of the following signs: — restlessness, irritability — sunken eyes — drinks eagerly, thirsty — skin pinch goes back slowly	— Give fluid and food for some dehydration (see Diarrhoea Treatment Plan B, page 50) — Advise mother on home treatment and when to return immediately (see Chapter 11, page 116) — Follow up in 5 days if not improving.
No dehydration	Not enough signs to classify as some or severe dehydration	— Give fluid and food to treat diarrhoea at home (see Diarrhoea Treatment Plan A, page 52) — Advise mother on when to return immediately (see Chapter 11, page 121) — Follow up in 5 days if not improving.

- stiff neck or neck pain
- headache
- pain on passing urine
- ear pain.

Examination

- stiff neck
- haemorrhagic skin rash—purpura, petechiae
- skin sepsis—cellulitis or skin pustules
- discharge from ear/red immobile ear-drum on otoscopy
- severe palmar pallor
- refusal to move joint or limb
- local tenderness
- fast breathing.

Laboratory investigations

- blood smear
- LP if signs suggest meningitis (with no signs of raised intracranial pressure).

Differential diagnosis

There are three major categories of children presenting with fever:

- fever due to infection without localized signs (no rash) (see Table 11).
- fever due to infection with localized signs (no rash) (see Table 12).
- fever with rash (see Table 13).

Some causes of fever are only found in certain regions (e.g. dengue haemorrhagic fever, relapsing fever). Other fevers are seasonal (e.g. malaria, meningococcal meningitis) or can occur in epidemics (measles, meningococcal meningitis, typhus).

Treatment

Treatment guidelines for the most common important medical causes of fever in a young child in developing countries are indicated below:

For a child aged 2 months to 5 years:

- ear infections (pages 68–70)
- malaria (pages 58–61)
- measles (pages 65, 66)
- meningitis (including meningococcal) (pages 62–64)
- prolonged fever (pages 25–28)
- septicaemia (page 67)
- typhoid (page 68)
- urinary tract infection (pages 70, 71)
- viral upper respiratory infection (pages 33, 34)
- septic arthritis (page 71)
- osteomyelitis (page 71)
- HIV (pages 93–95)

For a young infant, aged <2 months (see Chapter 6, page 74):

- umbilical and skin infection (page 77)
- serious bacterial infection (meningitis/neonatal sepsis) (pages 75, 76).

2.4.1 ***Fever lasting longer than 7 days***

As there are many causes of prolonged fever, it is important to know the most common causes in a given area. Investigations for the most likely cause can then be started and treatment decided. Sometimes there has to be a "trial of treatment", e.g. for suspected tuberculosis or salmonella infections; if the child improves, this confirms the suspected diagnosis.

Table 11 ***Differential diagnosis of fever without localizing signs.***

DIAGNOSIS of fever	In favour
Malaria (only in children exposed to malaria transmission)	— Blood film positive — Severe anaemia — Enlarged spleen — Jaundice
Septicaemia	— Seriously and obviously ill with no apparent cause — Purpura, petechiae — Shock or hypothermia in young infant
Typhoid	— Seriously and obviously ill with no apparent cause — Abdominal tenderness — Shock — Confusion
Urinary tract infection	— Costo-vertebral angle or suprapubic tenderness — Crying on passing urine — Passing urine more frequently than usual — Incontinence in previously continent child — White blood cells and/or bacteria in urine on microscopy
Fever associated with HIV infection	— Signs of HIV infection (see Chapter 8, page 85)

Table 12 ***Differential diagnosis of fever with localized signs.***

DIAGNOSIS of fever	In favour
Meningitis	— LP positive — Stiff neck — Bulging fontanelle — Meningococcal rash (petechial or purpuric)
Otitis media	— Red immobile ear-drum on otoscopy — Pus draining from ear — Ear pain
Mastoiditis	— Tender swelling above or behind ear
Osteomyelitis	— Local tenderness — Refusal to move the affected limb — Refusal to bear weight on leg
Septic arthritis	— Joint hot, tender, swollen
Skin and soft tissue infection	— Cellulitis — Boils — Skin pustules — Pyomyositis (purulent infection of muscle)
Pneumonia (see section 3.1, pages 29–33, for other clinical findings)	— Cough with fast breathing — Lower chest wall indrawing — Fever — Coarse crackles — Nasal flaring — Grunting
Viral upper respiratory tract infection	— Symptoms of cough/cold — No systemic upset
Throat abscess	— Sore throat in older child — Difficulty in swallowing/drooling of saliva — Tender cervical nodes
Sinusitis	— Facial tenderness on percussion over affected sinus — Foul nasal discharge

History

Take a history as for fever (see above, page 24). In addition, ask if the child has a chronic illness such as rheumatoid arthritis or malignancy which may cause persistent fever.

Examination

Fully undress the child and examine the whole body for any localizing signs of infection:

- stiff neck (meningitis)
- red tender joint (septic arthritis or rheumatic fever)
- fast breathing or chest indrawing (pneumonia or severe pneumonia)
- petechial rash (meningococcal disease or dengue)
- maculopapular rash (viral infection or drug reaction)
- throat and mucous membranes (throat infection)
- red/painful ear with immobile ear-drum (otitis media)
- jaundice or anaemia (malaria or septicaemia)
- spine and hips (osteomyelitis)
- abdomen (suprapubic tenderness in urinary tract infection, palpable mass, tender kidneys).

Some causes of persistent fever may have no localizing signs—septicaemia, salmonella infections, miliary tuberculosis, HIV infection or urinary infection.

Laboratory investigations

Where available, perform the following:

- blood films for malaria parasites
- full blood count, including platelet count, and examination of a thin film for cell morphology
- urinalysis
- Mantoux test (*note*: it is often negative in a child with tuberculosis who has severe malnutrition or miliary tuberculosis)
- chest X-ray
- blood culture
- HIV testing (if the fever has lasted for more than 30 days and there are other reasons to suspect HIV infection)
- lumbar puncture (if there are signs of meningitis).

Table 13 ***Differential diagnosis of fever with rash.***

DIAGNOSIS of fever	In favour
Measles	— Typical rash — Cough, runny nose, red eyes — Mouth ulcers — Corneal clouding — Recent exposure to a measles case — No documented measles immunization
Viral infections	— Mild systemic upset — Transient non-specific rash
Meningococcal infection	— Petechial or purpuric rash — Bruising — Shock — Stiff neck (if meningitis)
Relapsing fever (borreliosis)	— Petechial rash/skin haemorrhages — Jaundice — Tender enlarged liver and spleen — History of relapsing fever — Positive blood smear for *Borrelia*
Typhus[a]	— Epidemic of typhus in region — Characteristic macular rash
Dengue haemorrhagic fever[b]	— Bleeding from nose or gums, or in vomitus — Bleeding in stools or black stools — Skin petechiae — Enlarged liver and spleen — Shock — Abdominal tenderness

[a] In some regions, other rickettsial infections may be relatively common.
[b] In some regions, other viral haemorrhagic fevers have a similar presentation to dengue.

Differential diagnosis

Review all the conditions included in Tables 11–13 above. *In addition*, consider the following causes for a fever lasting longer than 7 days (see Table 14).

Treatment

For details on the management of infective endocarditis, rheumatic fever, abscess, brucellosis, and regional causes of fever such as relapsing fever, typhus and other rickettsial infections, see a standard paediatrics textbook.

Table 14 ***Additional differential diagnosis of fever lasting longer than 7 days.***

DIAGNOSIS	In favour
Abscess	— Fever with no obvious focus of infection (deep abscess) — Tender or fluctuant mass — Local tenderness or pain — Specific signs depend on site—subphrenic, psoas, retroperitoneal, lung, renal, etc.
Salmonella infection	— Child with sickle-cell disease — Osteomyelitis or arthritis in infant — Anaemia associated with malaria
Infective endocarditis	— Weight loss — Enlarged spleen — Anaemia — Heart murmur — Petechiae — Splinter haemorrhages in nail beds — Microscopic haematuria — Finger clubbing

continued page 28

Table 14 ***(continued)***

DIAGNOSIS	In favour
Rheumatic fever	— Heart murmur which may change over time — Cardiac failure — Fast pulse rate — Pericardial friction rub — Chorea — Recent known streptococcal infection
Miliary tuberculosis	— Weight loss — Anorexia, night sweats — Systemic upset — Enlarged liver and/or spleen — Cough — Tuberculin test negative
Brucellosis (local knowledge of prevalence is important)	— Chronic relapsing or persistent fever — Malaise — Musculoskeletal pain — Lower backache or hip pain — Enlarged spleen — Anaemia — History of drinking unboiled milk
Borreliosis (relapsing fever) (local knowledge of prevalence important)	— Painful muscles and joints — Red eyes — Enlarged liver and spleen — Jaundice — Petechial rash — Decreased level of consciousness — Spirochaetes on blood film

CHAPTER 3

Cough or difficult breathing

Cough and difficult breathing are common problems in young children. The causes range from a mild, self-limited illness to severe, life-threatening disease. This chapter provides guidelines for managing the most important conditions that cause cough, difficult breathing, or both in children aged 2 months to 5 years. The differential diagnosis of these conditions is described in Chapter 2. Management of these problems in infants <2 months of age is described in Chapter 6, and in severely malnourished children in Chapter 7.

3.1 Pneumonia

Pneumonia, an infection of the lungs, is usually caused by viruses or bacteria. Most serious episodes are caused by bacteria. It is usually not possible, however, to determine the specific cause by clinical features or chest X-ray. Pneumonia is classified as very severe, severe or non-severe, based on the clinical features, with specific treatment for each of them. Antibiotic therapy is needed in all cases. Severe and very severe pneumonia require additional treatment, such as oxygen, to be given in hospital.

3.1.1 Very severe pneumonia

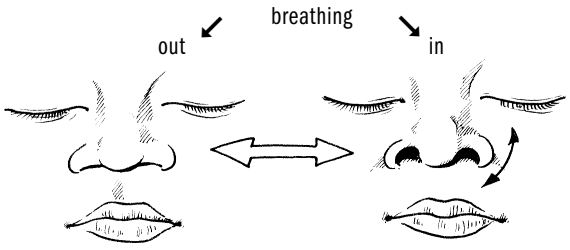
Diagnosis

Cough or difficult breathing plus *at least* one of the following:

- central cyanosis
- inability to breastfeed or drink, or vomiting everything
- convulsions, lethargy or unconsciousness
- severe respiratory distress (e.g. head nodding, see page 18).

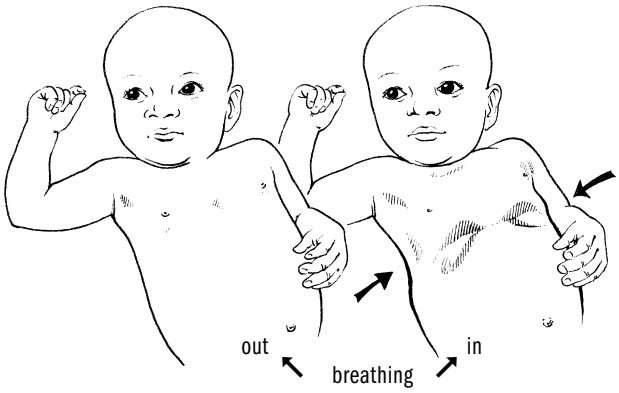
In addition, *some or all* of the other signs of pneumonia or severe pneumonia may also be present, such as:

— fast breathing: age <2 months: ≥60/minute
age 2–12 months: ≥50/minute
age 12 months to 5 years: ≥40/minute



Nasal flaring: with inspiration, the side of the nostrils flares outwards

— nasal flaring
— grunting
— lower chest wall indrawing (lower chest wall goes in when the child breathes in; if only the soft tissue between the ribs or above the clavicle goes in when the child breathes, this is not lower chest wall indrawing)



Lower chest wall indrawing: with inspiration, the lower chest wall moves in

— chest auscultation signs of pneumonia:
  — decreased breath sounds
  — bronchial breath sounds
  — crackles
  — abnormal vocal resonance (decreased over a pleural effusion, increased over lobar consolidation)
  — pleural rub.

If possible, obtain a chest X-ray to identify pleural effusion, empyema, pneumothorax, pneumatocoele, interstitial pneumonia and pericardial effusion.

Treatment

Admit the child with very severe pneumonia to hospital.

Antibiotic therapy

- Give *chloramphenicol* (25 mg/kg IM or IV every 8 hours) until the child has improved. Then continue orally 3 times a day for a total course of 10 days.
- If chloramphenicol is not available, give *benzylpenicillin* (50 000 units/kg IM or IV every 6 hours) and *gentamicin* (7.5 mg/kg IM once a day) for 10 days.
- If the child does not improve within 48 hours, switch to *gentamicin* (7.5 mg/kg IM once a day) and *cloxacillin* (50 mg/kg IM or IV every 6 hours), as described below for staphylococcal pneumonia. When the child improves, continue cloxacillin (or dicloxacillin) orally 4 times a day for a total course of 3 weeks.

Oxygen therapy

Give oxygen to all children with very severe pneumonia using nasal prongs, a nasal catheter, or a nasopharyngeal catheter. Use of nasal prongs is the best method for delivering oxygen to young infants. Face masks or head masks are *not* recommended. Oxygen supplies need to be available continuously at all times. A comparison of the different methods of oxygen administration and diagrams showing their use is given in section 9.5, page 109.

Continue with oxygen until the signs of hypoxia (such as severe lower chest wall indrawing, breathing rate of ≥70/minute, head nodding, or cyanosis) are no longer present. There is no value in giving oxygen after this time. Nurses should check every 3 hours that the catheter or prongs are not blocked with mucus and are in the correct place and that all connections are secure.

The two main sources of oxygen are cylinders and oxygen concentrators. It is important that all equipment is checked for compatibility and properly maintained, and that staff are instructed in their correct use.

Supportive care

- If the child has fever (≥39 °C) which appears to be causing distress, give paracetamol.
- If wheeze is present, give a rapid-acting bronchodilator (see page 36).
- Remove by gentle suction any thick secretions in the throat, which the child cannot clear.
- Ensure that the child receives daily maintenance fluids appropriate for the child's age (see section 9.2, page 108), but avoid overhydration.
  - — Encourage breastfeeding and oral fluids.
  - — If the child cannot drink, insert a nasogastric tube and give maintenance fluids in frequent small amounts. *If the child is taking fluids adequately by mouth, do not use a nasogastric tube as it increases the risk of aspiration pneumonia.* If oxygen is given by nasopharyngeal catheter at the same time as nasogastric fluids, pass both tubes through the same nostril.
- Encourage the child to eat as soon as food can be taken.

Monitoring

The child should be checked by nurses at least every 3 hours and by a doctor at least twice a day. In the absence of complications, within two days there should be signs of improvement (breathing not so fast, less indrawing of the lower chest wall, less fever, and improved ability to eat and drink).

Complications

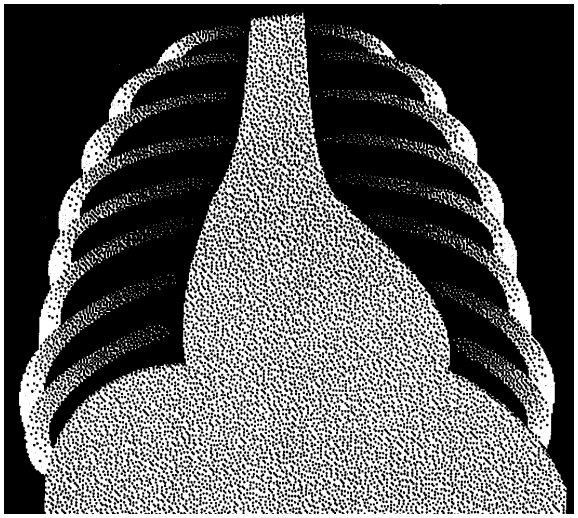
If the child has not improved after two days, or if the child's condition has worsened, look for complications or other diagnoses. If possible, obtain a chest X-ray. The most common complications are given below.

Staphylococcal pneumonia. This is suggested by rapid clinical deterioration despite treatment, by a pneumatocoele or pneumothorax with effusion on chest X-ray, numerous Gram-positive cocci in a smear of sputum, or heavy growth of *S. aureus* in cultured sputum or empyema fluid. The presence of septic skin pustules or soft tissue infection supports the diagnosis.

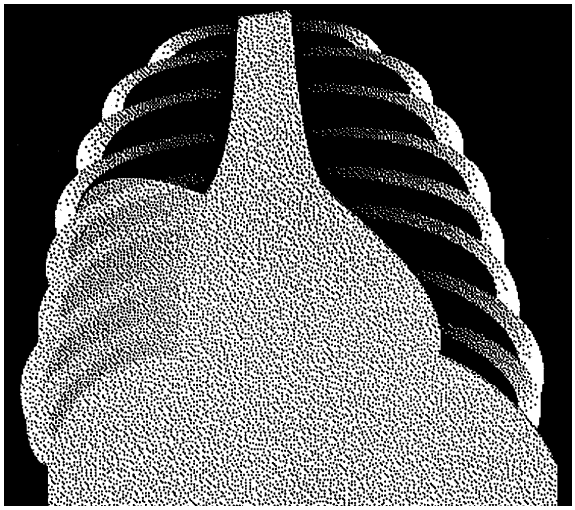
- Treat with *cloxacillin* (50 mg/kg IM or IV every 6 hours) and *gentamicin* (7.5 mg/kg IM or IV once a day). When the child improves, continue cloxacillin orally 4 times a day for a total course of 3 weeks. Note that cloxacillin can be substituted by another anti-staphylococcal antibiotic such as oxacillin, flucloxacillin, or dicloxacillin.

Empyema. This is suggested by persistent fever, and physical and chest X-ray signs of pleural effusion. Diagnosis and management are described in section 3.1.4, page 33.

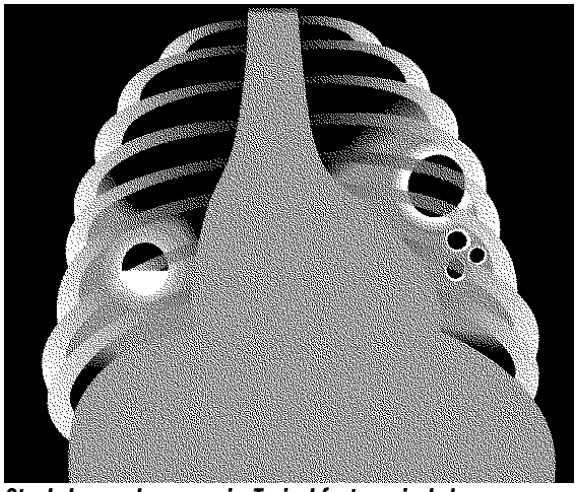
Tuberculosis. A child with persistent fever for more than 14 days and signs of pneumonia should be evaluated for tuberculosis. If another cause of the fever cannot be found, a trial of anti-tuberculosis



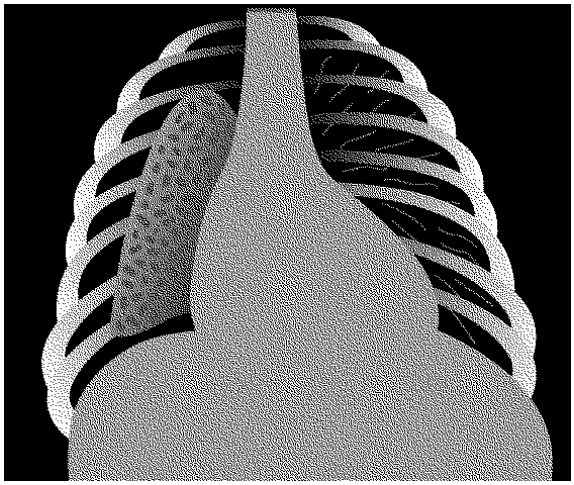
Normal chest X-ray



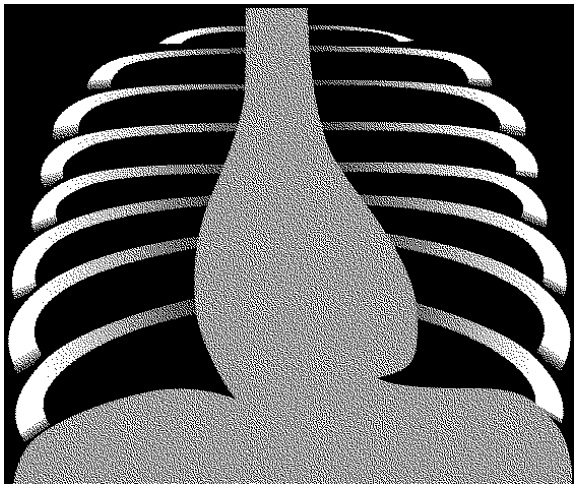
Lobar pneumonia of the right lower zone indicated by a consolidation (X-ray)



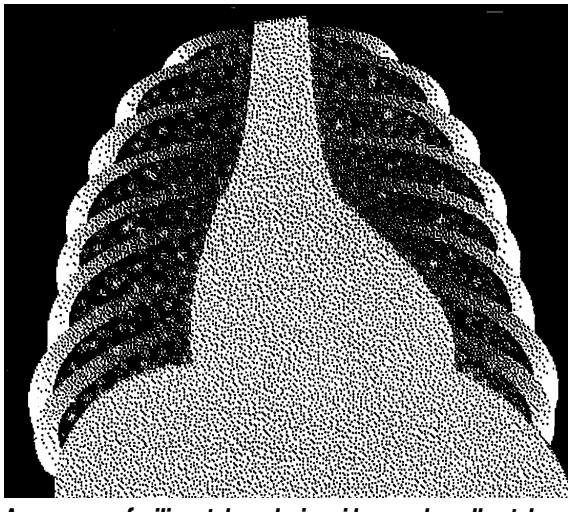
Staphylococcal pneumonia. Typical features include pneumatocoeles on the right side of the illustration, and an abscess with an air-fluid level on the left side of the illustration (X-ray).



Pneumothorax. The right lung (left side of the illustration) is collapsed towards the hilus, leaving a transparent margin around it without lung structure. In contrast, the right side (normal) demonstrates markings extending to the periphery (X-ray).



Hyperinflated chest. Features are an increased transverse diameter, ribs running more horizontally, a small contour of the heart, and flattened diaphragms (X-ray).



Appearance of miliary tuberculosis: widespread small patchy infiltrates throughout both lungs: "snow storm appearance" (X-ray).

treatment, following national guidelines, may be required (see section 3.6, page 41).

HIV infection and pneumonia. Most episodes of pneumonia in HIV-positive children have the same etiology and respond to the same treatment as in HIV-negative children (see Chapter 8, page 92). However, in an infant, a chest X-ray showing interstitial pneumonia suggests infection with *Pneumocystis carinii*. Treat with high doses of cotrimoxazole (8 mg/kg of trimethoprim and 40 mg/kg of sulfamethoxazole IV every 8 hours or orally 3 times a day) for 3 weeks.

3.1.2 ***Severe pneumonia***

Diagnosis

Cough or difficult breathing plus *at least* one of the following signs:

- lower chest wall indrawing
- nasal flaring
- grunting (in young infants).

Check that there are no signs of very severe pneumonia, such as:

- central cyanosis
- inability to breastfeed or drink
- vomiting everything
- convulsions, lethargy or unconsciousness
- severe respiratory distress.

In addition, some or all of the other signs of pneumonia may also be present:

— fast breathing: age <2 months: ≥60/minute
age 2–12 months: ≥50/minute
age 12 months to 5 years: ≥40/minute

— chest auscultation signs of pneumonia:
  — decreased breath sounds
  — bronchial breath sounds
  — crackles
  — abnormal vocal resonance (decreased over a pleural effusion, increased over lobar consolidation
  — pleural rub.

A routine chest X-ray rarely gives information which will change the management of severe pneumonia and is therefore not recommended.

Treatment

Admit or refer the child to hospital.

Antibiotic therapy

- Give *benzylpenicillin* (50 000 units/kg IM or IV every 6 hours) for at least 3 days.
- When the child improves, switch to oral *amoxicillin* (15 mg/kg 3 times a day). The total course of treatment is 5 days.
- If the child does not improve within 48 hours, or deteriorates, switch to *chloramphenicol* (25 mg/kg every 8 hours IM or IV) until the child has improved. Then continue orally for a total course of 10 days.

Oxygen therapy

If readily available, give oxygen to any child with severe lower chest wall indrawing or a respiratory rate of ≥70/minute. See section 9.5 (page 109).

Supportive care

See above (page 30), as described for very severe pneumonia.

Monitoring

The child should be checked by nurses at least every 6 hours and by a doctor at least once a day. Record the respiratory rate and temperature, and note the child's level of consciousness and ability to drink or breastfeed. In the absence of complications, within two days there should be signs of improvement (slower breathing, less chest indrawing, less fever, and improved ability to eat and drink).

Complications

See above (page 30), as described for very severe pneumonia.

3.1.3 ***Pneumonia (non-severe)***

Diagnosis

On examination, the child has cough or difficult breathing and fast breathing:

— age < 2 months: ≥60/minute
— age 2–12 months: ≥50/minute
— age 12 months to 5 years: ≥40/minute.

Check that the child has *none* of the signs of severe or very severe pneumonia given above in sections 3.1.1 and 3.1.2.

In addition, other signs of pneumonia (on auscultation) may be present: crackles, reduced breath sounds, or an area of bronchial breathing.

Treatment

Treat the child as an outpatient.

- Give cotrimoxazole (4 mg/kg trimethoprim/20 mg/kg sulfamethoxazole twice a day) for 5 days ***or*** amoxicillin (15 mg/kg 3 times a day) for 5 days.

- Give the first dose at the clinic and teach the mother how to give the other doses at home.

Follow-up

Encourage the mother to feed the child. Advise her to bring the child back after 2 days, or earlier if the child becomes more sick or is not able to drink or breastfeed. When the child returns:

- If the breathing has improved (slower), there is less fever, and the child is eating better, complete the 5 days of antibiotic treatment.
- If the breathing rate, fever and eating have not improved, change to the second-line antibiotic and advise the mother to return again in 2 days.
- If there are signs of severe or very severe pneumonia, *admit the child to hospital* and treat according to the guidelines described above.

3.1.4 ***Pleural effusion and empyema***

Diagnosis

A child with severe or very severe pneumonia may develop pleural effusion or empyema. On examination, the chest is dull to percussion and breath sounds are reduced or absent over the affected area. A pleural rub may be heard at an early stage before the effusion is fully developed.

A chest X-ray shows fluid on one or both sides of the chest. When empyema is present, fever persists despite antibiotic therapy and the pleural fluid is cloudy or frankly purulent.

Treatment

Drainage

Pleural effusions should be drained, unless they are very small. If effusions are present on both sides of the chest, drain both. It may be necessary to repeat drainage 2–3 times if fluid returns. See Appendix A1.6, page 134, for guidelines on chest drainage. Subsequent management depends on the character of the fluid obtained.

Where possible, pleural fluid should be analysed for protein and glucose content, cell count and differential count, and examined after Gram and Ziehl-Neelsen staining, and bacterial and *Mycobacterium tuberculosis* culture.

Antibiotic therapy

- Give *chloramphenicol* (25 mg/kg IM or IV every 8 hours) until the child has improved. Then continue orally 3 times a day for a total of 4 weeks.
- If infection with *Staphylococcus aureus* is identified, give *cloxacillin* (dose: 50 mg/kg IM or IV every 6 hours) and *gentamicin* (dose: 7.5 mg/kg IM or IV once a day) instead. When the child improves, continue with cloxacillin orally, 4 times a day. Continue treatment for a total of 3 weeks.

Failure to improve

If fever and other signs of illness continue, despite adequate chest drainage and antimicrobial therapy, assess for possible tuberculosis. A trial of anti-tuberculosis therapy may be required (see section 3.6, page 41).

3.2 Cough or cold

These are common, self-limited viral infections that require only supportive care. Antibiotics should not be given. Wheeze or stridor occur in some children, especially infants. Most episodes end within 14 days. Cough lasting 30 days or more may be caused by tuberculosis, asthma, pertussis or symptomatic HIV infection (see Chapter 8).

Diagnosis

Common features:

- cough
- nasal discharge
- mouth breathing
- fever.

The following are ***absent***:

— fast breathing
— lower chest wall indrawing
— stridor when the child is calm
— general danger signs.

Wheezing may occur in young children (see section 3.3, page 34).

Treatment

Treat the child as an outpatient.

- Soothe the throat and relieve the cough with a safe remedy, such as a warm, sweet drink.
- Relieve high fever of ≥39 °C (≥102.2 °F) with *paracetamol*, if this is causing distress to the child.
- Clear secretions from the child's nose before feeds using a cloth soaked in water, which has been twisted to form a pointed wick.

Do ***not*** give any of the following:

— an antibiotic (they are not effective and do not prevent pneumonia)
— remedies containing atropine, codeine or codeine derivatives, or alcohol (these may be harmful)
— medicated nose drops.

Clearing the child's blocked nose using a cloth wick soaked in water and twisted to form a point

Follow-up

Advise the mother to:

- feed the child
- watch for *fast or difficult breathing* and return, if either develops
- *return* if the child becomes more sick, or is not able to drink or breastfeed.

3.3 Conditions presenting with wheeze

Wheeze is a high-pitched whistling sound near the end of each expiration. It is caused by spasmodic narrowing or inflammation of the distal airways. To hear a wheeze, even in mild cases, place the ear next to the child's mouth and listen to the breathing while the child is calm, or use a stethoscope to listen for wheezes or rhonchi.

3.3.1 Bronchiolitis

Bronchiolitis is a lower respiratory viral infection, which typically is most severe in young infants, occurs in annual epidemics, and is characterized by airways obstruction and wheezing. Respiratory syncytial virus is the most important cause. Secondary bacterial infection may occur and is common in some settings. The management of bronchiolitis is therefore similar to that of pneumonia. Episodes of wheeze may occur for months after an attack of bronchiolitis, but eventually will stop.

Diagnosis

Typical features of bronchiolitis, on examination, include:

- wheezing which is *not* relieved by bronchodilators
- hyperinflation of the chest, with increased resonance to percussion
- lower chest wall indrawing
- fine crackles or rhonchi on auscultation of the chest
- difficulty in feeding, breastfeeding or drinking owing to respiratory distress.

Treatment

Most children can be treated at home, but those with the following signs should be *treated in hospital*:

Signs of severe or very severe pneumonia (see sections 3.1.1 and 3.1.2):

- central cyanosis
- inability to breastfeed or drink, or vomiting everything
- convulsions, lethargy or unconsciousness
- severe lower chest wall indrawing
- nasal flaring
- grunting (in young infants).

OR signs of respiratory distress:

- obvious discomfort in breathing
- difficulty in drinking, feeding or talking.

Antibiotic treatment

- *If treated at home*, give cotrimoxazole (4 mg/kg trimethoprim/20 mg/kg sulfamethoxazole twice a day) or amoxicillin (15 mg/kg 3 times a day) orally for 5 days.
- If there is *respiratory distress* but the child is able to drink and there is no central cyanosis, give benzylpenicillin (50 000 units/kg IM or IV every 6 hours) for at least 3 days. When the child improves, switch to oral amoxicillin (15 mg/kg 3 times a day). The total course of treatment is 5 days.
- If there are signs of *very severe pneumonia* (central cyanosis or inability to drink), give chloramphenicol (25 mg/kg IM or IV every 8 hours) until the child improves. Then continue by mouth 3 times a day for a total of 10 days.

Oxygen

Give oxygen to all children with wheezing and severe respiratory distress (as for pneumonia: see sections 3.1.1 and 3.1.2). The recommended methods for oxygen delivery are by nasal prongs or nasal catheter. It is also possible to use a nasopharyngeal

catheter. Nasal prongs are the best oxygen delivery method for young infants: see section 9.5, page 109.

Continue oxygen therapy until the signs of hypoxia are no longer present, after which there is no value in continuing with oxygen. The nurse should check, every 3 hours, that the catheter or prongs are in the correct position and not blocked with mucus, and that all connections are secure.

Supportive care

- If the child has fever (≥39 °C or ≥102.2 °F) which appears to be causing distress, give paracetamol.
- Ensure that the hospitalized child receives daily maintenance fluids appropriate for the child's age and weight (see section 9.2, page 108), but avoid over-hydration. Encourage breastfeeding and oral fluids.
- Encourage the child to eat as soon as food can be taken.

Monitoring

A hospitalized child should be assessed by a nurse every 6 hours (or every 3 hours, if there are signs of very severe illness) and by a doctor at least once a day. Monitor oxygen therapy as described on page 111. Watch especially for signs of respiratory failure, i.e. increasing hypoxia and respiratory distress leading to exhaustion.

Complications

If the child fails to respond to oxygen therapy, or the child's condition worsens suddenly, obtain a chest X-ray to look for evidence of pneumothorax. Tension pneumothorax associated with severe respiratory distress and shift of the heart requires immediate relief by placing a needle in the affected area to allow the air that is under pressure to escape. (Following this, continuous air exit should be assured by inserting a chest tube with an underwater seal until the air leak closes spontaneously and the lung expands).

3.3.2 *Asthma*

Asthma is a chronic inflammatory condition with reversible airways obstruction. It is characterized by recurrent episodes of wheezing, often with cough, which respond to treatment with bronchodilators and anti-inflammatory drugs. Antibiotics should be given only when there are signs of pneumonia.

Diagnosis

History of recurrent episodes of wheezing, often with cough. Findings on examination may include:

- hyperinflation of the chest
- lower chest wall indrawing
- prolonged expiration with audible wheeze
- reduced air intake when obstruction is severe
- absence of fever
- good response to treatment with a bronchodilator.

If the diagnosis is uncertain, give a dose of a rapid-acting bronchodilator (see Appendix A2.7, page 142). A child with asthma will usually improve rapidly, showing signs such as a decrease in the respiratory rate and chest wall indrawing and less respiratory distress. A child with severe asthma may require several doses before a response is seen.

Treatment

- A child with the ***first episode of wheezing and no respiratory distress*** can usually be managed at home with supportive care only. A bronchodilator is not necessary.
- If the child is in ***respiratory distress or has recurrent wheezing***, give salbutamol by nebulizer or metered-dose inhaler. If salbutamol is not available, give subcutaneous epinephrine. Reassess the child after 30 minutes to determine subsequent treatment:
  - — *If respiratory distress has resolved*, and the child does not have fast breathing, advise the mother on home care with oral salbutamol syrup or tablets (see Appendix A2.7, page 142).
  - — *If respiratory distress persists*, admit to hospital and treat with oxygen, rapid-acting bronchodilators and other drugs, as described below.
- If the child has ***central cyanosis or is unable to drink***, admit to hospital and treat with oxygen, rapid-acting bronchodilators and other drugs, as described below.

In children admitted to hospital, give oxygen, a rapid-acting bronchodilator, and a first dose of steroids (oral or IV) promptly. A positive response to these should be seen in 30 minutes, i.e. less respiratory distress, and better air entry on auscultation. If this does not occur, give the rapid-acting bronchodilator at up to 1-hourly intervals. If there is no response after 3 doses of rapid-acting bronchodilator, add IV aminophylline.

Oxygen

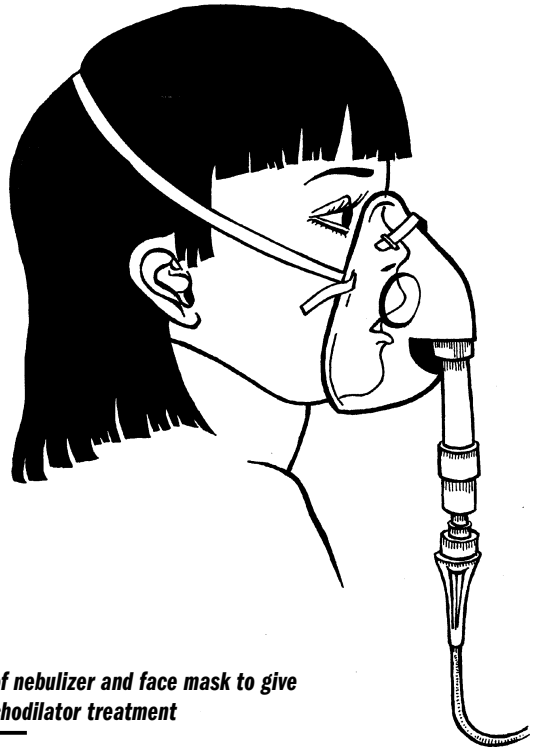
Give oxygen to all children with asthma, whose difficulty in breathing interferes with talking, eating or breastfeeding. See guidelines above in section 3.3.1.

Rapid-acting bronchodilators

Give the child one of the three rapid-acting bronchodilators—nebulized salbutamol, salbutamol by metered-dose inhaler with a spacer device, or subcutaneous epinephrine (adrenaline), as described below.

(1) Nebulized salbutamol

The driving source for the nebulizer must deliver at least 6–9 litres/minute. Recommended methods are an air compressor or oxygen cylinder. If neither is available, use a durable and easy-to-operate foot-pump, although this is less effective.



Use of nebulizer and face mask to give bronchodilator treatment

Place the bronchodilator solution and 2–4 ml of sterile saline in the nebulizer compartment and treat the child until the liquid is almost all used up. The dose of salbutamol is 2.5 mg (i.e. 0.5 ml of the 5 mg/ml nebulizer solution). This can be given 4-hourly, reducing to 6–8 hourly once the child's condition improves. If necessary in severe cases, it can be given hourly.

(2) Salbutamol by metered-dose inhaler with a spacer device

Spacer devices with a volume of 750 ml are commercially available. Introduce two puffs (200 micrograms) into the spacer chamber. Then place the child's mouth over the opening in the spacer and allow normal breathing for 3–5 breaths. This can be repeated 4-hourly, reducing to 6–8 hourly after the child's condition improves. If necessary in severe cases, it can be given hourly. Some infants and young children cooperate better when a face mask is attached to the spacer instead of the mouthpiece.

Use of spacer device and face mask to give bronchodilator treatment

If commercial devices are not available, a spacer device can be made from a plastic cup or a 1-litre plastic bottle. These require 3–4 puffs of salbutamol and the child should breathe from the device for up to 30 seconds.

(3) Subcutaneous epinephrine (adrenaline)

If the above two methods of delivering salbutamol are not available, give a subcutaneous injection of epinephrine (adrenaline)—0.01 ml/kg of 1:1000 solution (up to a maximum of 0.3 ml), measured accurately with a 1 ml syringe (for injection technique, see Appendix 1, A1.1, page 124). If there is no improvement after 20 minutes, repeat the dose once.

Oral bronchodilators

Once the child has improved to be discharged, oral salbutamol (syrup or tablets) can be given if inhaled salbutamol is not available. The dose is:

age 2–12 months: 1 mg 6–8 hourly
age 12 months to 5 years: 2 mg 6–8 hourly.

Steroids

If a child has a severe acute attack of wheezing *and* a history of recurrent wheezing, give oral prednisolone, 1 mg/kg once a day, for 3 days. If the child remains

very sick, continue the treatment until improvement is seen. Steroids are not usually required for the first episode of wheezing.

Aminophylline

If a child does not improve after 3 doses of a rapid-acting bronchodilator plus oral prednisolone, give IV aminophylline—initial dose of 5–6 mg/kg (up to a maximum of 300 mg), followed by a maintenance dose of 5 mg/kg every 6 hours. Weigh the child carefully and give the IV dose over at least 20 minutes and preferably over 1 hour.

Intravenous aminophylline can be dangerous in an overdose or when given too rapidly. *Omit the initial dose if the child has already received any form of aminophylline in the previous 24 hours*. Stop giving it immediately if the child starts to vomit, has a pulse rate >180/min, develops a headache, or has a convulsion. If IV aminophylline is not available, aminophylline suppositories are an alternative.

Antibiotics

Antibiotics should *not* be given routinely for asthma or to a child with asthma who has fast breathing *without* fever. Antimicrobial treatment is indicated, however, when there is persistent fever and other signs of pneumonia (see section 3.1, page 29).

Supportive care

Ensure that the child receives daily maintenance fluids appropriate for his/her age (see page 108). Encourage breastfeeding and oral fluids. Encourage adequate complementary feeding for the young child, as soon as food can be taken.

Monitoring

A hospitalized child should be assessed by a nurse every 3 hours, or every 6 hours as the child shows improvement (i.e. decreased breathing rate, less lower chest wall indrawing, and less respiratory distress), and by a doctor at least once a day. Record the respiratory rate and watch especially for signs of respiratory failure—increasing hypoxia and respiratory distress leading to exhaustion. If the response to treatment is poor, give salbutamol more frequently, up to once every 60 minutes. If this is ineffective, give aminophylline. Monitor oxygen therapy as described on page 30.

Complications

If the child fails to respond to the above therapy, or the child's condition worsens suddenly, obtain a chest X-ray to look for evidence of pneumothorax. Treat as described on page 35.

3.3.3 *Wheeze with cough or cold*

Most first episodes of wheezing in children aged <2 years are associated with cough and cold. These children are not likely to have a family history of atopy (e.g. hay fever, eczema, allergic rhinitis) and their wheezing episodes become less frequent as they grow older. The wheezing, if troublesome, often responds to oral salbutamol treatment at home.

3.4 Conditions presenting with stridor

Stridor is a harsh noise during inspiration, which is due to narrowing of the air passage in the oropharynx, subglottis or trachea. If the obstruction is severe, stridor may also occur during expiration.

3.4.1 *Viral croup*

Croup causes obstruction in the upper airway which, when severe, can be life-threatening. Most severe episodes occur in infants. This section deals with croup caused by various respiratory viruses. For croup associated with measles, see pages 64–66.

Diagnosis

Mild croup is characterized by:

- fever
- a hoarse voice
- a barking or hacking cough
- stridor that is heard only when the *child is agitated*.

Severe croup is characterized by:

- stridor when the *child is quiet*
- rapid breathing and indrawing of the lower chest wall.

Treatment

Mild croup can be managed at home with supportive care, including encouraging oral fluids, breastfeeding or feeding, as appropriate.

A child with ***severe croup*** should be admitted to hospital for treatment as follows:

1. *Oxygen*. Give oxygen to all children with lower chest wall indrawing, using *nasal prongs* only. Do *not* use a nasopharyngeal or a nasal catheter because they can provoke paroxysms of coughing. Continue with oxygen therapy until the lower chest wall indrawing is no longer present, after which there is no value in giving oxygen. Every 3 hours, the nurse should check that the prongs are in the correct place and not blocked with mucus, and that all connections are secure. See section 9.5 (page 109) for further details.

2. *Steroid treatment*. Give one dose of oral dexamethasone (0.6 mg/kg) or equivalent dose or some other steroid (see Appendix 2, section A2.7, page 142).
3. *Epinephrine (adrenaline)*. As a trial, give the child nebulized epinephrine (1:1000 solution). If this is effective, repeat as often as every 2 hours, with careful monitoring. While this treatment can lead to improvement within 30 minutes in some children, it is often temporary and lasts only about 2 hours.
4. *Antibiotics*. These are not effective and should *not* be given.
5. *Intubation and tracheostomy*. If there are signs of incipient airway obstruction, such as severe indrawing of the lower chest wall and restlessness, intubate the child immediately. If this is not possible, transfer the child urgently to a hospital where intubation or emergency tracheostomy can be done. If this is not possible, monitor the child closely and ensure that facilities for an emergency tracheostomy are immediately available, as airway obstruction can occur suddenly. Tracheostomy should only be done by experienced staff.

Supportive care

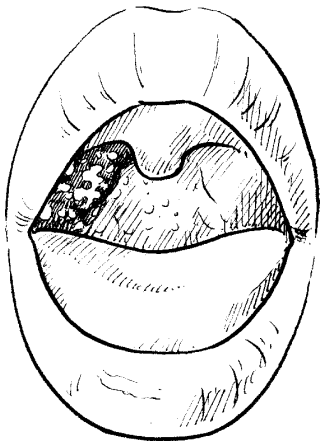
- If the child has fever (≥39 °C or higher) which appears to be causing distress, give paracetamol.
- Encourage breastfeeding and oral fluids. Avoid parenteral fluids, which are usually not required.
- Encourage the child to eat as soon as food can be taken.
- Avoid using mist tents which are not effective. They separate the child from the parents and make observation of the child's condition very difficult.

Monitoring

The child's condition, especially respiratory status, should be assessed by nurses every 3 hours and by doctors twice a day. The child should occupy a bed close to the nursing station, so that any sign of incipient airway obstruction can be detected as soon as it develops.

3.4.2 *Diphtheria*

Diphtheria is a bacterial infection which can be prevented by immunization. Infection in the upper airway or nasopharynx produces a grey membrane which, when present in the larynx or trachea, can cause stridor and obstruction. Nasal involvement produces a bloody discharge. Diphtheria toxin causes muscular paralysis and myocarditis, which is associated with increased mortality.



Pharyngeal membrane of diphtheria. Note: the membrane extends beyond the tonsils and covers the adjacent pharyngeal wall.

Diagnosis

Carefully examine the child's nose and throat and look for a grey, adherent membrane, which cannot be wiped off with a swab. Great care is needed when examining the throat, as this may precipitate complete obstruction of the airway. A child with pharyngeal diphtheria may have an obviously swollen neck, termed a 'bull neck'.

Treatment

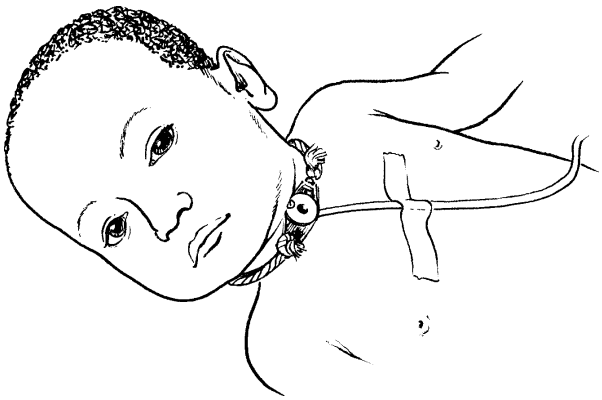
Antibiotics. Any child with suspected diphtheria should be given procaine penicillin (50 000 units/kg IM) daily for 7 days.

Antitoxin. Give 40 000 units of diphtheria antitoxin (IM or IV) *immediately*, because delay can lead to increased mortality. As there is a small risk of a serious allergic reaction to the horse serum in this product, an initial intradermal test to detect hyper-

Bull neck—a sign of diphtheria due to enlarged lymph nodes in the neck

sensitivity should be carried out, as described in the instructions.

Oxygen. Avoid using oxygen *unless* there is incipient airway obstruction. Signs such as severe indrawing of the lower chest wall and restlessness are more likely to indicate the need for tracheostomy (or intubation) than oxygen. Moreover, the use of nasal prongs or a nasal or nasopharyngeal catheter can upset the child and precipitate obstruction of the airway. However, oxygen *should* be given, if there is incipient airway obstruction and a tracheostomy is deemed necessary and is to be performed.



Child with tracheostomy tube in position

Tracheostomy/intubation. Tracheostomy should be performed only by experienced staff, if there are signs of incipient airway obstruction, such as severe lower chest wall indrawing and restlessness. If obstruction occurs, an emergency tracheostomy should be carried out. Orotracheal intubation is an alternative, but may dislodge the membrane and fail to relieve the obstruction.

Supportive care

- If the child has fever (≥39 °C or ≥102.2 °F) and this appears to be causing distress, give paracetamol.
- Encourage the child to eat and drink. If there is difficulty in swallowing, nasogastric feeding is required.
- Avoid frequent examinations or disturbing the child unnecessarily.

Monitoring

The child's condition, especially respiratory status, should be assessed by nurses every 3 hours and by doctors twice a day. The child should occupy a bed close to the nursing station, so that any sign of incipient airway obstruction can be detected as soon as it develops.

Complications

Myocarditis and paralysis may occur 2–7 weeks after the onset of illness. Signs of *myocarditis* include a weak, irregular pulse and evidence of heart failure. Refer to standard paediatric textbooks for details of the diagnosis and management of myocarditis.

Public health measures

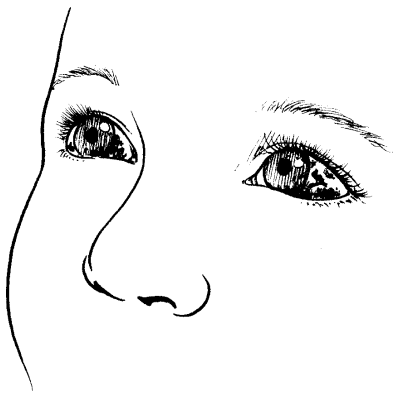
- Nurse the child in a separate room using staff who are fully immunized against diphtheria.
- Give all *immunized* household contacts a diphtheria toxoid booster.
- Give all *unimmunized* household contacts one IM dose of benzathine penicillin (600 000 units to those aged ≤5 years; 1 200 000 units to those aged >5 years). Immunize them with diphtheria toxoid and check daily for 5 days for any signs of diphtheria.

3.5 Pertussis

Pertussis, a respiratory infection characterized by bronchitis which resolves slowly, is most severe in young infants who have not yet been immunized. After an incubation period of 7–10 days, the child develops fever, usually with a cough and nasal discharge which clinically are indistinguishable from a common cough and cold. In the second week, there is paroxysmal coughing which can be recognized as pertussis. The episodes of coughing can continue for 3 months or longer. The child is infectious for a period of 2 weeks up to 3 months after the onset of illness.

Diagnosis

Suspect pertussis if a child has been having a severe cough for more than two weeks, especially if the disease is known to be occurring locally. The most useful diagnostic signs are:



Subconjunctival haemorrhages prominent on the white sclera

- paroxysmal coughing followed by a whoop when breathing in, often with vomiting
- subconjunctival haemorrhages
- child not immunized against pertussis.

Young infants may not whoop; instead, the cough may be followed by suspension of breathing (apnoea) or cyanosis, or apnoea may occur without coughing. Also, examine the child for signs of pneumonia and ask about convulsions.

Treatment

Treat mild cases in children aged ≥6 months at home with supportive care. Admit infants aged <6 months to hospital; also admit any child with pneumonia, convulsions, dehydration, severe malnutrition, or prolonged apnoea or cyanosis after coughing.

Antibiotics

- Give oral erythromycin (12.5 mg/kg four times a day) for 10 days. This does not shorten the illness but reduces the period of infectiousness.
- If there is fever, give oral chloramphenicol (25 mg/kg three times a day) for 5 days to treat possible secondary pneumonia. Follow the other guidelines for severe pneumonia (see section 3.1.2, page 32). If chloramphenicol is not available, give cotrimoxazole, as described for pneumonia (non-severe) (see section 3.1.3, page 32).

Oxygen

Give oxygen to children who have spells of apnoea or cyanosis, or severe paroxysms of coughing. Use nasal prongs, *not* a nasopharyngeal catheter or nasal catheter which can provoke coughing. Place the prongs just inside the nostrils and secure with a piece of tape just above the upper lip. Care should be taken to keep the nostrils clear of mucus since this blocks the flow of oxygen. Set a flow rate of 1–2 litres/min (0.5 litre/min in young infants). Humidification is not required with nasal prongs.

Continue oxygen therapy until the above signs are no longer present, after which there is no value in continuing with oxygen. The nurse should check, every 3 hours, that the prongs or catheter are in the correct place and not blocked with mucus, and that all connections are secure. See section 9.5 (page 109) for further details.

Airway management

During paroxysms of coughing, place the child head down and prone, or on the side, to prevent any inhaling of vomitus and to aid expectoration of secretions.

- If the child has *cyanotic* episodes, clear secretions from the nose and throat with brief, gentle suction.
- If *apnoea* occurs, clear the airway immediately with gentle suction, give manual respiratory stimulation or bag ventilation, and administer oxygen.

Supportive care

- Avoid, as far as possible, any procedure that could trigger coughing, such as application of suction, throat examination, and use of a nasogastric tube.
- Do *not* give cough suppressants, sedatives, mucolytic agents or antihistamines.
- If the child has fever (≥39 °C or higher) which appears to be causing distress, give paracetamol.
- Encourage breastfeeding or oral fluids. If the child cannot drink, pass a nasogastric tube and give small, frequent amounts of fluid to meet the child's maintenance needs (see pages 105–108). If there is respiratory distress, give maintenance fluids IV to avoid the risk of aspiration and reduce triggering of coughing. Ensure adequate nutrition by giving smaller, more frequent feeds. If there is continued weight loss despite theses measures, feed the child by nasogastric tube.

Monitoring

The child should be assessed by nurses every 3 hours and by the doctor once a day. To facilitate observation for early detection and treatment of apnoeic or cyanotic spells, or severe episodes of coughing, the child should occupy a bed in a place close to the nursing station where oxygen is available. Also, teach the child's mother to recognize apnoeic spells and to alert the nurse if this should occur.

Complications

Pneumonia. This most common complication of pertussis is caused by secondary bacterial infection or inhalation of vomited material. Signs suggesting pneumonia include fast breathing between coughing episodes, fever, and the rapid onset of respiratory distress. Treat pneumonia in children with pertussis as follows:

- Give chloramphenicol (dose: 25 mg/kg every 8 hours) for 5 days.
- Give oxygen as described for the treatment of very severe pneumonia (see sections 3.1.1 and 9.5, pages 30 and 109).

Convulsions. These may result from anoxia associated with an apnoeic or cyanotic episode, or toxin-mediated encephalopathy. If a convulsion does not stop within two minutes, give an anticonvulsant (diazepam or paraldehyde), following guidelines in Chapter 1 (Chart 9, page 12).

Malnutrition. Children with pertussis may become malnourished as a result of reduced food intake and frequent vomiting. Prevent malnutrition by ensuring adequate feeding, as described above, under "supportive care".

Haemorrhage and hernias. Subconjunctival haemorrhage and epistaxis are common during pertussis. No specific treatment is needed. Umbilical or inguinal hernias may be caused by violent coughing. Do not treat them unless there are signs of bowel obstruction, but refer the child for surgical evaluation after the emergency.

Public health measures

Give DPT immunization to any child in the family who is not fully immunized and to the child with pertussis. Give a DPT booster to previously immunized children. Give erythromycin (12.5 mg/kg 4 times a day) for 5 days to any infant in the family who is aged <6 months and has fever or other signs of a respiratory infection.

3.6 Tuberculosis

Most children infected with *Mycobacterium tuberculosis* do not develop tuberculosis disease. The only evidence of infection may be a positive skin test. The development of tuberculosis disease depends on the competence of the immune system to resist multiplication of the *M. tuberculosis* infection. This competence varies with age, being least in the very young. HIV and malnutrition lower the body's defences, and measles and whooping cough temporarily impair the strength of the immune system. In the presence of any of these conditions, tuberculosis disease can develop more easily.

Tuberculosis is most often severe when the disease is located in the lungs or meninges. Bones, joints, abdomen, cervical lymph nodes, ear, eye, and skin may also be affected. Many children present only with failure to grow normally, weight loss or prolonged fever. Cough for more than 30 days can also be a presenting sign; in children, however, sputum-positive tuberculosis is rarely diagnosed.

Diagnosis

The risk of tuberculosis is increased when there is an active case (infectious, smear-positive tuberculosis) in the same house, or when the child is malnourished, has HIV/AIDS, or has had measles in the past few months. Consider tuberculosis in any child with:

- A ***history*** of:
  - unexplained weight loss or failure to grow normally;
  - unexplained fever, especially when it continues for more than 2 weeks;
  - chronic cough (i.e. cough for more than 30 days, with or without a wheeze);
  - exposure to an adult with probable or definite pulmonary infectious tuberculosis.
- On ***examination***:
  - fluid on one side of the chest (reduced air entry, stony dullness to percussion);
  - enlarged non-tender lymph nodes or a lymph node abscess, especially in the neck;
  - signs of meningitis, especially when these develop over several days and the spinal fluid contains mostly lymphocytes and elevated protein;
  - abdominal swelling, with or without palpable lumps;
  - progressive swelling or deformity in the bone or a joint, including the spine.

Investigations

Try to obtain specimens for preparation of smears for ***microscopic examination*** of acid-fast bacilli (Ziehl-Nielsen stain) and for culture of tubercle bacilli. Possible specimens include three consecutive early morning gastric aspirates, CSF (if clinically indicated), and pleural fluid and ascites fluid. Owing to low detection rates by these methods, a positive result would confirm tuberculosis, but a negative result does not exclude the disease.

Obtain a ***chest X-ray*** (see figures on page 31). A diagnosis of tuberculosis is supported when a chest X-ray shows a miliary pattern of infiltrates or a persistent area of infiltrate or consolidation, often with pleural effusion.

Perform a ***PPD (tuberculin) skin test***. The test is usually positive in children with pulmonary tuberculosis (≥10-mm reaction is suggestive of tuberculosis; <10 mm in a child, previously immunized with BCG, is equivocal). However, the PPD test may be negative in children with tuberculosis who have HIV/AIDS or when there is miliary disease, severe malnutrition or recent measles.

Treatment

Give a full course of treatment to all confirmed or *highly suspected* cases. When in doubt, e.g. in a child highly suspected of tuberculosis or who fails to respond to treatment for other likely diagnoses, give treatment for tuberculosis. Treatment failures for other diagnoses include antibiotic treatment for apparent bacterial pneumonia (when the child has

pulmonary symptoms), or for possible meningitis (when the child has neurological symptoms), or for intestinal worms or giardiasis (when the child fails to thrive or has diarrhoea or abdominal symptoms).

Follow the treatment recommended by the national tuberculosis programme. Inform this programme and arrange for adequate monitoring. If national recommendations are not available, follow the WHO guidelines which are given below.

1. **In the majority of cases of childhood tuberculosis (i.e. in the absence of smear-positive pulmonary tuberculosis or severe disease), give:**

   First 2 months (initial phase): isoniazid + rifampicin + pyrazinamide daily *or* 3 times a week,

   followed by EITHER

   Next 6 months (continuation phase): isoniazid + ethambutol *or* isoniazid + thioacetazone daily; *OR*

   Next 4 months (continuation phase): isoniazid + rifampicin daily *or* 3 times a week.

2. **In the case of smear-positive pulmonary tuberculosis or severe disease, give the following treatment:**

   First 2 months (initial phase): isoniazid + rifampicin + pyrazinamide + streptomycin (or ethambutol) daily *or* 3 times a week,

   followed by EITHER

   Next 6 months (continuation phase): isoniazid + ethambutol *or* isoniazid + thioacetazone daily; *OR*

   Next 4 months (continuation phase): isoniazid + rifampicin daily *or* 3 times a week.

3. **In the case of tuberculous meningitis, miliary tuberculosis or spinal TB with neurological signs, give the following regimen:**

   First 2 months (initial phase): isoniazid + rifampicin + pyrazinamide + streptomycin (or ethambutol) daily *or* 3 times a week,

   followed by

   Next 7 months (continuation phase): isoniazid + rifampicin daily.

Details of the regimen and dosage for each of the above drugs is given in Appendix 2, section A2.2, page 138.

Precautions: Avoid streptomycin, where possible, in children because the injections are painful, irreversible auditory nerve damage may occur, and there is a risk of spreading HIV due to improper handling of the needle and syringe. Avoid ethambutol in a child who is unable to report a deterioration in sight or colour perception due to optic neuritis, which can occur as an adverse effect. Avoid thioacetazone in a child who is known to be HIV-infected or when the likelihood of HIV infection is high, because severe (sometimes fatal) skin reactions can occur.

Monitoring

Confirm that the medication is being taken as instructed, by direct observation of each dose. Monitor the child's weight gain (daily) and temperature (twice daily) in order to check for resolution of the fever. These are signs of the response to therapy. When treatment is given for suspected tuberculosis, improvement should be seen within one month. If this does not happen, tuberculosis is unlikely and the treatment should be stopped.

Public health measures

Notify the case to the responsible district health authorities. Ensure that treatment monitoring is carried out, as recommended by the national tuberculosis programme. Check all household members of the child (and, if necessary, school contacts) for undetected cases of tuberculosis and arrange treatment for any who are found.

3.7 Foreign body inhalation

Nuts, seeds or other small objects may be inhaled, most often by children under 4 years of age. The foreign body usually lodges in a bronchus (more often in the right) and can cause collapse or consolidation of the portion of lung distal to the site of blockage. Choking is a frequent initial symptom. This may be followed by a symptom-free interval of days or weeks before the child presents with persistent wheeze, chronic cough or pneumonia, which fails to respond to treatment. Small sharp objects can lodge in the larynx causing stridor or wheeze. Rarely, a large object lodging in the larynx could cause sudden death from asphyxia, unless an emergency tracheostomy is done.

Diagnosis

Inhalation of a foreign body should be considered in a child with the following signs:

- sudden onset of choking, coughing or wheezing; or
- segmental or lobar pneumonia which fails to respond to antibiotic therapy (note also differential diagnosis of tuberculosis—see above, section 3.6).

Examine the child for:

- unilateral wheeze;

- an area of decreased breath sounds which is either dull or hyper-resonant on percussion;
- deviation of the trachea or apex beat.

Obtain a chest X-ray at full expiration to detect an area of hyper-inflation or collapse, mediastinal shift (away from the affected side), or a foreign body if it is radio-opaque.

Treatment

Emergency first aid. Attempt to dislodge and expel the foreign body. The management depends on the age of the child. See Chart 3, page 6.

For infants:

- Lay the infant on one arm or on the thigh in a head-down position.
- Give five blows to the infant's back with the heel of the hand.
- If the obstruction persists, turn the infant over and give five chest thrusts with two fingers, 1 finger's breadth below the nipple level in the midline.
- If the obstruction persists, check the infant's mouth for any obstruction which can be removed.
- If necessary, repeat this sequence with back slaps again.

For older children:

- While the child is sitting, kneeling or lying, give five blows to the child's back with the heel of the hand.
- If the obstruction persists, go behind the child and pass your arms around the child's body; form a fist with one hand immediately below the sternum; place the other hand over the fist and thrust sharply upwards into the abdomen (Heimlich manoeuvre, see page 6). Repeat this up to five times.
- If the obstruction persists, check the child's mouth for any obstruction which can be removed.
- If necessary, repeat the sequence with back slaps again.

Once this has been done, it is important to check the patency of the airway by:

- looking for chest movements
- listening for breath sounds, and
- feeling for breath.

If further management of the airway is required after the obstruction is removed, see Chart 4, page 7. This describes actions which will keep the child's airway open and prevent the tongue from falling back to obstruct the pharynx while the child recovers.

Later treatment. If a foreign body is suspected, refer the child to a hospital where diagnosis is possible and the object can be 'removed' by bronchoscopy. If there is evidence of pneumonia, begin treatment with chloramphenicol (25 mg/kg every 8 hours), as for very severe pneumonia (see section 3.1.1, page 29), before attempting to remove the foreign body.

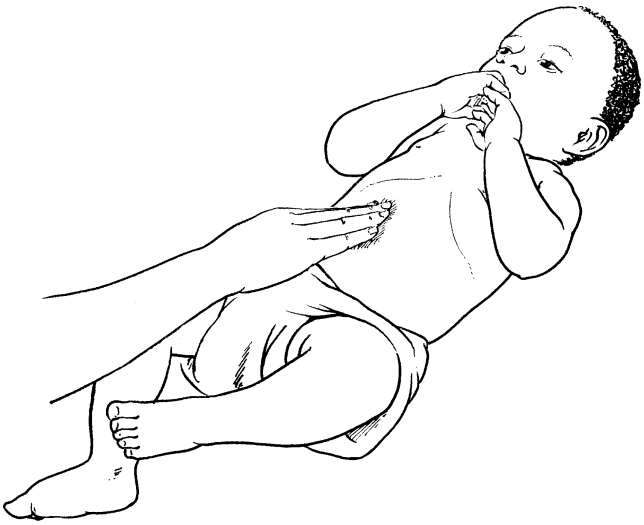
3.8 Heart failure

Heart failure causes fast breathing and respiratory distress. Underlying causes include congenital heart disease (usually in the first months of life), acute rheumatic fever, myocarditis, suppurative pericarditis with constriction, infective endocarditis, severe anaemia and severe malnutrition (see page 80). Heart failure can be precipitated or worsened by fluid overload, especially when giving salt-containing IV fluids.

Diagnosis

The most common signs of heart failure, on examination, are:

- tachycardia (heart rate >160/minute in a child under 12 months old; >120/minute in a child aged 12 months to 5 years)
- gallop rhythm with basal crackles
- enlarged, tender liver

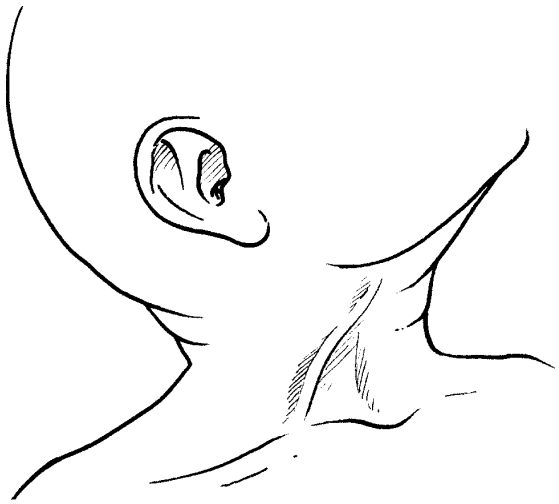


Palpation for an enlarged liver—a sign of heart failure

- in *infants*—fast breathing (or sweating), especially when feeding (see section 3.1.1, page 29, for definition of fast breathing); *in older children*—oedema of the feet, hands or face, or distended neck veins.

Severe palmar pallor may be present if severe anaemia is the cause of the heart failure.

If the diagnosis is in doubt, a chest X-ray can be taken and will show an enlarged heart.



Raised jugular venous pressure (JVP)—a sign of heart failure

Treatment

For details on the treatment of the underlying heart disease, consult a standard paediatrics textbook. The main measures for treatment of heart failure in non-severely malnourished children are as follows.

- *Diuretics*. Give furosemide (frusemide): a dose of 1 mg/kg should cause increased urine flow within 2 hours. For faster action, give the drug IV. If the initial dose is not effective, give 2 mg/kg and repeat in 12 hours, if necessary. Thereafter, a single daily dose of 1–2 mg/kg orally is usually sufficient.
- *Digoxin*. If there is congenital heart disease, give oral digoxin (see Appendix 2, section A2.9, page 143).
- *Supplemental potassium*. Supplemental potassium is *not* required when furosemide is given alone for treatment lasting only a few days. When digoxin and furosemide are given, or if furosemide is given for more than 5 days, give oral potassium (3–5 mmol/kg/day).
- *Oxygen*. Give oxygen if the child has a respiratory rate of ≥70/min, shows signs of respiratory distress, or has central cyanosis. See section 9.5, page 109.

Supportive care

- Avoid the use of IV fluids, where possible, especially those containing sodium (NaCl).
- Support the child in a semi-seated position with head and shoulders elevated and lower limbs dependent.
- Relieve any fever with paracetamol to reduce the cardiac workload.

Monitoring

The child should be checked by nurses every 6 hours (3 hourly whilst on oxygen therapy) and by doctors once a day. Monitor both respiratory and pulse rates, liver size, and body weight to assess the response to treatment. Continue treatment until the respiratory and pulse rates are normal and the liver is no longer enlarged.

CHAPTER 4

Diarrhoea

This chapter gives treatment guidelines on the management of the most important conditions presenting with diarrhoea in children aged 1 week to 5 years. Guidelines are given for acute diarrhoea (with severe, some or no dehydration), persistent diarrhoea, and dysentery. Management of diarrhoea in young infants under 2 months old is described in section 6.3 (page 77), and in severely malnourished children in sections 7.2 and 7.3 (pages 81–89).

The two essential elements in the management of all children with diarrhoea are *rehydration therapy* and *continued feeding*.

During diarrhoea there is an increased loss of water and electrolytes (sodium, potassium and bicarbonate) in the liquid stool. Water and electrolytes are also lost through vomit, sweat, urine and breathing. Dehydration occurs when these losses are not adequately replaced and a deficit of water and electrolytes develops. The degree of dehydration is graded according to symptoms and signs that reflect the amount of fluid lost (see sections 2.3 and 4.1). The rehydration regimen is selected according to the degree of dehydration.

During diarrhoea, a decrease in food intake and nutrient absorption and increased nutrient requirements often combine to cause weight loss and failure to grow. The child's nutritional status declines and any pre-existing malnutrition is made worse. In turn, malnutrition can make the diarrhoea more severe, more prolonged and more frequent, compared with diarrhoea in non-malnourished children. This vicious circle can be broken by giving nutrient-rich foods during the diarrhoea episode and when the child is well.

Antibiotics should not be used routinely. They are reliably helpful *only* for children with bloody diarrhoea (probable shigellosis), suspected cholera with severe dehydration, and other serious non-intestinal infections such as pneumonia. Antiprotozoal drugs are rarely indicated. "Antidiarrhoeal" drugs and anti-emetics should *not* be given to young children with acute or persistent diarrhoea; they do not prevent dehydration or improve nutritional status and some have dangerous, sometimes fatal, side-effects.

4.1 Acute diarrhoea

For all children with diarrhoea, hydration status should be classified as **severe dehydration**, **some dehydration** or **no dehydration** (see sections 4.1.1, 4.1.2 and 4.1.3) and appropriate treatment given.

4.1.1 *Severe dehydration*

Children with severe dehydration require rapid IV rehydration with close monitoring, which is followed by oral rehydration once the child starts to improve sufficiently. In areas where there is a cholera outbreak, give an antibiotic effective against cholera (see page 46).

Note: The treatment guidelines in this section are for severely dehydrated children who are not severely malnourished. The assessment and management of severely malnourished children with diarrhoea is described in Chapter 7 (sections 7.2.3 and 7.3.4, pages 83, 89).

Diagnosis

If any *two* of the following signs are present, *severe dehydration* should be diagnosed:

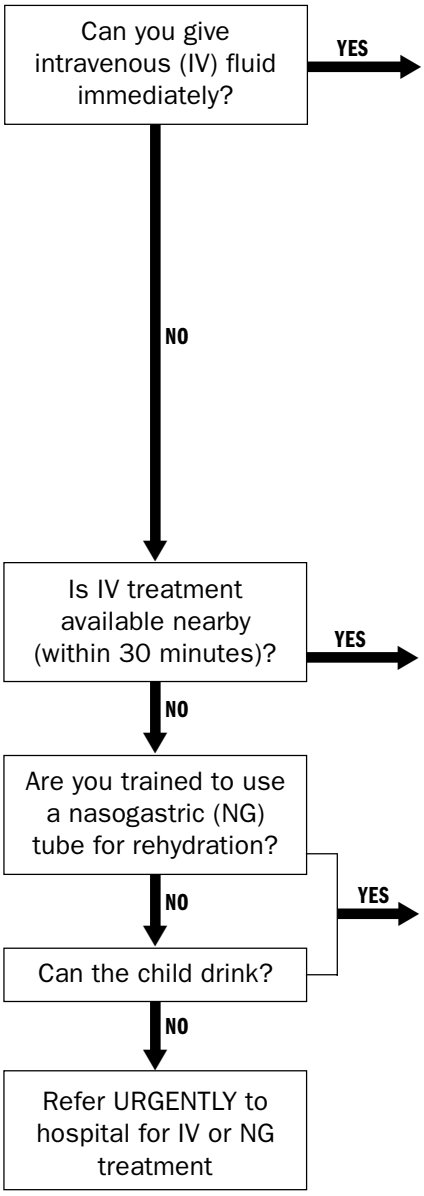
- lethargy or unconsciousness
- sunken eyes

Sunken eyes

Chart 12. **Diarrhoea Treatment Plan C: Treat severe dehydration quickly**

➥ **FOLLOW THE ARROWS. IF ANSWER IS "YES", GO ACROSS. IF "NO", GO DOWN.**

START HERE



- Start IV fluid immediately. If the child can drink, give ORS by mouth while the drip is set up. Give 100 ml/kg Ringer's lactate solution (or, if not available, normal saline), divided as follows:

AGE	First give 30 ml/kg in:	Then give 70 ml/kg in:
Infants (under 12 months)	1 hour*	5 hours
Children (12 months up to 5 years)	30 minutes*	2 1/2 hours

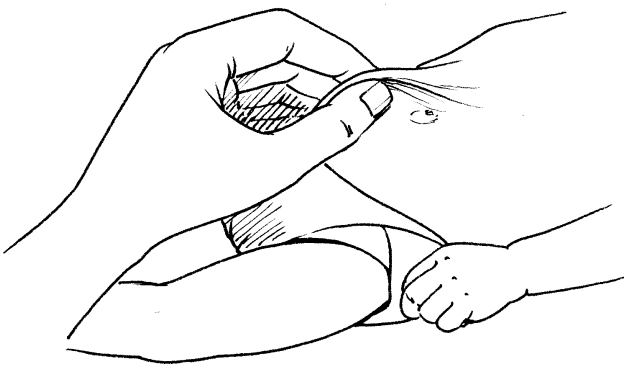
** Repeat once if radial pulse is still very weak or not detectable.*

- Reassess the child every 1–2 hours. If hydration status is not improving, give the IV drip more rapidly.
- Also give ORS (about 5 ml/kg/hour) as soon as the child can drink: usually after 3–4 hours (infants) or 1–2 hours (children).
- Reassess an infant after 6 hours and a child after 3 hours. Classify dehydration. Then choose the appropriate plan (A, B, or C) to continue treatment.

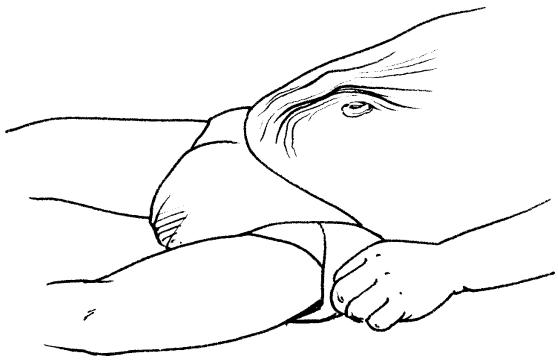
- Refer URGENTLY to hospital for IV treatment.
- If the child can drink, provide the mother with ORS solution and show her how to give frequent sips during the trip.

- Start rehydration by tube (or mouth) with ORS solution: give 20 ml/kg/hour for 6 hours (total of 120 ml/kg).
- Reassess the child every 1–2 hours:
  - — If there is repeated vomiting or increasing abdominal distension, give the fluid more slowly.
  - — If hydration status is not improving after 3 hours, send the child for IV therapy.
- After 6 hours, reassess the child. Classify dehydration. Then choose the appropriate plan (A, B, or C) to continue treatment.

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



Pinching the child's abdomen to test for decreased skin turgor



Slow return of skin pinch in severe dehydration

- skin pinch goes back very slowly (2 seconds or more)
- not able to drink or drinks poorly.

Treatment

Children with severe dehydration should be given rapid IV rehydration followed by oral rehydration therapy.

- *Start IV fluids immediately*. While the drip is being set up, give ORS solution if the child can drink.

Note: The best IV fluid solution is Ringer's lactate solution (also called Hartmann's Solution for Injection). If Ringer's lactate is not available, normal saline solution (0.9% NaCl) can be used. 5% glucose (dextrose) solution on its own is **not** effective and can be dangerous if given quickly.

- *Give 100 ml/kg of the chosen solution* divided as shown in Table 15.

For more information, see Diarrhoea Treatment Plan C in hospital, page 48. This includes guidelines for giving ORS solution by nasogastric tube or by mouth when IV therapy is not possible.

Cholera

Suspect cholera in children over 2 years old who have acute watery diarrhoea and signs of severe dehydration, if cholera is occurring in the local area. Give an oral antibiotic to which strains of *Vibrio cholerae* in the area are known to be sensitive. Possible choices are: tetracycline, doxycycline, cotrimoxazole, erythromycin, and chloramphenicol (for dosages, see Appendix 2, section A2.1, page 135).

Monitoring

Reassess the child every 15–30 minutes until a strong radial pulse is present. If hydration is not improving, give the IV solution more rapidly. Thereafter, reassess the child by checking skin pinch, level of consciousness, and ability to drink, at least every hour, in order to confirm that hydration is improving. Sunken eyes recover more slowly than other signs and are less useful for monitoring.

When the full amount of IV fluid has been given, reassess the child's hydration status fully, using the chart on page 10.

- *If signs of severe dehydration are still present*, repeat the IV fluid infusion as outlined earlier. Persistent severe dehydration after IV rehydration is unusual; it usually occurs only in children who pass large watery stools frequently during the rehydration period.
- *If the child is improving but still shows signs of some dehydration*, discontinue IV treatment and give ORS solution for 4 hours (see section 4.1.2 below and Diarrhoea Treatment Plan B, page 50). If the child is normally breastfed, encourage the mother to continue breastfeeding frequently.
- *If there are no signs of dehydration*, follow the guidelines in section 4.1.3, page 51, and Diarrhoea Treatment Plan A, page 52. Where appropriate, encourage the mother to continue breastfeeding

Table 15 ***Administration of IV fluid (100 ml) to a severely dehydrated child***

	First, give 30ml/kg in:	Then, give 70ml/kg in:
<12 months old	1 hour[a]	5 hours
≥12 months old	30 minutes[a]	2½ hours

[a] Repeat again if the radial pulse is still very weak or not detectable.

Chart 13. Diarrhoea Treatment Plan B: Treat some dehydration with ORS

Give in clinic recommended amount of ORS over 4-hour period

➥ **DETERMINE AMOUNT OF ORS TO GIVE DURING FIRST 4 HOURS.**

AGE*	Up to 4 months	4 months up to 12 months	12 months up to 2 years	2 years up to 5 years
WEIGHT	< 6 kg	6–< 10 kg	10–< 12 kg	12–19 kg
In ml	200–400	400–700	700–900	900–1400

** Use the child's age only when you do not know the weight. The approximate amount of ORS required (in ml) can also be calculated by multiplying the child's weight (in kg) by 75.*

— If the child wants more ORS than shown, give more.
— For infants under 6 months who are not breastfed, also give 100–200 ml clean water during this period.

➥ **SHOW THE MOTHER HOW TO GIVE ORS SOLUTION.**
— Give frequent small sips from a cup.
— If the child vomits, wait 10 minutes. Then continue, but more slowly.
— Continue breastfeeding whenever the child wants.

➥ **AFTER 4 HOURS:**
— Reassess the child and classify the child for dehydration.
— Select the appropriate plan to continue treatment.
— Begin feeding the child in clinic.

➥ **IF THE MOTHER MUST LEAVE BEFORE COMPLETING TREATMENT:**
— Show her how to prepare ORS solution at home.
— Show her how much ORS to give to finish 4-hour treatment at home.
— Give her enough ORS packets to complete rehydration. Also give her 2 packets as recommended in Plan A.
— Explain the 3 Rules of Home Treatment:

1. GIVE EXTRA FLUID
2. CONTINUE FEEDING
3. WHEN TO RETURN

} **See Diarrhoea Treatment Plan A** (page 50) **and Mother's Card** (page 119)

frequently. Observe the child for at least 6 hours before discharge, to confirm that the mother is able to maintain the child's hydration by giving ORS solution.

All children should start to receive some ORS solution (about 5ml/kg/hour) by cup when they can drink without difficulty (usually within 3–4 hours for infants, or 1–2 hours for older children). This provides additional base and potassium, which may not be adequately supplied by the IV fluid.

4.1.2 ***Some dehydration***

In general, children with some dehydration should be given ORS solution, for the first 4 hours at a clinic while the child is monitored and the mother is taught how to prepare and give ORS solution. If the child has another non-severe illness in addition to the diarrhoea, start treatment for dehydration before the other illness is treated. However, if the child has a severe illness in addition to diarrhoea, assess and treat this illness first.

Diagnosis

If the child has *two or more* of the following signs, the child has ***some dehydration***:

- restlessness/irritability
- thirsty and drinks eagerly
- sunken eyes
- skin pinch goes back slowly.

Note that if the child has *one* of the above signs and one of the signs of severe dehydration listed in section 4.1.1 (e.g. restless/irritable and drinking poorly), then that child also has some dehydration.

Treatment

- *In the first 4 hours*, give the child the following *approximate* amounts of ORS solution, according to the child's weight (or age if the weight is not known), as shown in Table 16.

However, if the child wants more to drink, give more.

- Show the mother how to give the child ORS solution, a teaspoonful every 1–2 minutes if the child is under 2 years; frequent sips from a cup for an older child.
- Check regularly to see if there are problems.
- *If the child vomits*, wait 10 minutes; then, resume giving ORS solution more slowly (e.g. a spoonful every 2–3 minutes).
- *If the child's eyelids become puffy*, stop ORS solution and give plain water or breast milk. This child can be considered to be rehydrated and the mother should be taught the rules of home treatment as described below.
- Advise breastfeeding mothers to continue breastfeeding whenever the child wants. Infants under 6 months who are not breastfed should be given 100–200 ml clean water in addition to the ORS solution during the first 4 hours.
- If the mother has to leave before 4 hours, show her how to prepare ORS solution and give her enough ORS packets to complete rehydration at home plus for 2 more days.
- *Reassess the child after 4 hours*, checking for signs of dehydration listed earlier.

  (*Note*: Reassess the child before 4 hours if the child is not taking the ORS solution or seems to be getting worse.)

  — If there is no dehydration, teach the mother the three rules of home treatment:
    (i) give extra fluid
    (ii) continue feeding (see Chapter 9, page 99)
    (iii) return if the child develops any of the following signs:
      — drinking poorly or unable to drink or breastfeed
      — becomes more sick
      — develops a fever
      — has blood in the stool.

  — If the child still has some dehydration, repeat treatment for another 4 hours with ORS solution, as above, and start to offer food, milk or juice and breastfeed frequently.
  — If signs of severe dehydration have developed, see section 4.1.1 (page 45) for recognition and treatment.

Table 16 ***Administration of ORS in the first 4 hours to a child with some dehydration***

Weight	Age	Amount of ORS in first 4 hours
<5 kg	<4 months	200–400 ml
5–<8 kg	4–<12 months	400–600 ml
8–<11 kg	12 months to <2 years	600–800 ml
11–<16 kg	2–<5 years	800–1200 ml
16–50 kg	5–15 years	1200–2200 ml

Chart 14. Diarrhoea Treatment Plan A: Treat diarrhoea at home

Counsel the mother on the 3 rules of home treatment:

give extra fluid, continue feeding, when to return

1. GIVE EXTRA FLUID (as much as the child will take)

➥ **TELL THE MOTHER**:

— Breastfeed frequently and for longer at each feed.
— If the child is exclusively breastfed, give ORS or clean water in addition to breastmilk.
— If the child is not exclusively breastfed, give one or more of the following: ORS solution, food-based fluids (such as soup, rice water, and yoghurt drinks), or clean water.

It is especially important to give ORS at home when:

— *the child has been treated with Plan B or Plan C during this visit.*
— *the child cannot return to a clinic if the diarrhoea gets worse.*

➥ **TEACH THE MOTHER HOW TO MIX AND GIVE ORS. GIVE THE MOTHER 2 PACKETS OF ORS TO USE AT HOME.**

➥ **SHOW THE MOTHER HOW MUCH FLUID TO GIVE IN ADDITION TO THE USUAL FLUID INTAKE:**

Up to 2 years	50 to 100 ml after each loose stool
2 years or more	100 to 200 ml after each loose stool

Tell the mother to:

— Give frequent small sips from a cup.
— If the child vomits, wait 10 minutes. Then continue, but more slowly.
— *Continue giving extra fluid until the diarrhoea stops.*

2. CONTINUE FEEDING

3. WHEN TO RETURN

} **See Mother's Card** (page 119)

Diarrhoea Treatment plans A and B on pages 52, 50 give further details.

Feeding

Continuation of nutritious feeding is an important element in the management of diarrhoea.

- In the initial 4-hour rehydration period, do not give any food except breast milk. Breastfed children should continue to breastfeed frequently *throughout* the episode of diarrhoea.
- After 4 hours, if the child still has some dehydration and ORS continues to be given, give food every 3–4 hours.
- All children over 4–6 months old should be given some food before being sent home. This helps to emphasize to carers the importance of continued feeding during diarrhoea.

If the child is not normally breastfed, explore the feasibility of **relactation** (restarting breastfeeding after it was stopped) or give the usual breast milk substitute. If the child is 6 months or older or already taking solid food, give freshly prepared foods —cooked, mashed or ground. The following are recommended:

- cereal or another starchy food mixed with pulses, vegetables and meat or fish, if possible, with 1–2 teaspoons of vegetable oil added to each serving
- complementary foods recommended by IMCI in that area (see section 9.1, page 99)
- fresh fruit juice or mashed banana to provide potassium.

Encourage the child to eat by offering food at least 6 times a day. Give the same foods after the diarrhoea stops and give an extra meal a day for 2 weeks.

4.1.3 ***No dehydration***

Children with diarrhoea but no dehydration should receive extra fluids at home to prevent dehydration. They should continue to receive an appropriate diet for their age, including continued breastfeeding.

Diagnosis

Diarrhoea with no dehydration should be diagnosed if the child does not have two or more of the following signs which characterize some or severe dehydration:

- restlessness/irritability
- lethargy or unconsciousness
- not able to drink or drinks poorly
- thirsty and drinks eagerly
- sunken eyes
- skin pinch goes backs slowly or very slowly.

Treatment

1) Treat the child as an outpatient.
2) Counsel the mother on the three rules of home treatment:
   — give extra fluid
   — continue feeding
   — give advice on when to return.

See Diarrhoea Treatment plan A on page 52.

3) Give extra fluid, as follows:
   - If the child is being breastfed, advise the mother to breastfeed frequently and for longer at each feed. If the child is exclusively breastfed, give ORS solution or clean water in addition to breast milk. After the diarrhoea stops, exclusive breastfeeding should be resumed, if appropriate to the child's age.
   - In non-exclusively breastfed children, give one or more of the following:
     — ORS solution
     — food-based fluids (such as soup, rice water and yoghurt drinks)
     — clean water.

   To prevent dehydration from developing, advise the mother to give extra fluids—as much as the child will take:

   — for children <2 years, about 50–100 ml after each loose stool
   — for children 2 years or over, about 100–200 ml after each loose stool.

   Tell the mother to give small sips from a cup. If the child vomits, wait 10 minutes and then give more slowly. She should continue giving extra fluid until the diarrhoea stops.

   Teach the mother how to mix and give ORS solution and give her two packets of ORS to take home.

4) Continue feeding—see nutrition counselling in Chapters 9 (page 99) and 11 (page 116).

5) Advise the mother on when to return—see below.

Follow-up

Advise the mother to return *immediately* to the clinic if the child becomes more sick, or is unable to drink or breastfeed, or drinks poorly, or develops a fever, or shows blood in the stool. If the child shows none of these signs but is still not improving, advise the mother to return for follow-up at 5 days.

Also explain that this same treatment should be given in the future as soon as diarrhoea develops. See Diarrhoea Treatment plan A, page 52.

4.2 Persistent diarrhoea

Persistent diarrhoea is diarrhoea, with or without blood, which begins acutely and lasts for 14 days or longer. When there is some or severe dehydration, persistent diarrhoea is classified as "severe". Severe persistent diarrhoea is usually associated with signs of malnutrition and often with serious non-intestinal infections, such as pneumonia. These children require hospital treatment until the diarrhoea has lessened, their condition is stable, and they are gaining weight. Most children with non-severe persistent diarrhoea can be treated at home with careful monitoring. Proper feeding is essential.

The following guidelines are for children with persistent diarrhoea who are not severely malnourished. Severely malnourished children with persistent diarrhoea require hospitalization and specific treatment, as described in Chapter 7 (section 7.3.4, page 89).

4.2.1 Severe persistent diarrhoea

Diagnosis

Infants or children with diarrhoea lasting ≥14 days, with signs of dehydration (see pages 45–47), have severe persistent diarrhoea and require hospital treatment.

Treatment

- *Assess the child for signs of dehydration and give fluids* according to Diarrhoea Treatment Plans B or C, as appropriate (see pages 50, 48).

ORS solution is effective for most children with persistent diarrhoea. In a few, however, glucose absorption is impaired and ORS solution is not effective. When given ORS, their stool volume increases markedly, thirst increases, signs of dehydration develop or worsen, and the stool contains a large amount of unabsorbed glucose. These children require IV rehydration until ORS solution can be taken without causing the diarrhoea to worsen.

Routine treatment of persistent diarrhoea with antibiotics is not effective and should not be given. Some children, however, have non-intestinal or intestinal infections that require specific antibiotic therapy.

- *Examine every child with persistent diarrhoea for non-intestinal infections* such as pneumonia, sepsis, urinary tract infection, oral thrush, and otitis media and treat appropriately.
- *Treat persistent diarrhoea with blood in the stool with an oral antibiotic* effective for *Shigella* as described in section 4.3, page 54.
- *Give treatment for amoebiasis* (oral metronidazole: 10 mg/kg, 3 times a day, for 5 days) only if:
  — microscopic examination of fresh faeces carried out in a reliable laboratory reveals trophozoites of *Entamoeba histolytica* with red blood cells inside; OR
  — two different antibiotics, which are usually effective for *Shigella* locally, have been given without clinical improvement.
- *Give treatment for giardiasis* (metronidazole: 5 mg/kg, 3 times a day, for 5 days) if cysts or trophozoites of *Giardia lamblia* are seen in the faeces.
- *In areas where HIV is highly prevalent*, suspect HIV if there are other clinical signs or risk factors (see Chapter 8, page 92).

Feeding

Careful attention to feeding is *essential* for all children with persistent diarrhoea. Besides giving the child energy and nutrition, feeding helps the gut to recover. In addition to its treatment role, it can have an important preventive value. The normal diet of a child with persistent diarrhoea is often inadequate, so treatment is an important opportunity to teach the mother how to improve her child's nutrition.

Breastfeeding should be continued for as often and as long as the child wants. Other food should be withheld for 4–6 hours—*only* for children with dehydration who are being rehydrated following Diarrhoea Treatment Plans B or C.

Hospital diets

Children treated in hospital require special diets until their diarrhoea lessens and they are gaining weight. The goal is to give a daily intake of *at least* 110 kcalories/kg.

Infants aged under 4 months

- Encourage exclusive breastfeeding. Help mothers who are not breastfeeding exclusively to do so.
- If the child is not breastfeeding, give a breast milk substitute that is low in lactose, such as yoghurt, or is lactose-free. Use a spoon or cup, do not use a feeding bottle. Once the child improves, help the mother to re-establish lactation.
- If the mother is not breastfeeding because she is HIV-positive, she should receive appropriate counselling about the correct use of breast milk substitutes.

Children aged 4 months or older

Feeding should be restarted as soon as the child can eat. Food should be given 6 times a day to achieve a total intake of at least 110 kcalories/kg/day. Many children will eat poorly, however, until any serious

infection has been treated for 24–48 hours. Such children may require nasogastric feeding initially.

Two recommended diets

Given below are two diets recommended for children and infants aged >4 months with severe persistent diarrhoea. If the first diet is given for 7 days, some 60–70% of children will improve with this treatment. If there are signs of dietary failure (see below) or if the child is not improving after 7 days of treatment, the first diet should be stopped and the second diet given for 7 days.

Successful treatment with either diet is characterized by:

- adequate food intake
- weight gain
- fewer diarrhoeal stools
- absence of fever.

The most important criterion is weight gain. Many children will lose weight for 1–2 days, and then steadily gain weight as the infections get under control and the diarrhoea subsides. There should be at least *three* successive days of increasing weight before one can conclude that weight gain is occurring; for most children the weight on day 7 will be greater than on admission.

Dietary failure is shown by:

— an increase in stool frequency (usually to >10 watery stools a day), often with a return of signs of dehydration (this usually occurs shortly after a new diet is begun), OR
— a failure to establish daily weight gain within 7 days.

Table 17 ***First diet: A starch-based, reduced milk concentration (low lactose) diet***

The diet should contain at least 70 kcalories/100 g, provide milk or yoghurt as a source of animal protein, but no more than 3.7 g lactose/kg body weight/day, and should provide at least 10% of kcalories as protein. The following example provides 83 kcalories/100 g, 3.7 g lactose/kg body weight/day and 11% of calories as protein:

● full-fat dried milk (or whole liquid milk: 85 ml)	11 g
● rice	15 g
● vegetable oil	3.5 g
● cane sugar	3 g
● water to make	200 ml

Of the children who do not improve on this first diet, more than half will improve when given the second diet, from which milk has been totally removed and starch (cereals) partly replaced with glucose or sucrose.

Table 18 ***Second diet: A no-milk (lactose-free) diet with reduced cereal (starch)***

The second diet should contain at least 70 kcalories/100 g, and provide at least 10% of calories as protein (egg or chicken). The following example provides 75 kcalories/100 g:

● whole egg	64 g
● rice	3 g
● vegetable oil	4 g
● glucose	3 g
● water to make	200 ml

Finely ground, cooked chicken (12 g) can be used in place of egg to give a diet providing 70 kcalories/100 g.

Supplementary multivitamins and minerals

Give all children with persistent diarrhoea daily supplementary multivitamins and minerals for two weeks. These should provide as broad a range of vitamins and minerals as possible, including at least two recommended daily allowances (RDAs) of folate, vitamin A, zinc, magnesium and copper (see page 54).

Monitoring

Nurses should check the following daily:

- body weight
- temperature
- food taken
- number of diarrhoea stools.

Give additional fresh fruit and well cooked vegetables to children who are responding well. After 7 days of treatment with the effective diet, they should resume an appropriate diet for their age, including milk, which provides at least 110 kcalories/kg/day. Children may then return home, but follow them up regularly to ensure continued weight gain and compliance with feeding advice.

4.2.2 ***Persistent diarrhoea (non-severe)***

These children do not require hospital treatment but need special feeding and extra fluids at home.

Diagnosis

Children with diarrhoea lasting 14 days or longer who have no signs of dehydration and no severe malnutrition.

Treatment

Treat the child as an outpatient.

Prevent dehydration

Give fluids according to Diarrhoea Treatment Plan A, page 52. ORS solution is effective for most children with persistent diarrhoea. In a few, however,

glucose absorption is impaired and when given ORS solution their stool volume increases markedly, thirst increases, signs of dehydration develop or worsen, and the stool contains a large amount of unabsorbed glucose. These children require admission to hospital for IV rehydration until ORS solution can be taken without aggravating the diarrhoea.

Identify and treat specific infections

Do not routinely treat with antibiotics as they are not effective. However, give antibiotic treatment to children with specific non-intestinal or intestinal infections. Until these infections are treated correctly, persistent diarrhoea will not improve.

Non-intestinal infections. Examine every child with persistent diarrhoea for non-intestinal infections, such as pneumonia, sepsis, urinary tract infection, oral thrush and otitis media. Treat with antibiotics following the guidelines in this manual.

Intestinal infections. Treat persistent diarrhoea with blood in the stool with an oral antibiotic which is effective for *Shigella*, as described in section 4.3 below.

Feeding

Careful attention to feeding is *essential* for all children with persistent diarrhoea. In addition to its role in treatment, it can have important preventive value. The normal diet of children with persistent diarrhoea is often inadequate; so it is important, during treatment, to teach the mothers how to improve their children's nutrition.

A child with persistent diarrhoea may have difficulty in digesting animal milk other than breast milk. Advise the mother to reduce the amount of animal milk in the child's diet temporarily. Continue breastfeeding and give appropriate complementary foods:

- If still breastfeeding, give more frequent, longer breastfeeds, by day and night.
- If taking other animal milk, explore the feasibility of replacing animal milk with fermented milk products (e.g. yoghurt), which contain less lactose and are better tolerated.
- If replacement of animal milk is not possible, limit animal milk to 50 ml/kg/day. Mix the milk with the child's cereal, but do not dilute it.
- Give other foods appropriate for the child's age to ensure an adequate caloric intake. Infants aged >4 months whose only food has been animal milk should begin to take solid foods.
- Give frequent small meals, at least 6 times a day.

Supplementary micronutrients

All children with persistent diarrhoea should receive daily supplementary multivitamins and minerals for two weeks. Locally available commercial preparations are often suitable (tablets that can be crushed and given with the food are cheapest). These should provide as broad a range of vitamins and minerals as possible, including at least two recommended daily allowances (RDAs) of folate, vitamin A, iron, zinc, magnesium and copper. As a guide, one RDA for a child aged 1 year is:

— folate 50 micrograms
— zinc 10 mg
— vitamin A 400 micrograms
— iron 10 mg
— copper 1mg
— magnesium 80 mg.

Follow-up

Ask the mother to bring the child back for reassessment after five days, or earlier if the diarrhoea worsens or other problems develop.

Fully reassess children who have not gained weight or whose diarrhoea has not improved in order to identify any problems, such as dehydration or infection, which need immediate attention or admission to hospital.

Those who have gained weight and who have less than three loose stools per day may resume a normal diet for their age.

4.3 Dysentery

Dysentery is diarrhoea presenting with loose frequent stools containing blood. Most episodes are due to *Shigella* and nearly all require antibiotic treatment.

Diagnosis

The diagnostic signs of dysentery are frequent loose stools with blood.

Other findings on examination may include:

- abdominal pain
- fever
- convulsions
- lethargy
- dehydration (see section 4.1, page 45)
- rectal prolapse.

Treatment

Home treatment

Children with severe malnutrition and dysentery, and young infants (<2 months old) with dysentery should

be admitted to hospital. Others can be treated at home.

The following children (aged 2 months to 5 years) should be treated at home and asked to return for reassessment after two days:

- those who were initially dehydrated
- those who have had measles during the past 3 months
- infants aged 2–12 months
- any child who is not getting better.

- Give an oral antibiotic (for 5 days), to which most strains of *Shigella* locally are sensitive.

  Examples of antibiotics to which *Shigella* strains can be sensitive (in the absence of resistance) are: cotrimoxazole, ampicillin, pivmecillinam, nalidixic acid and fluoroquinolones. Note that metronidazole, streptomycin, tetracyclines, chloramphenicol, sulfonamides, nitrofurans (e.g. nitrofurantoin, furazolidone), aminoglycosides (e.g. gentamicin, kanamycin), first and second-generation cephalosporins (e.g. cefalexin, cefamandole), and amoxicillin are not effective in the treatment of *Shigella*.

- In the follow-up visit in two days, look for the following signs of improvement:

  - disappearance of fever
  - less blood in the stool
  - passage of fewer stools
  - improved appetite
  - a return to normal activity.

- If there is no improvement after two days, check for other conditions (see Chapter 2), stop the first antibiotic, and give the child a second-line antibiotic which is known to be effective against *Shigella* in the area. In most countries the second or third-line antimicrobial for children aged 2 months to 5 years will be either nalidixic acid, pivmecillinam (amidinocillin pivoxil) or ciprofloxacin. (See Appendix 2, A2.1, page 135, for dosages).

- If the two antibiotics, which are usually effective for *Shigella* in the area, have produced no signs of clinical improvement, check for other conditions (see Chapter 2 and refer to a standard paediatric textbook). Admit the child if there is another condition requiring hospital treatment. Otherwise treat as an outpatient for possible amoebiasis. Give the child metronidazole (10 mg/kg, 3 times a day) for 5 days.

Hospital treatment

Admit young infants (aged <2 months) who have blood in their stools and severely malnourished children with bloody diarrhoea.

Young infants. Examine the young infant for surgical causes of blood in the stools (for example, intussusception—see Chapter 2 and also a standard paediatrics textbook) and refer to a surgeon, if appropriate. Otherwise give the young infant IM ceftriaxone (100 mg/kg) once daily for 5 days.

Severely malnourished children. See Chapter 7 for the general management of these children. Treat bloody diarrhoea with an antibiotic against *Shigella* or amoebiasis, as described above. If microscopic examination of fresh faeces in a reliable laboratory is possible, check for trophozoites of *E. histolytica* within red blood cells and treat for amoebiasis, if present.

Supportive care

Supportive care includes the prevention or correction of dehydration and continued feeding. For guidelines on supportive care of severely malnourished children with bloody diarrhoea, see also Chapter 7 (page 80).

Never give drugs for symptomatic relief of abdominal pain and rectal pain, or to reduce the frequency of stools, as they can increase the severity of the illness.

Treatment of dehydration

Assess the child for signs of dehydration and give fluids according to Diarrhoea Treatment Plan A, B or C (see pages 52, 50, 48), as appropriate.

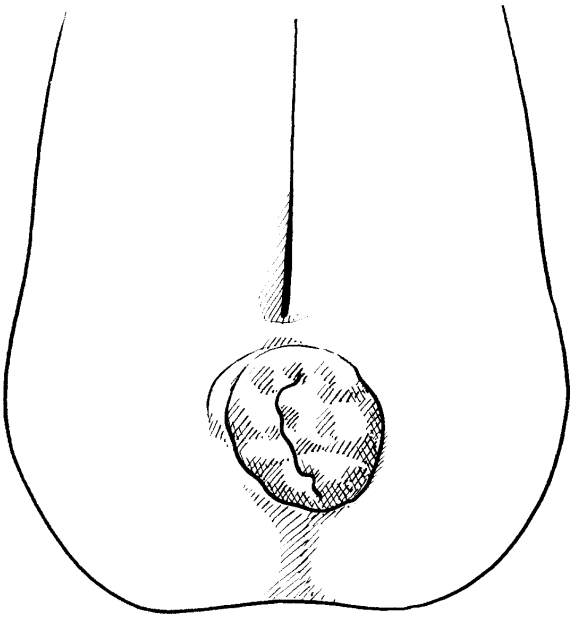
Nutritional management

Ensuring a good diet is very important as dysentery has a marked adverse effect on nutritional status. However, feeding is often difficult because of lack of appetite. Return of appetite is an important sign of improvement.

- Breastfeeding should be continued throughout the course of the illness, more frequently than normal, if possible, because the infant may not take the usual amount per feed.
- Children aged 4–6 months or more should receive their normal foods. Encourage the child to eat and allow the child to select preferred foods.

Complications

- *Potassium depletion*. This can be prevented by giving ORS solution (when indicated) or potassium-rich foods such as bananas, coconut water or dark green leafy vegetables.



Rectal prolapse

- *High fever*. If the child has high fever (≥39 °C or ≥102.2 °F) which appears to be causing distress, give paracetamol.
- *Rectal prolapse* (see figure). Gently push back the rectal prolapse using a surgical glove or a wet cloth. Alternatively, prepare a warm solution of saturated magnesium sulfate and apply compresses with this solution to reduce the prolapse by decreasing the oedema. The prolapse often recurs but usually disappears spontaneously after the diarrhoea stops.
- *Convulsions*. A single convulsion is the most common finding. However, if this is prolonged or is repeated, give anticonvulsant treatment with IM paraldehyde, (see Appendix 2, page 141). Avoid giving rectal paraldehyde or diazepam. If convulsions are repeated, check for hypoglycaemia.
- *Haemolytic-uraemic syndrome*. Where laboratory tests are not possible, suspect haemolytic-uraemic syndrome (HUS) in patients with easy bruising, pallor, altered consciousness, and low or no urine output. Where laboratory support is available, make the diagnosis of HUS on the basis of the following:
  - — blood smear shows fragmented red blood cells, reduced or absent platelets, or both
  - — an elevated blood urea nitrogen or serum creatinine, indicating renal failure.

When a patient develops low urine output and HUS is suspected, stop giving foods or fluids containing potassium, such as ORS solution, and transfer the patient to a facility where haemodialysis or peritoneal dialysis and blood transfusion can be performed. Further details of treatment can be found in standard paediatrics textbooks.

CHAPTER 5

Fever

Fever is the commonest sign of illness in young children. As there are a wide range of causes in different regions of the world, a knowledge of locally important causes is vital. This chapter gives treatment guidelines for the management of the most important conditions presenting with fever in children aged between 2 months and 5 years. Management of febrile conditions in young infants (<2 months old) is described in Chapter 6, page 74.

5.1 Malaria

In areas where malaria transmission is intense, malaria is often the commonest cause of fever in young children. The disease may occur year-round or seasonally. Chloroquine used to be the first-line antimalarial in all countries, but resistance is now very common. A knowledge of local resistance patterns is therefore important.

5.1.1 Severe malaria

Severe malaria, which is due to *Plasmodium falciparum*, is serious enough to be an immediate threat to life. The illness starts with fever and often cough and vomiting. Children can deteriorate rapidly over 1–2 days, going into coma (cerebral malaria) or shock, or manifesting convulsions, severe anaemia and acidosis.

Diagnosis

Suspect severe malaria in a child who has been exposed to *P. falciparum* transmission and presents with any of the symptoms, signs or laboratory findings in the list given below. *A history of residence or travel in an endemic area, or of previous treatment with antimalarials or other drugs may also be important.*

History. This will indicate a change of behaviour, confusion, drowsiness, and generalized weakness.

Examination. In some children fever may be absent. The main features are:

- unrousable coma
- generalized convulsions
- acidosis (presenting with deep, laboured breathing)
- generalized weakness, so that the child can no longer walk or sit up without assistance
- jaundice
- respiratory distress, pulmonary oedema
- shock
- bleeding tendency.

Laboratory investigations. Children with the following findings have severe malaria:

- severe anaemia (haematocrit <18%; haemoglobin <6 g/dl)
- hypoglycaemia (blood glucose <2.5 mmol/litre or <45 mg/dl).

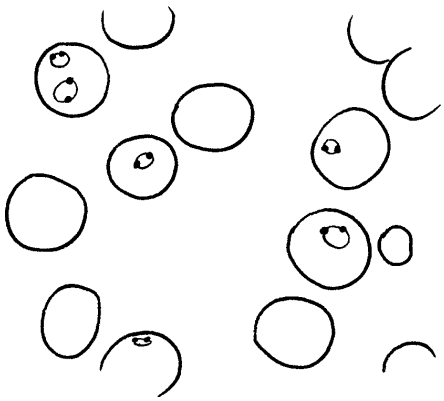
In children with altered consciousness and/or convulsions, check:

- blood glucose.

In addition, in all children suspected of severe malaria, check:

- thick and thin blood smears
- haematocrit.

In suspected cerebral malaria (i.e. children with unrousable coma for no obvious cause), perform a lumbar puncture to exclude bacterial meningitis.



Thin blood film showing malaria parasites. Ring-shaped parasites are seen within the red blood cells.

Delay lumbar puncture if the following signs of raised intracranial pressure are present: unequal pupils, rigid posture, focal paralysis of any of the limbs or trunk, irregular breathing.

If severe malaria is suspected clinically and the blood smear is normal, repeat the blood smear urgently.

Treatment

Emergency measures—*to be taken within the first hour*:

- If the child is unconscious, check for hypoglycaemia and correct, if present (see below, pages 59–60).
- Minimize the risk of aspiration pneumonia by inserting a nasogastric tube and removing the gastric contents by suction.
- Treat convulsions with rectal diazepam or paraldehyde (see Chart 9, page 12) or with IM paraldehyde (see Appendix 2, A2.6, page 141).
- Restore the circulating blood volume (see below, page 59).
- Treat severe anaemia (see below, page 59).
- Start treatment with an effective antimalarial (see below).

Antimalarial treatment

- If blood smear confirmation of malaria is likely to take more than one hour, start antimalarial treatment before the diagnosis is confirmed.
- *Quinine* is the drug of choice in all African countries and most other countries, except in parts of south-east Asia and the Amazon basin. Give it preferably IV in normal saline or 5% glucose (dextrose); if this is not possible, give it IM. Change to oral administration as soon as possible.

IV quinine. Give a loading dose of quinine (20 mg/kg of quinine dihydrochloride salt) in 10 ml/kg of IV fluid over a period of 4 hours. Some 12 hours after the start of the loading dose, give 10 mg/kg quinine salt in IV fluid over 2 hours, and repeat every 12 hours until the child is able to take oral treatment. Then, give oral quinine doses to complete 7 days of treatment ***or*** give one dose of sulfadoxine-pyrimethamine (SP). If there is resistance to SP, use a second-line drug according to national drug policy. *It is essential that the loading dose of quinine is given only if there is close nursing supervision of the infusion and control of the infusion rate. If this is not possible, it is safer to give IM quinine.*

IM quinine. If IV infusion is not possible, quinine dihydrochloride can be given in the same dosages by IM injection. Give 10 mg of quinine salt per kg IM and repeat after 4 hours. Then, give every 12 hours until the malaria is no longer severe. The parenteral solution should be diluted before use because it is better absorbed and less painful.

Details of antimalarial drug dosages and methods of administration are given in Appendix 2, section A2.3, page 139.

Second-line antimalarials include the following:

- *IV artesunate*. Give 2.4 mg/kg artesunate IV, followed by 1.2 mg/kg after 12 and 24 hours. Then give 1.2 mg/kg daily for 6 days. See Appendix 1 (page 124) for instructions on preparation of IV injection. If the child is able to swallow, give the daily dose orally.
- *IM artemether*. Give 3.2 mg/kg artemether IM as a loading dose, followed by 1.6 mg/kg IM daily for a minimum of 3 days until the child can take oral treatment with an effective antimalarial. When the child can swallow, change to an effective oral antimalarial (such as mefloquine 15 mg/kg as a single dose, or 15 mg/kg followed by 10 mg/kg 12 hours later, depending on mefloquine resistance levels).
- *IV quinidine*. Give a loading dose of 15 mg/kg of quinidine gluconate base by IV infusion over 4 hours. Then 8 hours later, give a maintenance dose of 7.5 mg/kg of quinidine base over 4 hours repeated 8-hourly. When the child can swallow, change to oral quinine 10 mg/kg salt to complete 7 days of treatment or give a dose of sulfadoxine-pyrimethamine.

Note: Quinidine is more cardiotoxic than quinine. It should only be used if parenteral quinine, artesunate or artemether are not suitable.

Supportive care

- Examine all children with convulsions for hypoglycaemia and hyperpyrexia. Treat hypoglycaemia (see below, page 59). If a temperature of ≥39 °C (≥ 102.2 °F) is causing the child distress or discomfort, give paracetamol.
- If meningitis is a possible diagnosis and cannot be excluded by a lumbar puncture (see above), give parenteral antibiotics immediately (see section 5.2, page 61).
- Avoid useless or harmful ancillary drugs like corticosteroids and other anti-inflammatory drugs, urea, invert glucose, low-molecular dextran, heparin, adrenaline (epinephrine), prostacyclin and cyclosporin.

In an unconscious child:

- Maintain a clear airway.
- Nurse the child on the side to avoid aspiration of fluids.
- Turn the patient every 2 hours.
- Do not allow the child to lie in a wet bed.
- Pay attention to pressure points.

Take the following precautions in the delivery of fluids:

- Check for dehydration (see page 45) and treat appropriately.
- During rehydration, examine frequently for signs of fluid overload. The most reliable sign is an enlarged liver. Additional signs are gallop rhythm, fine crackles at lung bases and/or fullness of neck veins when upright.
- If, after careful rehydration, the urine output over 24 hours is less than 4 ml/kg body weight, give IV furosemide, initially at 2 mg/kg body weight. If there is no response, double the dose at hourly intervals to a *maximum* of 8 mg/kg body weight (given over 15 minutes).
- In children with no dehydration, ensure that they receive their daily fluid requirements but take care not to exceed the recommended limits (see section 9.2, page 108). Be particularly careful in monitoring IV fluids.

Complications

Coma (cerebral malaria)

- Assess the level of consciousness according to the AVPU or another locally used coma scale for children (see page 2).
- Give meticulous nursing care and pay careful attention to the airway, eyes, mucosae, skin and fluid requirements.
- Exclude other treatable causes of coma (e.g. hypoglycaemia, bacterial meningitis). If you cannot do a lumbar puncture and cannot exclude meningitis, give antibiotics as for bacterial meningitis.
- Convulsions are common before and after the onset of coma. When convulsions are present, give anticonvulsant treatment with rectal diazepam or paraldehyde (see Chart 9, page 12) or IM paraldehyde (see Appendix 2, A2.6, page 141). Correct any possible contributing cause such as hypoglycaemia or very high fever.
- If the child is to be referred elsewhere, give a prophylactic anticonvulsant (phenobarbital sodium, 20 mg/kg IM) for the journey.

Some children may have a cold, clammy skin. Some of them may be in shock (with a systolic blood pressure <50 mmHg and core-to-skin temperature difference of up to 10 °C or 18 °F). These features are not usually due to malaria alone. Suspect an additional bacteraemia and give both an antimalarial and antibiotic treatment—benzylpenicillin (50 000 units/kg every 6 hours) plus chloramphenicol (25 mg/kg every 8 hours), as for septicaemia (see section 5.4, page 67).

Some 10% of children who survive cerebral malaria will have neurological sequelae, which will persist into the convalescent period, including unsteady gait, paralysis of limbs, speech disorders, blindness, behavioural disturbances, and reduced or increased tone in the limbs and trunk. Recovery from much of this deficit may take up to a year.

Severe anaemia

This is indicated by severe palmar pallor, often with a fast pulse rate, difficult breathing, confusion or restlessness. Signs of heart failure such as gallop rhythm, enlarged liver and, rarely, pulmonary oedema (fast breathing, fine basal crackles on auscultation) may be present.

- Give a *blood transfusion* as soon as possible (see Appendix 1, page 130) to:
  - all children with a haematocrit of ≤12% or Hb of ≤4g/dl
  - less severely anaemic children (haematocrit 13–18%; Hb 4–6 g/dl) with any of the following:
    - clinically detectable dehydration
    - shock
    - impaired consciousness
    - deep and laboured breathing
    - heart failure
    - very high parasitaemia (>10% of red cells parasitized).
- Give *packed cells* (10 ml/kg body weight), if available, over 3–4 hours in preference to whole blood. If not available, give fresh whole blood (20 ml/kg body weight) over 3–4 hours.
- A diuretic is *not* usually indicated because many of these children have a low blood volume (hypovolemia).
- Check the respiratory rate and pulse rate every 15 minutes. If one of them rises, transfuse more slowly. If there is any evidence of fluid overload due to the blood transfusion, give IV furosemide (1–2 mg/kg body weight) up to a maximum total of 20 mg.
- After the transfusion, if the Hb remains low, repeat the transfusion.
- In severely malnourished children, fluid overload is a common and serious complication. Give whole blood (10 ml/kg body weight rather than 20 ml/kg) once only and do not repeat the transfusion.

Hypoglycaemia

Hypoglycaemia (blood glucose: <2.5 mmol/litre or <45 mg/dl) is particularly common in children under 3 years old, in children with convulsions or hyperparasitaemia, and in comatose patients. It is easily overlooked because clinical signs may mimic cerebral malaria.

Give 5 ml/kg of 10% glucose (dextrose) solution IV rapidly (see Chart 10, page 13). Recheck the blood glucose in 30 minutes, and repeat the glucose (5 ml/kg) if the level is low (<2.5 mmol/litre or <45 mg/dl).

Prevent further hypoglycaemia in an unconscious child by giving 10% glucose (dextrose) infusion (add 10 ml of 50% glucose to 90 ml of a 5% glucose solution, or 10 ml of 50% glucose to 40 ml of sterile water). Do not exceed maintenance fluid requirements for the child's weight (see section 9.2, page 108). If the child develops signs of fluid overload, stop the infusion; repeat the IV 10% glucose (5 ml/kg) at regular intervals.

Once the child is conscious, stop IV treatment. Feed the child as soon as it is safe. Breastfeed every 3 hours, if possible, or give milk feeds of 15 ml/kg if the child can swallow. If not able to feed without risk of aspiration, give sugar solution by nasogastric tube (see Chapter 1, page 4). Continue to monitor the blood glucose level, and treat accordingly (as above) if found to be <2.5 mmol/ litre or <45 mg/dl.

Acidosis *(deep, laboured breathing)*

This presents with deep breathing while the chest is clear—sometimes accompanied by lower chest wall indrawing. It is caused by systemic metabolic acidosis (frequently lactic acidosis) and may develop in a fully conscious child, but more often in children with cerebral malaria or severe anaemia.

- Correct reversible causes of acidosis, especially dehydration and severe anaemia.
  - — *If Hb is ≥6 g/dl*, give 20 ml/kg of normal saline or an isotonic glucose-electrolyte solution IV over 30 minutes.
  - — *If Hb is <6 g/dl*, give whole blood (10 ml/kg) over 30 minutes, and a further 10 ml/kg over 1–2 hours *without* diuretics. Check the respiratory rate and pulse rate every 15 minutes. If either of these shows any rise, transfuse more slowly to avoid precipitating pulmonary oedema (see guidelines on blood transfusion in Appendix 1, section A1.3, page 130).

Aspiration pneumonia

Treat aspiration pneumonia immediately because it can be fatal.

- Place the child on his/her side. Give IM or IV chloramphenicol (25 mg/kg every 8 hours) until the child can take this orally, for a total of 7 days. Give oxygen if there is central cyanosis, lower chest wall indrawing or a respiratory rate of ≥70/minute.

Monitoring

The child should be checked by nurses at least every 3 hours and by a doctor at least twice a day. The rate of IV infusion should be checked hourly. Children with cold extremities, hypoglycaemia on admission, and/or deep coma are at highest risk of death. It is particularly important that these children be kept under very close observation.

- Monitor and report immediately any change in the level of consciousness, convulsions, or changes in the child's behaviour.
- Monitor the temperature, pulse rate, respiratory rate (and, if possible, blood pressure) every 6 hours, for at least the first 48 hours.
- Monitor the blood glucose level every 3 hours until the child is fully conscious.
- Check the rate of IV infusion regularly. If available, use a giving chamber with a volume of 100–150 ml. Be very careful about overinfusion of fluids from a 500 ml or 1 litre bottle or bag, especially if the child is not supervised all the time. If the risk of overinfusion cannot be ruled out, rehydration using a nasogastric tube may be safer.
- Keep a careful record of fluid intake (including IV) and output.

5.1.2 *Malaria (non-severe)*

Diagnosis

The child has:

- fever (temperature ≥37.5 °C or ≥99.5 °F), and
- a positive blood smear.

None of the following is present, on examination:

- — altered consciousness
- — severe anaemia (haematocrit <18% or haemoglobin <6 g/dl)
- — hypoglycaemia (blood glucose <2.5 mmol/litre or <45 mg/dl)
- — respiratory distress
- — jaundice.

Note: If a child in a malarious area has fever, but it is not possible to confirm with a blood film, treat the child as for malaria.

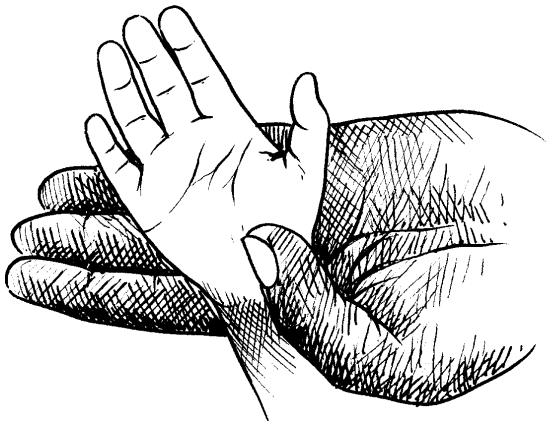
Treatment

Treat at home with a first-line antimalarial, as recommended in the national guidelines. Chloroquine and sulfadoxine-pyrimethamine are the first- and second-line antimalarials in many countries (see Appendix 2, A2.3, page 139, for details of dosage regimens).

Complications

Anaemia (not severe)

In any child with palmar pallor, determine the haemoglobin or haematocrit level. Check that severe anaemia is not present. Haemoglobin between 6 g/dl and 9.3 g/dl (equivalent to a haematocrit of between approximately 18% and 27%) indicates non-severe anaemia. Begin treatment as follows.



Palmar pallor—sign of anaemia

- Give home treatment with a daily dose of iron/folate tablet or iron syrup for 14 days: see Appendix 2, A2.5, page 141). Note: *If the child is taking sulfadoxine-pyrimethamine for malaria, do not give iron tablets that contain folate until a follow-up visit in 2 weeks. The folate may interfere with the action of the antimalarial.*
- Ask the parent to return with the child in 14 days. Treat for 3 months, where possible (it takes 2–4 weeks to correct the anaemia and 1–3 months to build up iron stores).
- If the child has not had mebendazole in the previous 6 months, give one dose of mebendazole (500 mg) for possible hookworm or whipworm infestation (see page 143).
- Advise the mother about good feeding practices.
- Omit iron in any child with severe malnutrition in the acute phase.

Follow-up

Tell the mother to return if the fever persists for two days after starting treatment, or sooner if the child's condition gets worse. She should return any time if the fever comes back.

If this happens: check if the child actually took the treatment and repeat a blood smear. If the treatment was not taken, repeat it. If it was taken but the blood smear is still positive (within 14 days), treat with a second-line antimalarial. Reassess the child to exclude the possibility of other causes of fever (see Chapter 2, pages 24–29, and sections 5.2 to 5.9 below).

If the fever persists after two days of treatment with the second-line antimalarial, ask the mother to return with the child to reassess for other causes of fever.

5.2 Meningitis

Acute bacterial meningitis is a bacterial infection of the meninges and cerebrospinal fluid, resulting in meningeal inflammation, obstruction of the circulation of the cerebrospinal fluid caused by purulent exudate, cerebral oedema, and local necrosis of nerve fibres and cerebral vessels. Early diagnosis is essential for effective treatment. This section covers children and infants over 2 months old. See section 6.1 (page 74) for diagnosis and treatment of meningitis in young infants.

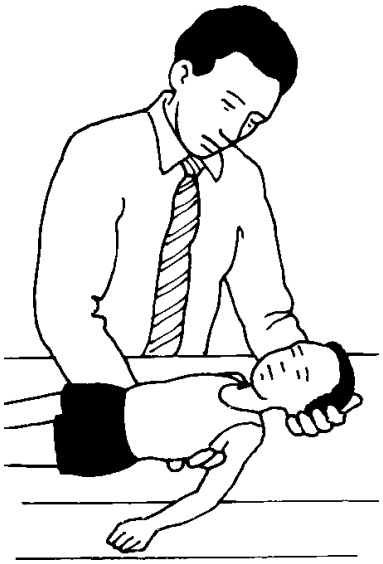
Diagnosis

Look for a *history* of:

- vomiting
- inability to drink or breastfeed
- a headache or pain in back of neck
- a recent head injury
- convulsions
- irritability.

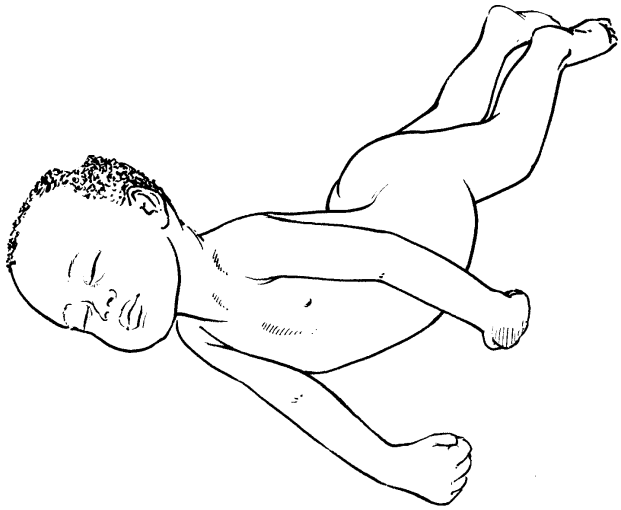
On *examination*, look for:

- a stiff neck
- repeated convulsions
- a petechial rash or purpura
- lethargy



Looking and feeling for stiff neck in a child

Unequal pupil size—a sign of raised intracranial pressure



Opisthotonus and rigid posture: a sign of meningeal irritation and raised intracranial pressure

- irritability
- evidence of head trauma suggesting possibility of a recent skull fracture
- bulging fontanelle.

Also, look for any of the following signs of raised intracranial pressure:

- unequal pupils
- rigid posture (see Figure)
- focal paralysis in any of the limbs or trunk
- irregular breathing.

Laboratory investigations

If possible, confirm the diagnosis with a lumbar puncture and examination of the CSF. Microscopy alone should indicate the presence of meningitis in the majority of cases with the white cell (polymorph) count above 100/mm^3. Confirmatory information can be gained from the CSF glucose (low: <1.5 mmol/litre), CSF protein (high: >0.4 g/litre), and Gram staining and culture of the CSF, where possible. Do not, however, carry out a lumbar puncture if there are signs of raised intracranial pressure or local infection at the lumbar puncture site. For procedures during meningococcal outbreaks, see below.

In children known or suspected to be HIV-positive, tuberculous or fungal meningitis should also be considered (by examination of CSF—see a standard textbook of paediatrics for details). Tuberculous meningitis is also more common in children with severe malnutrition and those with presumed bacterial meningitis who respond poorly to antibiotic treatment.

Treatment

If the CSF is obviously cloudy, treat immediately with antibiotics before the results of laboratory CSF examination are available. If the child has signs of meningitis and a lumbar puncture is not possible, treat immediately.

Antibiotic treatment

- Give antibiotic treatment as soon as possible. Choose one of the following two regimens:

  1. Chloramphenicol: 25 mg/kg IM (or IV) every 6 hours, *plus*

     ampicillin: 50 mg/kg IM (or IV) every 6 hours

     OR

  2. Chloramphenicol: 25 mg/kg IM (or IV) every 6 hours, *plus*

     benzylpenicillin: 60 mg/kg (100 000 units/kg) every 6 hours IM (or IV).

     Where there is known significant drug resistance of common organisms (e.g. *Haemophilus influenzae* or *Pneumococcus*) to these antibiotics, follow the national guidelines. In many circumstances, the most appropriate treatment will be a third-generation cephalosporin such as:

     — ceftriaxone: 50 mg/kg IV, over 30–60 minutes every 12 hours; or
     — cefotaxime: 50 mg/kg IM or IV, every 6 hours.

- Review therapy when CSF results are available. If the diagnosis is confirmed, give treatment parenterally for at least 3 days. Once the child has improved, give chloramphenicol orally unless there is concern about oral absorption (e.g. in severely malnourished children or in those with diarrhoea), in which cases the full treatment should be given parenterally. The total duration of treatment is 10 days.

Note: Fever may persist for 5–7 days. If the child is responding well to treatment, i.e. with resolution of

clinical signs of meningitis and improved level of consciousness, there is no need to change the treatment. However, check for a second focus of infection such as pneumonia or septic arthritis.

- If there is a poor response to treatment:
  - — Consider the presence of common complications, such as subdural effusions (persistent fever plus focal neurological signs or reduced level of consciousness) or a cerebral abscess. If these are suspected, refer the child to a central hospital with specialized facilities for further management (see a standard paediatrics textbook for details of treatment).
  - — Look for other sites of infection which may be the cause of fever, such as cellulitis at injection sites, arthritis, or osteomyelitis.
  - — Repeat the lumbar puncture after 48 hours or more if the fever is still present and the child's overall condition is not improving, and look for evidence of improvement (e.g. fall in leukocyte count and rise in glucose level).
- During a *confirmed epidemic of meningococcal meningitis* it is not necessary to perform a lumbar puncture on children who have petechial or purpuric signs, which are characteristic of meningococcal infection. During such epidemics, give oily chloramphenicol (100 mg/kg IM as a single dose up to a maximum of 3 grams) for the treatment of meningococcal meningitis. The oily suspension is thick and may be difficult to push through the needle. If this problem is encountered, the dose can be divided into two parts and an injection given into each buttock of the child. This simplified treatment schedule is particularly useful in situations where there are limited resources to deal with the epidemic.
- Consider tuberculous meningitis if:
  - — fever persists for 14 days
  - — fever persists for more than 7 days and there is a family member with tuberculosis
  - — HIV infection is known or suspected
  - — the patient remains unconscious
  - — CSF continues to have moderately high white blood cell counts (typically, <500 white cells per ml, mostly lymphocytes), elevated protein levels (0.8–4 g/l) and low glucose levels (<1.5 mmol/litre).
  - — a chest X-ray suggests tuberculosis.

  Consult a standard paediatrics textbook for further details if tuberculous meningitis is suspected. The diagnosis is usually made on the above clinical findings and CSF results. Occasionally, when the diagnosis is not clear, a trial of treatment for tuberculous meningitis is added to the treatment for bacterial meningitis. Consult national tuberculosis programme guidelines. The optimal treatment regimen, where there is no drug resistance, comprises:
  - — isoniazid (10 mg/kg) for 6–9 months; and
  - — rifampicin (15–20 mg/kg) for 6–9 months; and
  - — pyrazinamide (35 mg/kg) for the first 2 months.

Steroid treatment

In some hospitals in industrially developed countries, parenteral dexamethasone is used in the treatment of meningitis. There is not sufficient evidence to recommend routine use of dexamethasone in all children with bacterial meningitis in developing countries.

Do *not* use steroids in:
- — newborns
- — suspected cerebral malaria
- — suspected viral encephalitis
- — areas with a high prevalence of penicillin-resistant pneumococcal invasive disease.

Dexamethasone (0.6 mg/kg/day for 2–3 weeks, tailing the dose over a further 2–3 weeks) should be given to cases of tuberculous meningitis complicated by a reduced level of consciousness and focal neurological signs.

Antimalarial treatment

In malarious areas, take a blood smear to check for malaria since cerebral malaria should be considered as a differential diagnosis or co-existing condition. Treat with an antimalarial if malaria is diagnosed. If for any reason a blood smear is not possible, treat presumptively with an antimalarial.

Supportive care

Examine all children with convulsions for hyperpyrexia and hypoglycaemia. Treat the hypoglycaemia (see page 59). Control high fever (≥39 °C or ≥102.2 °F) with paracetamol.

In an *unconscious child*:

- Maintain a clear airway.
- Nurse the child on the side to avoid aspiration of fluids.
- Turn the patient every 2 hours.
- Do not allow the child to lie in a wet bed.
- Pay attention to pressure points.

Oxygen treatment

Oxygen is *not* indicated unless the child has convulsions or associated severe pneumonia with signs of hypoxia (central cyanosis, severe lower chest wall

indrawing, respiratory rate of ≥70/minute). If available, give oxygen to these children (see section 9.5, page 109).

High fever

If fever (≥39 °C or ≥102.2 °F) is causing distress or discomfort, give paracetamol.

Fluid and nutritional management

There is no good evidence to support fluid restriction in children with bacterial meningitis. Give them their daily fluid requirement, but not more (see page 108) because of the risk of cerebral oedema. Monitor IV fluids very carefully and examine frequently for signs of fluid overload. The most reliable sign is an enlarging liver. Additional signs are gallop rhythm, fine crackles at lung bases and/or, in older children, fullness of neck veins when sitting upright.

Give due attention to acute nutritional support and nutritional rehabilitation (see page 99).

Monitoring

Nurses should monitor the child's state of consciousness, respiratory rate and pupil size every 3 hours during the first 24 hours (thereafter, every 6 hours), and a doctor should monitor the child at least twice daily.

On discharge, assess all children for neurological problems, especially hearing loss. Measure and record the head circumference of infants. If there is neurological damage, refer the child for physiotherapy, if possible, and give simple suggestions to the mother for passive exercises.

Complications

Convulsions

If convulsions occur, give anticonvulsant treatment with rectal diazepam or paraldehyde (see Chart 9, page 12) or IM paraldehyde (see Appendix 2, A2.6, page 141).

Hypoglycaemia

Give 5 ml/kg of 10% glucose (dextrose) solution IV rapidly (see Chart 10, page 13). Recheck the blood glucose in 30 minutes and if the level is low (<2.5 mmol/litre or <45 mg/dl), repeat the IV 10% glucose or dextrose (5 ml/kg)

Prevent further hypoglycaemia in unconscious children with 10% glucose infusion (by adding 10 ml of 50% glucose to 90 ml of a 5% glucose solution). Do not exceed maintenance fluid requirements for the child's weight (see section 9.2, page 108). If the child develops signs of fluid overload, stop the infusion and repeat the IV 10% dextrose (5 ml/kg) at regular intervals.

Once the child is conscious, stop IV treatment. Feed the child as soon as it is safe. Breastfeed every 3 hours, if possible, or give milk feeds of 15 ml/kg if the child can swallow. If there is a risk of aspiration, give the sugar solution by nasogastric tube (see Chart 10, page 13). Continue to monitor the blood glucose level and treat accordingly (as above), if found to be <2.5 mmol/ litre or <45 mg/dl.

Follow-up

Sensorineural deafness is common after meningitis. Arrange a hearing assessment on all children after discharge from hospital.

Public health measures

In meningococcal meningitis epidemics, advise families of the possibility of secondary cases within the household so that they report for treatment promptly.

5.3 Measles

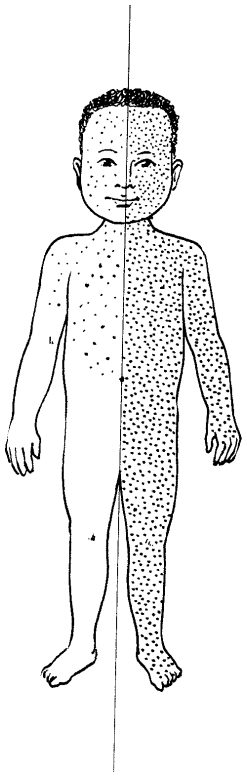
Measles is a highly contagious viral disease with serious complications (such as blindness in children with pre-existing vitamin A deficiency) and high mortality. It is rare in infants under 3 months of age. After 1–2 weeks of incubation, the infection presents with a cough, mild conjunctivitis, fever and nasal discharge. Small grey-white lesions (Koplick's spots) appear on the posterior buccal mucosa. A fine maculopapular rash develops behind the ears and along the hair-line, and spreads to become generalized and blotchy, lasting about 4 days. The rash may lead to skin desquamation.

Diagnosis

Measles often occurs in epidemics; recent episodes in the area should raise the suspicion of measles. Diagnose measles if the mother clearly reports that the child has had a typical measles rash, or if the child has:

- fever; *and*
- a generalized rash; *and*
- *one* of the following—cough, runny nose, or red eyes.

In children with HIV infection, these signs may not be present and the diagnosis of measles may be difficult.



Distribution of measles rash. The left side of the drawing shows the early rash covering the head and upper part of the trunk, the right side shows the later rash covering the whole body.

5.3.1 *Severe complicated measles*

Diagnosis

In a child with evidence of measles (as above), any one of the following symptoms and signs indicate the presence of severe complicated measles:

- inability to drink or breastfeed
- vomits everything
- convulsions.

On *examination*, look for signs of *late complications* after the rash has disappeared, such as:

- lethargy or unconsciousness
- corneal clouding
- deep or extensive mouth ulcers.
- pneumonia (see section 3.1, page 29)
- dehydration from diarrhoea (see section 4.1, page 45)
- stridor due to measles croup
- severe malnutrition.

Corneal clouding—sign of xerophthalamia in vitamin A deficient child shown in comparison to the normal eye (right side)

Treatment

Children with severe complicated measles require treatment in hospital.

Vitamin A therapy is given to all children with measles unless the child has already had adequate vitamin A treatment for this illness as an outpatient or had received a preventive vitamin A supplement within 1 month. Give two doses: the first immediately on diagnosis, the second the next day. The dose will vary with the child's age: vitamin A 50 000 IU (if aged <6 months), 100 000 IU (6–11 months) or 200 000 IU (12 months up to 5 years). See details in Appendix 2, page 141. If the child shows eye signs of vitamin A deficiency or is severely malnourished, a third dose must be given 2–4 weeks after the second dose when the child comes for follow-up.

Supportive care

Fever

If the temperature is ≥39 °C or ≥102.2 °F and this is causing the child distress, give paracetamol. If the fever persists for more than 3–4 days, this may be an indication of a secondary infection. Reassess the child to determine if there is another cause for the fever. Give antimalarial treatment if the blood film is positive.

Nutritional support

Assess the nutritional status by weighing the child and plotting the weight on a growth chart (rehydrate before weighing). Encourage continued breastfeeding. Encourage the child to take frequent small meals. Check for mouth ulcers and treat them, if present (see below). Follow the guidelines on nutritional management given in Chapter 9 (page 99).

Complications

Follow the guidelines given in other sections of this manual for the management of the following complications:

- *Pneumonia*: see section 3.1, page 29.
- *Otitis media*: see page 69.
- Diarrhoea: treat dehydration, bloody diarrhoea or persistent diarrhoea: see Chapter 4, page 45.
- *Measles croup*: see section 3.4.1, page 37.
- *Eye problems*. Conjunctivitis and corneal and retinal damage may occur due to infection, vitamin A deficiency, or harmful local remedies. In addition to giving vitamin A (as above), treat any infection that is present. If there is a clear watery discharge, no treatment is needed. If there is pus discharge, clean the eyes using cotton wool boiled in water, or a clean cloth dipped in clean water. Apply tetracycline eye ointment, 3 times a day

for 7 days. Never use steroid ointment. Use a protective eye pad to prevent other infections. If there is no improvement, refer to an eye specialist.

- *Mouth ulcers*. If the child is able to drink and eat, clean the mouth with clean, salted water (a pinch of salt in a cup of water) at least 4 times a day.
  - — Apply 0.25% gentian violet to the sores in the mouth after cleaning.
  - — If the mouth ulcers are severe and/or smelly, give IM benzylpenicillin (50 000 units/kg every 6 hours) and oral metronidazole (7.5 mg/kg 3 times a day) for 5 days.
  - — If the mouth sores result in decreased intake of food or fluids, the child may require feeding via a nasogastric tube.
- *Neurological complications*. Convulsions, excessive sleepiness, drowsiness or coma may be a symptom of encephalitis or severe dehydration. Assess the child for dehydration and treat accordingly (see section 4.1, page 45). See Chart 9, page 12, for treatment of convulsions and care of an unconscious child.
- *Severe malnutrition*. See guidelines in Chapter 7, page 80.

Monitoring

Take the child's temperature twice a day and check for the presence of the above complications once daily. In children with uncomplicated measles, the temperature usually returns to normal about 4 days after the appearance of the rash. A temperature that does not go down, or even rises after staying normal for 24 hours or more, suggests a secondary infection. Weigh the child daily to monitor nutrition.

Follow-up

Recovery following acute measles is often delayed for many weeks and even months, especially in children who are malnourished. Recovery may be complicated by failure to thrive, recurrent infections, and persistent pneumonia and diarrhoea. The death rate during this phase is significantly increased. After discharge, mothers should be advised of potential problems and asked to return if they arise. Arrange for the child to receive the third dose of vitamin A before discharge, if this has not already been given.

Public health measures

If possible, isolate children admitted to hospital with measles for at least 4 days after the onset of the rash. Ideally, they should be kept in a separate ward from other children. In malnourished and immunocompromised children, the isolation should be continued throughout the duration of the illness.

When there are measles cases in the hospital, immunize all other children above the age of 6 months (including those seen in outpatients, children admitted in the week following a measles case, and HIV-positive children). If infants aged 6–9 months receive measles vaccine, it is essential for the second dose to be given as soon as possible after 9 months of age.

Check the immunization status of hospital staff and immunize, if necessary.

5.3.2 *Measles (non-severe)*

Diagnosis

Diagnose non-severe measles in a child whose mother clearly reports that the child has had a measles rash, or if the child has:

- fever; *and*
- a generalized rash; *and*
- *one* of the following—cough, runny nose or red eyes; *but*
- none of the features of severe measles (see section 5.3.1, page 65).

Treatment

Treat as an outpatient. The present section gives guidelines on the management of children under the IMCI classifications of "measles" and "measles with eye complications".

Vitamin A therapy. Follow instructions for treatment given on page 65. See details in Appendix 2, A2.5, page 141.

Supportive care

Fever. If ≥39 °C or ≥102.2 °F and this is causing distress or discomfort, give paracetamol. Give antimalarial treatment if the blood film is positive. Do not use antibiotics routinely.

Nutritional support. Assess the nutritional status by weighing the child and plotting the weight on a growth chart. Encourage the mother to continue breastfeeding and to give the child frequent small meals. Check for mouth ulcers and treat, if present (see above). Follow guidelines on nutritional management (see Chapter 9, page 99).

Eye care. For mild conjunctivitis with only a clear watery discharge, no treatment is needed. If there is pus, clean the eyes using cotton wool boiled in water, or a clean cloth dipped in clean water. Apply tetracycline eye ointment, 3 times a day for 7 days. Never use steroid ointment.

Mouth care. If the child has a sore mouth, ask the mother to wash the mouth with clean, salted water (a pinch of salt in a cup of water) at least 4 times a day. Advise the mother to avoid giving salty, spicy or hot foods to the child.

Follow-up

Ask the mother to return with the child in two days to see whether the mouth or eye problems are resolving, and to exclude any severe complications of measles (see above).

5.4 Septicaemia

Consider septicaemia in a child with acute fever who is severely ill, when no cause can be found. Wherever meningococcal disease is common, a clinical diagnosis of meningococcal septicaemia must be made if petechiae or purpura (haemorrhagic skin lesions) are present.

Diagnosis

On *examination*, look for the following:

- fever with no obvious focus of infection
- blood film for malaria is negative
- no stiff neck or other specific signs of meningitis (or a lumbar puncture for meningitis is negative)
- signs of systemic upset (e.g. inability to drink or breastfeed, convulsions, lethargy or vomiting everything)
- purpura may be present.

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

Where possible, *laboratory investigations* for bacteriology culture should be carried out on the blood and urine.

Treatment

- Give benzylpenicillin (50 000 units/kg every 6 hours) plus chloramphenicol (25 mg/kg every 8 hours) for 7 days.
- If the child's response to the above treatment is poor after 48 hours, change to chloramphenicol (25 mg/kg every 8 hours) plus ampicillin (50 mg/kg IM 6-hourly).

Where there is known significant drug resistance to these antibiotics among Gram-negative bacteria, follow the national or local hospital guidelines for management of septicaemia. In many circumstances, the appropriate antibiotic may be a third-generation cephalosporin such as ceftriaxone (80 mg/kg IV, once daily over 30–60 minutes) for 7 days.

Supportive care

If a high fever of ≥39 °C (≥102.2 °F) is causing the child distress or discomfort, give paracetamol. For information on fluid intake and nutritional management, see sections 9.1 and 9.2 (pages 99, 108).

Complications

Common complications of septicaemia include convulsions, confusion or coma, dehydration, shock, cardiac failure, disseminated intravascular coagulation (with bleeding episodes), pneumonia, and anaemia. Septicaemic shock is an important cause of death. Treat medical complications according to the guidelines given in other sections (see management of shock, coma and convulsions in Chapter 1, pages 2–4; diarrhoea with dehydration in section 4.1, page 45; cardiac failure in section 3.8, page 43; pneumonia in section 3.1, page 29; and anaemia in section 9.4, page 109). Refer to a standard paediatrics textbook for the management of disseminated intravascular coagulation.

Monitoring

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

5.5 Typhoid fever

Consider typhoid fever if a child presents with fever, plus any of the following: diarrhoea or constipation, vomiting, abdominal pain, headache or cough, particularly if the fever has persisted for 7 or more days and malaria has been excluded. Multiple drug resistance is now a significant problem in many parts of Asia and may lead to higher mortality.

Diagnosis

On *examination*, key diagnostic features of typhoid are:

- fever with no obvious focus of infection
- no stiff neck or other specific signs of meningitis, or a lumbar puncture for meningitis is negative (*note*: children with typhoid can occasionally have a stiff neck)
- signs of systemic upset, e.g. inability to drink or breastfeed, convulsions, lethargy, disorientation/confusion, or vomiting everything.

Laboratory investigation of blood smear for malaria is negative.

Typhoid fever can present atypically in young infants as an acute febrile illness with shock and hypothermia. In areas where typhus is common, it may be very difficult to distinguish between typhoid fever and typhus by clinical examination alone (see standard paediatrics textbook for diagnosis of typhus).

Treatment

- Treat with chloramphenicol (25 mg/kg every 8 hours) for 14 days, but see section 6.1, page 74, for treatment of young infants.
- If there is severe systemic upset or signs suggesting meningitis, treat with benzylpenicillin (50 000 units/kg every 6 hours) for 14 days, *in addition* to chloramphenicol (25 mg/kg every 6 hours).
- If the response to treatment is poor after 48 hours, change to chloramphenicol (25 mg/kg every 8 hours) plus ampicillin (50 mg/kg IM every 6 hours).
- Where drug resistance to chloramphenicol and ampicillin among *Salmonella typhi* isolates is known to be significant, follow the national guidelines for typhoid fever. In many circumstances, the appropriate antibiotic will be a third-generation cephalosporin such as ceftriaxone (80 mg/kg IM or IV, once daily, over 30–60 minutes). As multiple drug resistance is now common in some parts of the world, other treatment regimens such as ciprofloxacin (see Appendix 2, A2.1, page 135) may have to be used in areas where there is known resistance to these drugs.

Supportive care

If the child has high fever (≥39 °C or ≥102.2 °F) which is causing distress or discomfort, give paracetamol.

For information on fluid intake and nutritional management, see sections 9.1 and 9.2, pages 99. 108.

Anaemia has been reported to be associated with increased mortality from typhoid fever. Monitor haemoglobin or haematocrit levels and, if they are low and falling, weigh the benefits of transfusion against any risk of blood-borne infection (see section 9.4, page 109).

Monitoring

The child should be checked by nurses at least every 3 hours and by a doctor at least twice a day. If the child responds poorly to treatment after 48 hours, change the antibiotic regimen. Check for the presence of complications (see below).

Complications

Complications of typhoid fever include convulsions, confusion or coma, diarrhoea, dehydration, shock, cardiac failure, pneumonia, osteomyelitis and anaemia. In young infants, shock and hypothermia can occur.

Acute gastrointestinal perforation with haemorrhage and peritonitis can occur, usually presenting with severe abdominal pain, vomiting, abdominal tenderness on palpation, severe pallor and shock. Abdominal examination may show an abdominal mass due to abscess formation, an enlarged liver and/or spleen.

If there are signs of gastrointestinal perforation, pass an IV line and nasogastric tube, and get surgical attention. Treat medical complications according to guidelines given in other sections (see management of shock, coma and convulsions in Chapter 1, pages 2–4; diarrhoea with dehydration in section 4.1, page 45; cardiac failure in section 3.8, page 43; pneumonia in section 3.1, page 29; and anaemia in section 9.4, page 109). Refer to a standard paediatrics textbook for management of abdominal surgical complications.

5.6 Ear infections

5.6.1 Mastoiditis

Mastoiditis is a bacterial infection of the mastoid cells behind the ear. Without treatment it can lead to meningitis and brain abscess.

Diagnosis

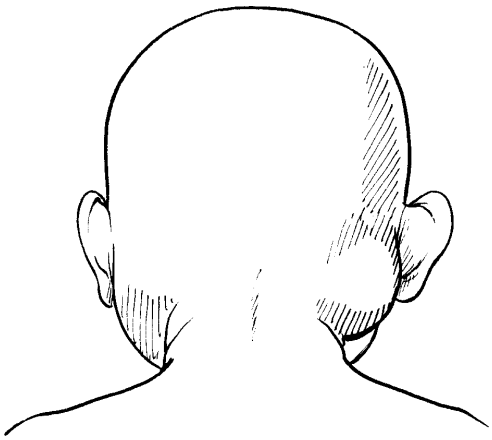
Key diagnostic features are:

- high fever
- tender swelling behind the ear.

Treatment

- Give chloramphenicol (25 mg/kg every 8 hours IM or IV) and benzylpenicillin (50 000 units/kg every

Feeling for a tender swelling behind the ears



Mastoiditis—a tender swelling behind the ear which pushes the ear forward

6 hours) until the child improves; then continue oral chloramphenicol every 8 hours for a total course of 10 days.
- If there is no response to treatment within 48 hours or the child's condition deteriorates, refer the child to a surgical specialist to consider incision and drainage of mastoid abscesses or mastoidectomy.
- If there are signs of meningitis or brain abscess, give antibiotic treatment as outlined in section 5.2 (page 62) and, if possible, refer to a specialist hospital immediately.

Supportive care

If high fever (≥39 °C or ≥102.2 °F) is causing distress or discomfort to the child, give paracetamol.

Monitoring

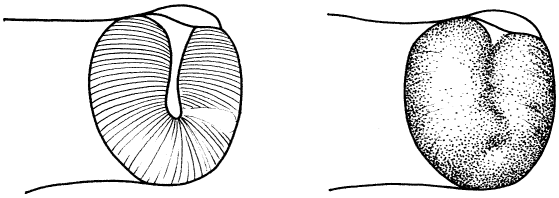
The child should be checked by nurses at least every 6 hours and by a doctor at least once a day. If the child responds poorly to treatment, consider the possibility of meningitis or brain abscess (see section 5.2, page 61).

5.6.2 ***Acute otitis media***

Acute otitis media is an inflammation of the middle ear cavity behind the eardrum for less than 14 days. Fluid accumulates and causes pain through the increase of pressure in the cavity. When the eardrum ruptures, pus discharges from the ear. Where possible, confirm otitis media by otoscopy.

Diagnosis

This is based on a *history* of ear pain or pus draining from the ear (for a period of <2 weeks). On *examination*, confirm acute otitis media by otoscopy. The ear drum will be red, inflamed and immobile.



Acute otitis media—bulging red eardrum (compared to normal appearance of eardrum on left)

Treatment

Treat the child as an outpatient.

- Give oral cotrimoxazole (trimethoprim 4 mg/kg/ sulfamethoxozole 20 mg/kg twice a day) or amoxicillin (15 mg/kg 3 times a day) for 5 days.
- If there is pus draining from the ear, show the mother how to dry the ear by wicking. *Roll clean, absorbent cloth or soft, strong tissue paper into a pointed wick. Insert this in the child's ear and remove when wet. Replace with a clean wick and continue to do this until the ear is dry.* Advise the mother to wick the ear 3 times daily until there is no more pus.
- Tell the mother not to place anything in the ear between wicking treatments. Do not allow the child to go swimming or get water in the ear.
- If the child has ear pain or high fever (≥39 °C or ≥102.2 °F) which is causing distress, give paracetamol.

Follow-up

Ask the mother to return after 5 days.

Wicking the child's ear dry in chronic otitis media

- *If ear pain or discharge persists*, treat for 5 more days with the same antibiotic and continue wicking the ear. Follow up in 5 days.
- *If there is a tender swelling behind the ear and high fever*, the child may have developed mastoiditis. Admit the child to hospital and treat according to guidelines in section 5.6.1, page 68.

5.6.3 *Chronic otitis media*

If pus has been draining from the ear for 2 weeks or longer, the child has a chronic ear infection.

Diagnosis

This is based on a *history* of pus draining from the ear for more than 2 weeks. On *examination*, confirm chronic otitis media (where possible) by otoscopy to distinguish from chronic otitis externa, although this may be difficult due to the pus. The eardrum may be inflamed and will show a perforation.

Treatment

Treat the child as an outpatient.

- Keep the ear dry by wicking (see page 69).

Follow-up

Ask the mother to return after 5 days.

- *If the ear discharge persists*, check that the mother is continuing to wick the ear. Give a *single course* of oral antibiotic treatment as for acute otitis media if not already given (see section 5.6.2). Follow up in 5 days. *Note*: oral antibiotic treatment may not be effective against chronic ear infections. Do not give repeated courses of oral antibiotics for a draining ear.
- *If the ear discharge persists*, encourage the mother to continue to wick the ear dry and, if possible, refer to a specialist for ear suction and parenteral antibiotic treatment.

5.7 Urinary tract infection

Urinary tract infection (UTI) is common, particularly in young female infants. When present, bacterial culture will show $>10^8$ bacteria per litre of uncontaminated urine taken from a symptomatic child. As bacterial culture is usually not available in developing countries, the diagnosis is usually based on clinical signs and urine microscopy.

Diagnosis

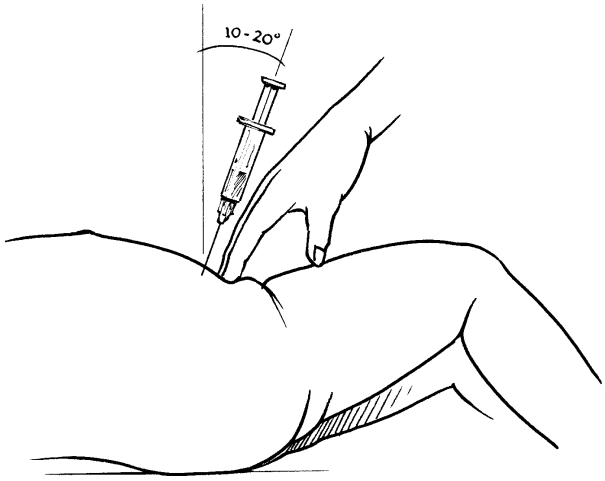
In young children, UTI often presents with non-specific signs, on examination, such as vomiting, fever, irritability, or failure to thrive. Older children may present with more specific signs such as abdominal pain, pain on passing urine, increased frequency of passing urine, or bed wetting (in a child who was previously dry at night).

Investigations

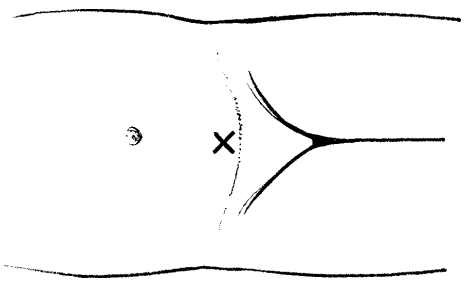
- Carry out microscopy of a clean, fresh, uncentrifuged specimen of urine. Cases of UTI will usually show >5 white cells per high-power field.
- If possible, obtain a "clean catch" urine sample for culture. In sick infants, supra-pubic aspiration may be required. Aspirate to a depth of 3 cm in the midline at the proximal transverse crease above the pubis with a 23 G needle under sterile conditions. Do this only in a child with a full bladder, which can be demonstrated by percussion. Do not use urine bags to collect urine because the specimens may become contaminated.

Treatment

Treat the child as an outpatient, except when there is high fever and systemic upset (such as vomiting everything or inability to drink or breastfeed).



Position for carrying out suprapubic aspirate—side view. Note the angle of insertion of the needle.



Selecting the place for a suprapubic aspirate. The bladder is punctured in the midline, just above the symphysis

- Give oral cotrimoxazole (4 mg trimethoprim/20 mg sulfamethoxazole per kg every 12 hours) for 7 days. Alternatives include ampicillin, amoxicillin and cefalexin, depending on local sensitivity patterns of *E. coli* and other Gram-negative bacilli that cause UTI, and on antibiotic availability (see Appendix 2, A2.1, page 135, for details of dosage regimens).
- If there is a poor response to the first-line antibiotic or the child's condition deteriorates, give gentamicin (7.5 mg/kg IM once daily) plus ampicillin (50 mg/kg IM every 6 hours) or a parenteral cephalosporin (see Appendix 2, A2.1, page 135). Consider complications such as pyelonephritis (tenderness in the costo-vertebral angle and high fever) or septicaemia.
- Treat young infants aged <2 months with gentamicin (7.5 mg/kg IM once daily) until the fever has subsided; then continue with oral treatment, as described above.

Supportive care

The child should be encouraged to drink or breastfeed regularly in order to maintain a good fluid intake, which will assist in clearing the infection and prevent dehydration.

Follow-up

- Investigate all episodes of UTI in >1-year-old males and in all children with more than one episode of UTI in order to identify the cause. See a standard paediatrics textbook for details. This may require referral to a larger hospital with facilities for appropriate X-ray or ultrasound investigations.

5.8 Septic arthritis and osteomyelitis

Acute osteomyelitis is an infection of the bone, usually caused by spread of bacteria through the blood. However, some bone or joint infections result from an adjacent focus of infection or from a penetrating injury. Occasionally several bones or joints can be involved.

Diagnosis

In acute cases of bone or joint infection, the child looks ill, is febrile, and usually refuses to move the affected limb or joint, or bear weight on the affected leg. In acute osteomyelitis there is usually swelling over the bone and tenderness. In septic arthritis, the affected joint is hot, swollen and tender.

These infections sometimes present as a chronic illness, in which case the child appears less ill and may not have a fever. Local signs are less marked. Among bacterial infections, consider tuberculous osteomyelitis when the illness is chronic and there are discharging sinuses.

Laboratory investigations

X-rays are not helpful in diagnosis in the early stages of the disease. If septic arthritis is strongly suspected, introduce a sterile needle into the affected joint and aspirate the joint. The fluid may be cloudy. If there is pus in the joint, use a wide-bore needle to obtain a sample and remove the pus. Examine the fluid for white blood cells and carry out culture, if possible.

Staphylococcus aureus is the usual cause in children aged >3 years. In younger children, the commonest causes are *Haemophilus influenzae* type b, *Streptococcus pneumoniae*, or *Streptococcus pyogenes* group A. *Salmonella* is a common cause in children with sickle-cell disease.

Treatment

If culture is possible, treat according to the causative organism and the results of antibiotic sensitivity tests. Otherwise:

- Treat with IM chloramphenicol (25 mg/kg every 8 hours) in children aged <3 years and in those with sickle-cell disease.

Sickle cells

- Treat with IM cloxacillin (50 mg/kg every 6 hours) in children aged >3 years. If this is not available, give chloramphenicol.
- Once the child's temperature returns to normal, change to oral treatment with the same antibiotic and continue this for a total of 3 weeks for septic arthritis and 5 weeks for osteomyelitis.
- In septic arthritis, remove the pus by aspirating the joint. If swelling recurs repeatedly after aspiration, or if the infection responds poorly to 3 weeks of antibiotic treatment, surgical exploration,

drainage of pus, and excision of any dead bone should be carried out by a surgeon. In the case of septic arthritis, open drainage may be required. The duration of antibiotic treatment should be extended in these circumstances to 6 weeks.

- Tuberculous osteomyelitis is suggested by a history of slow onset of swelling and a chronic course, which does not respond well to the above treatment. Treat according to national tuberculosis control programme guidelines. Surgical treatment is almost never needed because the abscesses will subside with anti-tuberculosis treatment.

Supportive care

The affected limb or joint should be rested. If it is the leg, the child should not be allowed to bear weight on it until pain-free. Treat the pain or high fever (if it is causing discomfort to the child) with paracetamol.

5.9 Dengue haemorrhagic fever

Dengue haemorrhagic fever (DHF) is caused by an arbovirus which is transmitted by the *Aedes* mosquito. It is highly seasonal in many countries in Asia. The illness starts with an acute onset of fever, flushed face, headache, joint and muscle pains, abdominal pain, vomiting and/or a rash. The fever remains continuously high for 2–7 days. The most severe form of DHF, dengue shock syndrome (DSS), is thought to occur in children (usually >6 months old) who have had a previous dengue infection.

Diagnosis

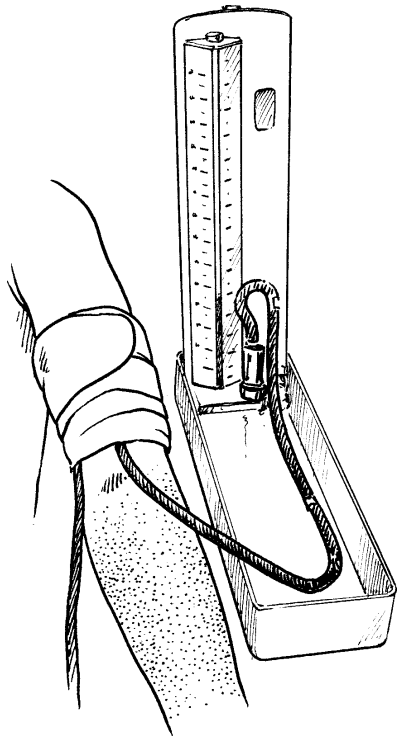
Suspect *severe DHF* in an area of dengue risk, if a child has fever lasting more than 2 days, plus any of the following signs on examination:

- bleeding from the nose or gums
- bleeding in the stools or vomitus
- black stools or vomitus
- skin petechiae
- tourniquet test positive (in absence of above signs).

Other signs which may be present:

- abdominal tenderness in the right upper quadrant
- maculo-papular rash
- pleural effusion
- reduced level of consciousness.

Suspect *dengue shock syndrome* in any child (usually aged >6 months) with fever and signs of severe DHF, who presents in shock. Shock usually occurs during days 3–7 of the febrile illness and is very uncommon before or after this period. Deterioration in the child's clinical condition often coincides with a drop in body temperature. In severe cases, death is usually due to shock and cardiac failure rather than severe haemorrhage.



Positive tourniquet test—sign of dengue haemorrhagic fever

A macular red-purple rash is often seen later in the illness and is associated with recovery from DHF.

Treatment

There is no specific treatment for the arboviral infection causing DHF. The most important aspects of treatment are prompt identification and treatment of shock and supportive care. Recovery usually occurs over 24–48 hours and can be dramatic.

- Identify children in shock in the triage process and give emergency treatment with oxygen and IV normal saline or Ringer's lactate to restore normal blood pressure (see Chapter 1, page 3).
- Maintain IV fluids for at least 48 hours, but monitor the child for fast breathing or respiratory distress due to fluid overload and pulmonary congestion (fine basal crackles on auscultation).
- Check for hypoglycaemia (blood glucose <2.5 mmol/litre or <45 mg/dl). If present, give IV glucose as described in Chart 10, page 13.
- Check the haemoglobin or haematocrit daily from day 3 of the illness (until the fever subsides) for evidence of significant blood loss. Interpretation of changes is aided when fluid replacement is optimal. In these circumstances, a 10% drop in haematocrit suggests significant internal haemor-

rhage. A blood transfusion (10 ml/kg) is indicated (see page 109).
- In children who are not in shock, encourage oral fluid intake with clean water or ORS solution to replace losses from fever and vomiting. Monitor them closely for signs of shock during the first 48 hours.

Supportive care

- Treat high fever with paracetamol if the child is uncomfortable. Do not give aspirin as this will aggravate the bleeding.
- Do *not* give steroids.
- Convulsions are not common in children with severe DHF. But if they occur, manage as outlined in Chapter 1, page 3.
- If the child is unconscious, follow the guidelines in Chapter 1, page 3.

Monitoring

The child's response to treatment should be checked by nurses every 3 hours, and by doctors daily. If the child is being treated for shock, the IV infusion should be checked hourly. The blood glucose should be monitored and the haemoglobin or haematocrit checked daily.

CHAPTER 6

Young infants

This chapter is focused on young infants aged between 7 days and 2 months. Children in this age group are susceptible to particular infectious agents and, when ill, often show less specific clinical signs, compared with children in other age groups. Guidelines on the management of young infants with bacterial infection, diarrhoea, ophthalmia neonatorum, and hypothermia are presented in this chapter; details on the management of cardiac failure, pertussis and croup are given in Chapter 3. For the treatment of conditions in the first 6 days of life (mainly related to prematurity and complications in delivery, e.g. hyaline membrane disease), which may present with respiratory signs, please refer to a standard paediatrics textbook.

6.1 Serious bacterial infection

Serious bacterial infection in young infants includes pneumonia, sepsis and meningitis. These diseases all present in a very similar manner and treatment has often to be started immediately, even before a diagnosis of the specific cause is known. Newborns aged 1–2 weeks can also have a serious bacterial infection, if they present with severe jaundice and an umbilical and/or skin infection. The course of the illness may be fulminant and lead to death in a few hours, or it may be more protracted.

Diagnosis

The symptoms of serious bacterial infection are often non-specific. There may be a history of:

- lethargy
- poor feeding
- vomiting
- convulsions.

General signs, on examination, are:

- fever (axillary temperature ≥37.5 °C or ≥99.5 °F) or hypothermia (<35.5 °C or <95.9 °F; <36 °C or <96.8 °F in newborns)
- pallor, cyanosis or jaundice
- fast or irregular breathing
- apnoeic episodes
- severe lower chest wall indrawing
- nasal flaring
- grunting
- abdominal distension
- hepatosplenomegaly
- reduced level of consciousness.

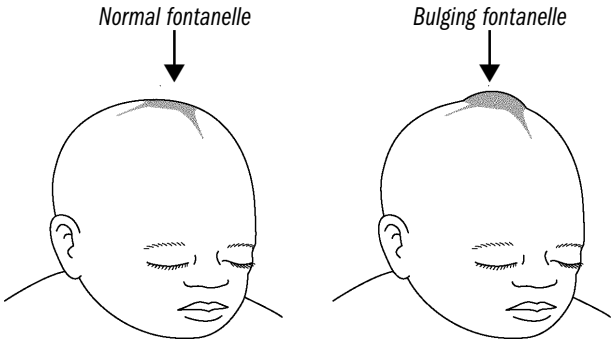
Localizing signs of infection are:

- pus draining from the ear (or signs of otitis media on otoscopy)
- painful joints, joint swelling, reduced movement, and irritability if these parts are handled
- many or severe skin pustules
- umbilical redness extending to the peri-umbilical skin or draining pus.

Suspect ***meningitis*** if the following signs are present:

- general illness—irritability, vomiting everything, lethargy
- tense or bulging fontanelle
- stiff neck (this may be a late sign)
- high pitched cry
- apnoeic episodes
- convulsions.

If there is a feeding problem, assess the infant's position (attachment) and suckling during breastfeeding (see Chapter 9, page 99), and check the mouth for thrush. In the absence of a clear cause such as thrush, the appearance of a feeding problem can be an important sign of a serious bacterial infection.



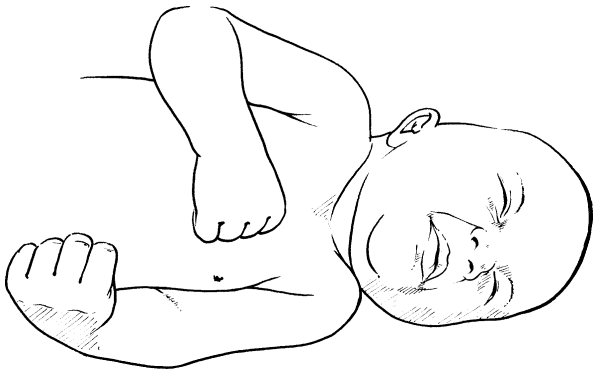
Bulging fontanelle—sign of meningitis in young infants with an open fontanelle

Laboratory investigations

- If skin pustules are present, examine the pus after Gram staining or culture the pus.
- When a bacterial infection is suspected and there are no localizing signs of infection, carry out a blood culture and urine microscopy or culture—urine taken by supra-pubic aspirate (see section 5.7, page 70) or by clean catch, if possible.
- If meningitis is suspected, carry out a lumbar puncture and CSF examination.

A newborn in the first week of life or young infant with *hypoxic-ischaemic encephalopathy* may have some of the above signs. Refer to a standard paediatrics textbook for treatment guidelines of this condition.

Consider *neonatal tetanus* in a previously well newborn who, at 3–10 days after birth, presents with irritability, difficulty in sucking, trismus, muscle spasms or convulsions. Consult a standard paediatrics textbook for guidelines on treatment.



Trismus and increased muscle tone ("fisting") in a baby with neonatal tetanus

Serious infection in a young infant may be the first indication of HIV infection.

Treatment

Antibiotic treatment is described below in two sections: treatment for *sepsis* when the precise diagnosis is not established, and treatment for meningitis when the diagnosis of *meningitis* has been established or is strongly suspected.

IM administration of antibiotics is recommended. However, IV administration may be preferable *if* there is very good monitoring to ensure that fluid overload does not occur.

Sepsis

- Give IM ampicillin (50 mg/kg every 6–8 hours depending on age—see Appendix 2, A2.1) plus IM gentamicin (7.5 mg/kg once daily). Continue treatment until the infant has remained well for at least 4 days. Once the infant's condition has substantially improved, oral amoxicillin (15 mg/kg every 8 hours) plus IM gentamicin (7.5 mg/kg once daily) can be given.
- If ampicillin is not available, give IM benzylpenicillin (50 000 units/kg every 6–8 hours depending on age—see Appendix 2, A2.1) plus IM gentamicin (7.5 mg/kg once daily). If gentamicin is not available, give instead kanamycin (20 mg/kg once daily).
- If the infection is hospital-acquired, if *Staphylococcus aureus* is known to be an important cause of neonatal sepsis locally, or if there are signs suggestive of severe staphylococcal infection such as widespread skin infection, abscesses or soft tissue infection, give IM cloxacillin (50 mg/kg every 6–8 hours depending on age—see Appendix 2, A2.1) plus IM gentamicin (7.5 mg/kg once daily) as the first-line treatment.

For neonates in the first week of life, the dosage regimens may be different to those given above for young infants—see Appendix 2, A2.1 for details.

- *If there is no response to treatment in the first 48 hours or if the child's condition deteriorates*, add IM chloramphenicol (25 mg/kg every 8–12 hours according to age—see Appendix 2, A2.1, page 135). However, chloramphenicol should ***not*** be used in premature infants (born before 37 weeks of gestation) and should be avoided in infants in the first week of life.
- If the response to treatment is poor and pneumococci are resistant to penicillin, change to IM or IV cefotaxime (50 mg/kg every 6 hours) plus IM ampicillin (50 mg/kg every 6 hours).

Meningitis

- Give IM ampicillin (50 mg/kg every 6–8 hours depending on age—see Appendix 2, A2.1) plus IM gentamicin (7.5 mg/kg once daily). An alternative regimen is IM ampicillin (50 mg/kg every 6–8 hours depending on age—see Appendix 2, A2.1) plus IM chloramphenicol (25 mg/kg every 6 hours). However, chloramphenicol should ***not*** be used in premature infants (born before 37 weeks gestation) and should be avoided in infants in the first week of life. In infants aged 1 week to 1 month, give it 12-hourly. Treatment should be continued for 14 days or until the young infant has remained well for 4 days, whichever is longer. Treatment should be continued IM throughout the course.

- If gentamicin is not available, kanamycin (20 mg/kg once daily) can be used instead.
- If accurate bacteriology reporting of CSF specimens is available and the results are known, continue treatment with the antibiotic to which the organism is sensitive.
- *If there is no response to treatment in the first 48 hours or if the child's condition deteriorates*, give a third-generation cephalosporin such as ceftriaxone (50 mg/kg every 12 hours) or cefotaxime (50 mg/kg every 6 hours).

Treatment for both sepsis and meningitis

- Give oxygen treatment to young infants with any of the following:
  — central cyanosis
  — grunting with every breath
  — difficulty in feeding due to respiratory distress
  — severe lower chest wall indrawing
  — head nodding (i.e. a nodding movement of the head, synchronous with the respiration and indicating severe respiratory distress).

  Nasal prongs are the preferred method for delivery of oxygen to this age group, with a flow rate of 0.5 litre per minute. Thick secretions from the throat may be cleared by intermittent suction, if they are troublesome and the young infant is too weak to clear them. Oxygen should be stopped when the infant's general condition improves and the above signs are no longer present. The recommendations for oxygen administration in section 9.5, page 109, should be followed.
- Give all sick infants aged <2 weeks 1mg of vitamin K (IM).
- Treat *convulsions* with IM phenobarbital (1 dose of 20 mg/kg). If they persist, continue with phenobarbital IM (10 mg/kg per dose). If there is no response to this treatment, phenytoin can be given. Convulsions in infants under 1 week of age can be tonic, clonic or myotonic movements and may be subtle. See a standard paediatrics textbook for further details, if required.

Supportive care

Thermal environment

- Keep the young infant dry and well wrapped. A bonnet or cap is helpful to reduce heat loss. Keep the room warm (at least 25 °C). As the condition of the young infant improves, keep the child close to the mother's body. Keeping the young infant in close skin-to-skin contact with the mother ("kangaroo mother care") for 24 hours a day is as effective as using an incubator or external heating device to avoid chilling.

Position for kangaroo mother care of young infant. Note: after wrapping the child, the head needs to be covered with a shawl to prevent heat loss.

- Pay special attention to avoid chilling the infant during examination or investigation.
- Regularly check that the infant's temperature is maintained in the range 36.5–37.5 °C (97.7–99.5 °F) rectal, or 36.0–37.0 °C (96.8–98.6 °F) axillary.

If there is considerable experience with the use of incubators or indirect heating sources (such as hot water bottles or heating pads, covered with several layers of cloth or other insulation), these may be used. However, they are no more effective than the simple measures noted above. Prevent overheating or burns by being especially careful if you have to use a hot water bottle or heating pad. Water bottles get cold and must be frequently replaced.

The use of heat lamps is not recommended. Radiant warmers should only be used to heat the room, not to warm the young infant directly.

High fever

Do *not* use antipyretic agents such as paracetamol for controlling fever in young infants. Control the environment. If necessary, undress the child.

Fluid and nutritional management

Encourage the mother to breastfeed frequently, unless the child is in respiratory distress or too sick to suck from the breast. In these cases, help the mother to express breast milk regularly and give it to the infant (20 ml/kg body weight) by nasogastric tube 6–8 times a day (or 8–12 times in newborns aged 1–2 weeks).

If it is essential to give IV fluids (e.g. as a vehicle for IV antibiotics), take care to avoid the risk of heart failure from fluid overload. Do not exceed daily fluid requirements. Monitor the IV infusion very carefully and use an infusion chamber of 100–150 ml, where possible.

Hypoglycaemia

Check for hypoglycaemia using a capillary blood dextrostix test. If the blood glucose is <2.5 mmol/litre (<45 mg/dl), treat with 10 ml/kg of 10% glucose, given by nasogastric tube, and prevent recurrences by frequent feeding.

Monitoring

The young infant should be assessed by the nurse every 6 hours (3 hourly, if very sick) and by a doctor daily. If the response to treatment is poor, change the antibiotic treatment as noted on page 75.

6.2 Local bacterial infection

The most common local bacterial infections in young infants are infected umbilicus and skin infections. These can progress quickly, with pustules and furuncles coalescing and spreading to other areas.

Diagnosis

On examination, look for:

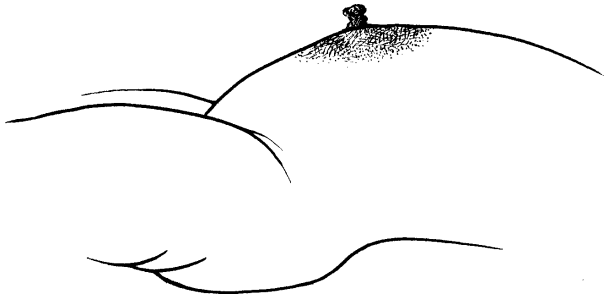
- redness and/or pus in the nails, eyes, or circumcision wound
- redness or pustules/furuncles in the skin. *Note*: If the umbilical redness extends to the peri-umbilical skin or drains pus, diagnose this as severe bacterial infection and admit the young infant for treatment—see section 6.1, page 74.

Treatment

Treat as an outpatient. Give oral cotrimoxazole (doses: 2 mg/kg trimethoprim/10 mg/kg sulfamethoxazole if aged 2–3 weeks and, respectively, 4 mg/kg/20 mg/kg if aged 4 weeks to 2 months) twice daily *or* amoxicillin (15 mg/kg every 8 hours) at home for 5 days.

Skin or umbilical infection

- Gently wash away any pus and crusts with soap and water. Dry the area. Paint with an antiseptic (such as gentian violet (methylrosanilinium chloride), povidone-iodine, or chlorhexidine).
- If there are many pustules and/or they are joined together or the umbilical redness extends to the skin or drains pus, admit the young infant to hospital and treat with gentamicin (7.5 mg/kg once daily) and cloxacillin (50 mg/kg every 6–8 hours depending on the age of the young infant—see Appendix 2, A2.1) for 5 days.



Peri-umbilical flare in umbilical sepsis. The inflammation extends beyond the umbilicus to the abdominal wall.

Paronychia (infection of the nailbed)

- Clean the finger with an antiseptic solution.
- Teach the mother to clean the infection hygienically and paint it with gentian violet.

For management of severe forms of infection such as staphylococcal scalded skin syndrome or necrotizing fasciitis, see a standard paediatrics textbook.

Follow-up

Ask the mother to return in 2 days to check that the infection is improving. Bacterial infections can rapidly worsen in young infants.

6.3 Diarrhoea

Frequent or loose stools are normal in a breastfed baby. A mother can recognize diarrhoea when the consistency and frequency of stools are abnormal.

Diagnosis

Diarrhoea in a young infant is classified in the same way as in an older infant or child (see Chapter 4, page 45).

Treatment

There are some special points to remember in treating diarrhoea in young infants.

- Frequent breastfeeding is essential. Encourage the mother to breastfeed more often and for longer.
- If signs of dehydration are present, give, in addition to breast milk, ORS solution (see section 4.1, page 45, for details).
  - If an infant is exclusively breastfed, it is important *not* to introduce a food-based fluid and to emphasize to the mother to continue with *exclusive* breastfeeding after the extra fluids for diarrhoea have been stopped.

- If the young infant has *some dehydration* (see page 47), give 200–400 ml ORS solution by cup within the first 4 hours. Encourage the mother to breastfeed the infant whenever the infant wants to, and then resume giving ORS solution. Give a young infant with some dehydration, who is not breastfeeding, an additional 100–200 ml of clean water during this period.
- If the diarrhoea has lasted ≥14 days (*persistent diarrhoea*), admit the young infant to hospital and treat according to the guidelines in section 4.2 (page 51).
- *Bloody diarrhoea* in a young infant is usually due to *Shigell*a infection and should be treated at home with the recommended treatment for dysentery (see page 54). Avoid cotrimoxazole in infants aged <1 month who are premature or jaundiced.
  - — Ask the mother to return in 2 days for follow-up. Reassess the infant for signs of improvement (fewer stools, less blood in stool, less abdominal pain, better appetite, no development of fever).
  - — If there is no improvement or the signs are worse, admit the infant to hospital. Ceftriaxone 100 mg IM once daily is the preferred treatment in these cases. See section 4.3, page 54, for treatment guidelines.
  - — Blood in the stools accompanied by bouts of abdominal pain and vomiting, and episodes of pallor and sweating may be caused by intussusception, which requires urgent surgical management. This is uncommon in the first month of life. Refer to a standard paediatrics textbook for guidelines on management.

6.4 Ophthalmia neonatorum

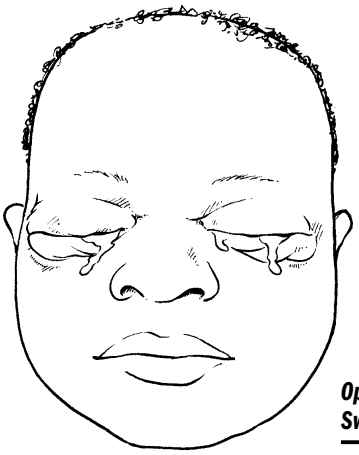
Ophthalmia neonatorum, also called neonatal conjunctivitis, is a severe purulent conjunctivitis in a <1-month-old infant, which can lead to blindness if untreated. The most important cause is gonococcal infection acquired during birth.

Diagnosis

Look for severe purulent conjunctivitis. Staining may show Gram-positive staphylococci or Gram-negative diplococci (gonococci).

Treatment

In countries where sexually transmitted diseases are prevalent and microscopic examination is not possible, all conjunctivitis in newborns should be treated as gonococcal. Most gonococcal strains are now resistant to penicillin.



Ophthalmia neonatorum. Swollen, red eyelids with pus.

- Give ceftriaxone (50 mg/kg to a maximum of 125 mg) in a single IM dose. Ceftriaxone is the most effective treatment against gonorrhoea, with a cure rate of almost 100%, and is also effective against extra-ocular gonococcal infection.

  If ceftriaxone is not available, there are two alternatives:

  - — kanamycin (25 mg/kg to a maximum of 75 mg) in a single IM dose; *or*
  - — spectinomycin (25 mg/kg to a maximum of 75 mg) in a single IM dose.

With disseminated gonococcal infection (fever, rash, arthritis, hepatitis, meningitis), continue the treatment for seven days (10 days if meningitis is present).

In some countries, the prevalence of STDs is very low and ophthalmia neonatorum is mainly caused by staphylococcal and Gram-negative organisms. Staphylococcal ophthalmia should be treated with cloxacillin (50 mg/kg, every 6–8 hours depending on the age of the young infant—see Appendix 2, A2.1).

When the etiology is uncertain, the treatment regimen should be changed according to local sensitivity patterns of the most common agents.

In the absence of microscopy to confirm the diagnosis, **the mother** should be assumed to be infected with both gonorrhoea and chlamydia. She and her partner must be treated with amoxicillin, spectinomycin or ciprofloxacin (for gonorrhoea) and tetracycline (for chlamydia).

Local treatment

Clean the newborn's eyes with 0.9% saline or clean water (boiled, then cooled). Wipe from the inside to the outside edge, using a clean swab for each eye. Wash the hands before and after this treatment.

6.5 Hypothermia

Hypothermia can be a signof a cold environment or of serious systemic infection. Therefore assess every hypothermic newborn for infection.

Diagnosis

Use a low-reading thermometer. If the rectal (core body) temperature is <32 °C (<89.6°F), the hypothermia is severe; between 32 °C (89.6°F) and 35.9 °C (96.6°F) the hypothermia is moderate.

Treatment

It is essential to rewarm a young infant with hypothermia *as soon as possible*. In cases of **severe hypothermia** (rectal temperature <32 °C or <89.6 °F), rapid rewarming can be achieved by using a thermostatically-controlled, heated mattress set at 37–38 °C (98.6–100.4 °F) or an air-heated incubator set at 35–36 °C (95–98.6 °F). Make sure that the incubator or the mattress is reliable, well maintained, and that staff have experience in using them. The room temperature must be at least 25 °C (77 °F).

This equipment is also good for rewarming infants with moderate hypothermia. If it is not available, use a warm room (at least 34 °C, 93.2 °F), a warm cot or skin-to-skin contact with the mother. The following points should be observed.

- Before rewarming, the child's cold clothing should be removed and replaced with pre-warmed clothes and a bonnet.
- A cot should be warmed to 36–37 °C (96.8 °F–98.6 °F). If it is heated with a hot water bottle or hot stone, these must be removed before the baby is put in the cot.
- For skin-to-skin rewarming, place the infant between the mother's breasts ("kangaroo mother care"). The child should be dressed in a shirt open at the front, a nappy, bonnet and socks, and covered with a blanket. The infant should be kept with the mother until the temperature becomes normal.
- Even if a warm room (at least 34–35 °C, 93–95 °F) is used for rewarming, the infant should still be dressed and well covered, and wear a bonnet.
- During an examination or investigation, particular attention should be paid to avoid chilling the infant.

Keeping a child warm: the child has skin contact with the mother, is wrapped in her clothes, and the head is covered to prevent heat loss.

Supportive care

Continue feeding the young infant to provide calories and fluid and to prevent a drop in the blood glucose level. Breastfeeding should be resumed as soon as possible. If the infant is too weak to breastfeed, give breast milk by nasogastric tube, spoon or cup. If feeding is not possible, monitor the blood glucose 6 hourly and, if necessary, set up an IV line to administer glucose.

Monitoring

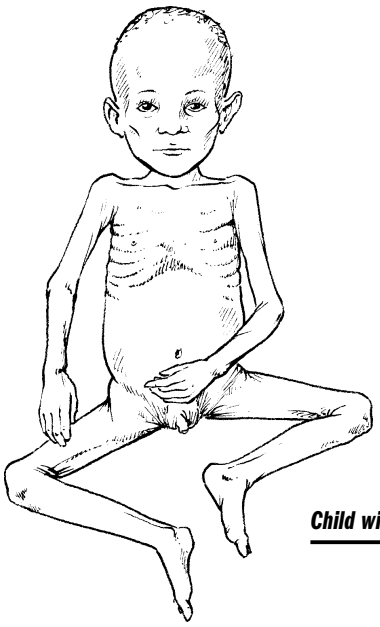
Nurses should check the young infant's temperature and, where appropriate, the temperature of the external heating device at least every hour. Once the baby's temperature reaches 34 °C (93.2 °F), the rewarming process should be slowed to avoid overheating.

CHAPTER 7

Severe malnutrition

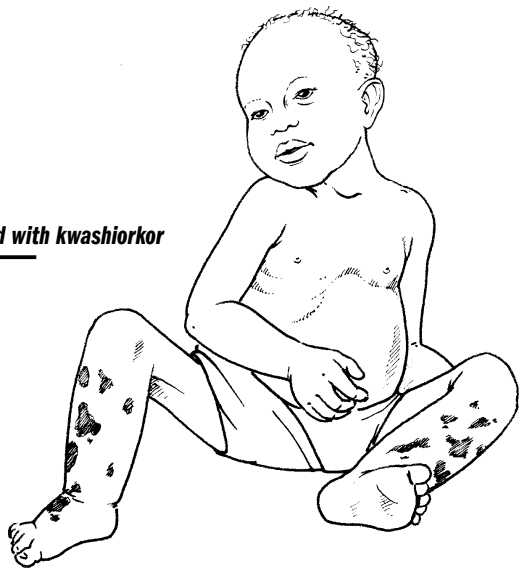
Severe malnutrition is defined in these guidelines as the presence of oedema of both feet, or severe wasting (<70% weight-for-height or <–3SD[a]), or clinical signs of severe malnutrition. No distinction has been made between the clinical conditions of kwashiorkor, marasmus, and marasmic kwashiorkor because the approach to their treatment is similar.

Children with severe malnutrition are at risk of several life-threatening problems like hypoglycaemia, hypothermia, serious infection, and severe electrolyte disturbances. Because of this vulnerability, they need careful assessment, special treatment and management, with regular feeding and monitoring. Their treatment in hospital should be well organized and given by specially trained staff. As recovery may take several weeks, their discharge from hospital should be carefully planned in order to provide outpatient care to complete their rehabilitation and to prevent relapse.



Child with marasmus

[a] SD = standard deviation score or Z-score. A weight-for-height of –2SD indicates the child is at the lower end of the normal range, and <–3SD indicates severe wasting. A weight-for-height of –3SD is approximately equivalent to 70% of the weight-for-height of the average (median) child (see chart on pages 147–148).



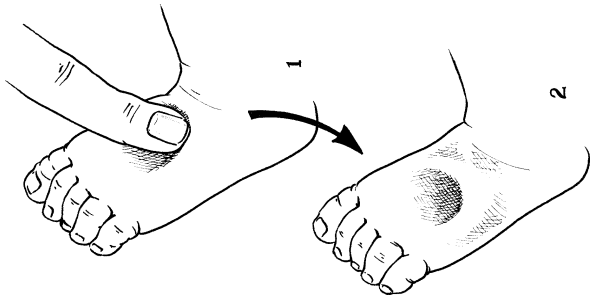
Child with kwashiorkor

Diagnosis

Key diagnostic features are:

- weight-for-length (or height) <70% or –3SD[a] (marasmus)
- oedema of both feet (kwashiorkor or marasmic kwashiorkor).

Note:
If weight-for-height or weight-for-length cannot be measured, use the clinical signs for marasmus or **visible severe wasting** (see Figure on the left). A child with visible severe wasting appears very thin and has no fat. There is severe wasting of the shoulders, arms, buttocks and thighs, with visible rib outlines.



Pitting oedema on dorsum of foot. After applying pressure for a few seconds, a pit remains after the finger is removed.

Children <60% weight-for-age may be stunted, and not severely wasted. Stunted children do ***not*** require hospital admission unless they have a serious illness. Children referred only on the basis of low weight-for-age should be reassessed to determine if any key diagnostic feature of severe malnutrition is present.

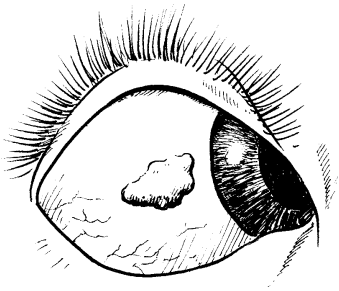
Initial assessment of the severely malnourished child

Take a *history* concerning:

- recent intake of food and fluids
- usual diet (before the current illness)
- breastfeeding
- duration and frequency of diarrhoea and vomiting
- type of diarrhoea (watery/bloody)
- loss of appetite
- family circumstances (to understand the child's social background)
- chronic cough
- contact with tuberculosis
- recent contact with measles
- known or suspected HIV infection.

On *examination*, look for:

- signs of dehydration or shock (see section 1.4, page 4)
- severe palmar pallor
- eye signs of vitamin A deficiency:
  — dry conjunctiva or cornea, Bitot's spots
  — corneal ulceration
  — keratomalacia



Bitot's spot (conjunctival xerosis)— sign of xerophthalmia in a vitamin A deficient child

- localizing signs of infection, including ear and throat infections, skin infection or pneumonia
- signs of HIV infection (see Chapter 8, page 92)
- fever or hypothermia (rectal temperature <35.5 °C, <95.9 °F)
- mouth ulcers
- skin changes of kwashiorkor:
  — hypo- or hyperpigmentation
  — desquamation
  — ulceration (spreading over limbs, thighs, genitalia, groin, and behind the ears)
  — exudative lesions (resembling severe burns) often with secondary infection, (including *Candida*).

Note: Children with vitamin A deficiency are likely to be photophobic and will keep their eyes closed. It is important to examine the eyes very gently to prevent corneal rupture.

Laboratory investigation of haemoglobin or haematocrit, if there is severe palmar pallor.

7.1 Organization of care

Successful management of the child with severe malnutrition requires frequent, careful clinical assessment and anticipation of common problems so that they can be prevented, or recognized and treated at an early stage. Staff should be trained in the correct management of severely malnourished children. On admission, they should be separated from infectious children and kept in a warm area (25–30 °C, with no draughts), and constantly monitored. Washing should be kept to a minimum, after which the child should be dried immediately. The mother should be requested to stay with the child at all times.

Good organization of feeding is essential. Facilities and sufficient staff should be available to ensure correct preparation of appropriate feeds, and to carry out regular feeding during the day and night. Accurate weighing machines are needed, and records should be kept of the feeds given and the child's weight so that progress can be monitored. Good communication with outpatient and community services is essential and will facilitate making arrangements for the child's care during rehabilitation and to prevent relapse.

7. 2 General treatment

Plan of treatment

For *triage assessment* of children with severe malnutrition and management of ***shock***, see Chapter 1, page 4. When there is ***corneal ulceration***, give vitamin A and instil chloramphenicol or tetracycline eye drops and atropine drops into the eye, cover with a saline soaked eye pad, and bandage—see page 88. ***Severe anaemia***, if present, will need urgent treatment (see section 7.3.2, page 88).

General treatment of severe malnutrition involves 10 steps in two phases: an initial *stabilization phase* for management of acute medical conditions, and a longer *rehabilitation phase*. Table 19 shows the approximate time scale of these two stages of treatment.

Table 19 ***Time frame for the management of the child with severe malnutrition***

	Stabilization		Rehabilitation
	Days 1–2	Days 3–7	Weeks 2–6
1. Hypoglycaemia	→		
2. Hypothermia	→		
3. Dehydration	→		
4. Electrolytes	→	→	→
5. Infection	→	→	
6. Micronutrients	no iron →	→	with iron →
7. Initiate feeding	→	→	
8. Catch-up growth			→
9. Sensory stimulation	→	→	→
10. Prepare for follow-up			→

7.2.1 ***Hypoglycaemia***

All severely malnourished children are at risk of hypoglycaemia and, immediately on admission, should be given 10% glucose or sucrose, or a feed (see below). Choose whichever is available most quickly. Frequent feeding is important to prevent hypoglycaemia.

Hypoglycaemia and hypothermia (see section 7.2.2, below) usually occur together and are frequently signs of infection. Check for hypoglycaemia whenever hypothermia is found.

Diagnosis

Where blood glucose results can be obtained quickly (e.g. with dextrostix), this should be measured immediately. Hypoglycaemia is present when the blood glucose is <3 mmol/l (<54 mg/dl). If the blood glucose cannot be measured, it should be assumed that all children with severe malnutrition have hypoglycaemia.

Treatment

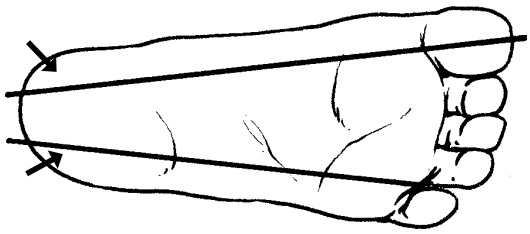
- Give 50 ml of 10% glucose or sucrose solution (1 rounded teaspoon of sugar in 3½ tablespoons of water) orally or by nasogastric tube, followed by the first feed as soon as it is available. Where possible, divide the first feed into 4 equal amounts and give at half-hourly intervals. If half-hourly feeding is not possible, give the whole feed and then continue with 2-hourly feeds.

  Note: If the first feed is quickly available and is given, then omit the glucose/sucrose solution and feed again after 2 hours.

- Give 2-hourly feeds, day and night, at least for the first day.
- Give appropriate antibiotics (see page 84).
- If the child is unconscious, treat with IV glucose or, if unavailable, 10% glucose or sucrose solution by nasogastric tube (see page 132).

Monitoring

If the initial blood glucose was low, repeat the measurement (using finger- or heelprick blood and dextrostix, where available) after 30 minutes. Once treated, most children stabilize within 30 minutes.



Suitable areas for a heel-stab to obtain blood in a young infant

- If blood glucose falls <3 mmol/l (<54 mg/dl) or child becomes drowsy, repeat the 10% glucose or sugar solution.
- If the rectal temperature falls <35.5 °C (<95.9 °F) or if there is deterioration in the level of consciousness, repeat the dextrostix measurement and treat accordingly.

Prevention

- Feed 2 hourly, starting immediately (see *Initial refeeding*, page 85) or, if necessary, rehydrate first. Continue feeding throughout the night.

7.2.2 ***Hypothermia***

Low body temperature (hypothermia) is associated with increased mortality in severely malnourished

children, and therefore needs to be controlled. Frequent feeding is an important part of prevention.

Diagnosis

If the axillary temperature is <35 °C (<95 °F) or does not register, assume hypothermia. Where a low-reading thermometer is available, take the rectal temperature (<35.5 °C, <95.5 °F) to confirm the hypothermia.

Treatment

- Feed the child immediately (if necessary, rehydrate first).
- Make sure the child is clothed (including the head), cover with a warmed blanket and place a heater (not pointing directly at the child) *or* lamp nearby, or put the child on the mother's bare chest or abdomen (skin-to-skin) and cover them with a warmed blanket and/or warm clothing.

  Note: Prevent burns by avoiding direct contact with heating sources, and avoid using hot water bottles except for warming blankets or clothing.
- Give appropriate antibiotics (see page 84).

Monitoring

- Take the child's rectal temperature 2-hourly until it rises to more than 36.5 °C or 97.7 °F. Take it half-hourly if a heater is being used.
- Ensure that the child is covered at all times, especially at night. Keep the head covered, preferably with a warm bonnet to reduce heat loss.
- Check for hypoglycaemia whenever hypothermia is found.

Prevention

- Feed the child 2-hourly, starting immediately (see *Initial refeeding*, page 85).
- Always give feeds through the night.
- Place the bed in a warm, draught-free part of the ward and keep the child covered.
- Change wet nappies, clothes and bedding to keep the child and the bed dry.
- Avoid exposing the child to cold (e.g. when bathing, or during medical examinations).
- Let the child sleep with the mother for warmth in the night.

7.2.3 *Dehydration*

Diagnosis

Dehydration tends to be overdiagnosed and its severity overestimated in severely malnourished children. This is because it is difficult to estimate dehydration status accurately in the severely malnourished child using clinical signs alone. Assume that all children with *watery diarrhoea* may have *some* dehydration.

Note: Low blood volume can co-exist with oedema.

Treatment

Do *not* use the IV route for rehydration except in cases of shock (see section 1.4, page 4). Standard WHO-ORS solution for general use has a high sodium and low potassium content, which is not suitable for severely malnourished children. Instead, give special rehydration solution for malnutrition (ReSoMal—see Appendix 3, A3.1, page 144, for recipe) or use commercially available ReSoMal.

- Give the *ReSoMal rehydration fluid*, orally or by nasogastric tube, much more slowly than you would when rehydrating a well-nourished child:
  - — give 5 ml/kg every 30 minutes for the first 2 hours
  - — then give 5–10 ml/kg/hour for the next 4–10 hours.

  The exact amount depends on how much the child wants, volume of stool loss, and whether the child is vomiting.
- If rehydration is still occurring at 6 hours and 10 hours, give starter F-75 (see Appendix 3, A3.3, page 145) instead of ReSoMal at these times. Use the same volume of starter F-75 as for ReSoMal.
- Then initiate refeeding with starter F-75.

Monitoring

Monitor the progress of rehydration half-hourly for 2 hours, then hourly for the next 6–12 hours. Be alert for signs of overhydration, which is very dangerous and may lead to heart failure. Check:

- respiratory rate
- pulse rate
- urine frequency
- frequency of stool and vomit.

During treatment, the child's breathing and pulse rate should decrease and the child should begin to pass urine. Continued fast breathing and a rapid pulse rate during rehydration suggest co-existing infection or overhydration. **If you find signs of overhydration (increasing respiratory and pulse rates), stop ReSoMal immediately** and reassess after 1 hour.

The return of tears, a moist mouth, less sunken eyes and fontanelle, and improved skin turgor are also signs that rehydration is proceeding, but many severely malnourished children will not show all these changes even when fully rehydrated.

Prevention

Measures to prevent dehydration with continuing watery diarrhoea are similar to those for well-nourished children (see Diarrhoea Treatment Plan A on page 52), except that ReSoMal fluid is used instead of standard ORS.

- If the child is breastfed, continue breastfeeding.
- Initiate refeeding with starter F-75.
- Give ReSoMal between feeds to replace stool losses. As a guide, give 50–100 ml after each watery stool.

Note: It is common for malnourished children to pass many small unformed stools; these should not be confused with profuse watery stools and do not require fluid replacement.

7.2.4 *Electrolyte imbalance*

All severely malnourished children have deficiencies of potassium and magnesium which may take 2 weeks or more to correct. Oedema is partly a result of these deficiencies. Do *not* treat oedema with a diuretic. Excess body sodium exists even though the plasma sodium may be low. *Giving high sodium loads could kill the child*.

Treatment

- Give extra potassium (3–4 mmol/kg daily).
- Give extra magnesium (0.4–0.6 mmol/kg daily).

The extra potassium and magnesium should be added to the feeds during their preparation. See Appendix 3, A3.2, page 144, for a recipe to make a combined electrolyte/mineral solution. Add 20 ml of this solution to 1 litre of feed to supply the extra potassium and magnesium required. Alternatively, use commercially available pre-mixed sachets (specially formulated for the malnourished child).

- When rehydrating, give low sodium rehydration fluid (ReSoMal) (see Appendix 3, A3.1, page 144).
- Prepare food without adding salt.

7.2.5 *Infection*

In severe malnutrition, the usual signs of infection such as fever are often absent, yet multiple infections are common. Therefore, assume that all malnourished children have an infection on their arrival in hospital and treat with antibiotics straightaway. Hypoglycaemia and hypothermia are often signs of severe infection.

Treatment

Give all severely malnourished children:

- a broad-spectrum antibiotic
- measles vaccine if child is >6 months and not immunized, or is >9 months and had been vaccinated before 9 months; delay vaccination if the child is in shock. Give second dose before discharge

Choice of broad-spectrum antibiotic

- *If the child appears to have no complications*, give cotrimoxazole (dosage: see Appendix 2, page 136) for 5 days
- *If there are complications* (hypoglycaemia, hypothermia, or the child looks lethargic or sickly), give:
  — ampicillin (50 mg/kg IM/IV 6-hourly for 2 days), then oral amoxicillin (15 mg/kg 8-hourly for 5 days) OR, if amoxicillin is not available, oral ampicillin (50 mg/kg 6-hourly for 5 days) over a total of 7 days

and

  — gentamicin (7.5 mg/kg IM/IV) once daily for 7 days.

- *If the child fails to improve within 48 hours*, add chloramphenicol (25 mg/kg IM/IV 8-hourly) for 5 days.

Note: These regimens can be modified according to drug availability and local patterns of pathogen resistance.

If meningitis is suspected, do a lumbar puncture for confirmation, where possible, and treat with chloramphenicol (25 mg/kg 6 hourly) for 10 days (see page 62). If you identify other specific infections (such as pneumonia, dysentery, skin- or soft-tissue infections), give antibiotics as appropriate. Add antimalarial treatment if the child has a positive blood film for malaria parasites. Tuberculosis is common, but anti-tuberculosis treatment should only be given when tuberculosis is diagnosed or strongly suspected (see section 7.3.5, page 89)

Note: Some experienced doctors routinely give metronidazole (7.5 mg/kg 8-hourly for 7 days) in addition to broad-spectrum antibiotics. However, the efficacy of this treatment has not been established by clinical trials.

Treatment for parasitic worms

If there is evidence of worm infestation, give mebendazole (100 mg orally twice a day) for 3 days (see page 143). In countries where infestation is very prevalent, also give mebendazole to children with no evidence of infestation after day 7 of admission.

Monitoring

If there is anorexia after the above antibiotic treatment, continue for a full 10-day course. If anorexia

still persists, reassess the child fully, including possible sites of infection, potentially resistant organisms (e.g. resistant malaria parasites), and whether vitamin and mineral supplements were given correctly.

7.2.6 *Micronutrient deficiencies*

All severely malnourished children have vitamin and mineral deficiencies. Although anaemia is common, do not give iron initially but wait until the child has a good appetite and starts gaining weight (usually in the second week), because iron can make the infections worse.

Treatment

Give daily (for at least 2 weeks):

- a multivitamin supplement
- folic acid (5 mg on day 1, then 1 mg/day)
- zinc (2 mg Zn/kg/day)
- copper (0.3 mg Cu/kg/day)
- *once gaining weight*, ferrous sulfate (3 mg Fe/kg/day).

Give vitamin A orally (aged <6 months: 50 000 IU; aged 6–12 months: 100 000 IU; older children: 200 000 IU) on day 1.

Zinc and copper supplements can be combined with the potassium and magnesium to make an electrolyte / mineral solution, which is added to ReSoMal and to the feeds (see Appendix 3, A3.2, page 144, for recipe). As an alternative, pre-mixed sachets containing electrolytes and all appropriate micronutrients are simpler to use.

Note: When using pre-mixed sachets, give single doses of vitamin A and folic acid on day 1, and give iron only after the child gains weight.

In some countries, multivitamin preparations also contain minerals. Check the ingredients in these preparations to see whether they contain iron, which should not be used until the child has started gaining weight.

7.2.7 *Initial refeeding*

In the initial phase, a cautious approach is required because of the child's fragile physiological state and reduced homeostatic capacity.

Treatment

Start feeding as soon as possible after admission, with feeds carefully worked out to provide just enough energy and protein to maintain basic physiological processes.

Essential features of initial feeding are:

- frequent small feeds of low osmolality and low in lactose
- oral or nasogastric feeds (never parenteral preparations)
- 100 kcal/kg/day
- protein: 1–1.5 g/kg/day
- liquid: 130 ml/kg/day (100 ml/kg/day if the child has severe oedema)
- if the child is breastfed, continue with this, but give the scheduled amounts of starter formula first (see below).

The suggested starter formula and feeding schedules (see below) are designed to meet these features. Milk-based formulas, such as starter F-75 (with 75 kcal/100 ml and 0.9 g of protein per 100 ml), will be satisfactory for most children (see recipes in Appendix 3, A3.3, page 145). Since cereal-based F-75 partially replaces sugar with cereal flour, it has the advantage of lower osmolarity which may benefit some children with persistent diarrhoea, but it needs to be cooked.

Feed from a cup or a bowl, or use a spoon, dropper or syringe to feed very weak children.

A recommended schedule, with gradual increase in the feed volume and gradual decrease in feeding frequency, is as follows:

Days	Frequency	Vol/kg/feed	Vol/kg/d
1–2	2-hourly	11 ml	130 ml
3–5	3-hourly	16 ml	130 ml
6 onwards	4-hourly	22 ml	130 ml

For children with a good appetite and no oedema, this schedule can be completed in 2–3 days. These amounts should be displayed on reference charts in a format which all staff can understand and use. The volumes/feed calculated according to body weight are set out on page 86. A reliable way of measuring feed volumes quickly and accurately should be available on the ward.

Note: If staff resources are limited, give priority to 2-hourly feeds for only the most seriously ill children, and aim for at least 3-hourly feeds initially. Get mothers and other carers to help with feeding. Show them what to do and supervise them. Night feeds are essential and staff rosters may need to be adjusted. If, despite all efforts, not all the night feeds can be given, the feeds should be spaced equally through the night to avoid long periods without a feed (with the risk of increased mortality).

If the child's intake (after allowing for any vomiting)

Table 20 ***Volumes of F-75 per feed***

Child's weight (kg)	2-hourly (ml/feed)	3-hourly (ml/feed)	4-hourly (ml/feed)
2.0	20	30	45
2.2	25	35	50
2.4	25	40	55
2.6	30	45	55
2.8	30	45	60
3.0	35	50	65
3.2	35	55	70
3.4	35	55	75
3.6	40	60	80
3.8	40	60	85
4.0	45	65	90
4.2	45	70	90
4.4	50	70	95
4.6	50	75	100
4.8	55	80	105
5.0	55	80	110
5.2	55	85	115
5.4	60	90	120
5.6	60	90	125
5.8	65	95	130
6.0	65	100	130
6.2	70	100	135
6.4	70	105	140
6.6	75	110	145
6.8	75	110	150
7.0	75	115	155
7.2	80	120	160
7.4	80	120	160
7.6	85	125	165
7.8	85	130	170
8.0	90	130	175
8.2	90	135	180
8.4	90	140	185
8.6	95	140	190
8.8	95	145	195
9.0	100	145	200
9.2	100	150	200
9.4	105	155	205
9.6	105	155	210
9.8	110	160	215
10.0	110	160	220

does not reach 80 kcal/kg/day, despite frequent feeds, coaxing and re-offering, give the remaining feed by nasogastric tube. *Do not exceed 100 kcal/kg/day in this initial phase.*

Monitoring

Monitor and record:

- amounts of feed offered and left over
- vomiting
- stool frequency and consistency
- daily body weight (see Appendix 4, page 150, for weight chart).

Appendix 4 (page 152) shows a form for recording the child's feed intake and a form for calculating how much to prepare.

During the initial phase, the diarrhoea should gradually diminish and oedematous children should lose weight as the oedema disappears. For advice on what to do if the diarrhoea continues or even worsens, see *Continuing diarrhoea*, page 89.

7.2.8 ***Catch-up growth***

Return of appetite is the sign for entering the rehabilitation phase, usually about one week after admission. During this phase a vigorous approach is required to achieve very high intakes and rapid weight gain of >10 g/kg/day. However, be alert to avoid the risk of heart failure, which can occur if children suddenly consume huge amounts.

Treatment

Make a gradual transition from starter to catch-up formula. It is important to measure *all* intakes.

- Replace the starter F-75 with an equal amount of catch-up F-100 for 2 days.

  Give a milk-based formula, such as catch-up F-100 which contains 100 kcal/100 ml and 2.9 g of protein per 100 ml (see Appendix 3, A3.3, page 145, for recipe). Modified porridges or complementary foods can be used, provided they have comparable energy and protein concentrations.

- Then increase each successive feed by 10 ml until some feed remains uneaten. The point when some of the feed remains unconsumed is likely to occur when intakes reach about 200 ml/kg/day.

After a gradual transition, give:

— frequent feeds, unlimited amounts
— 150–220 kcal/kg/day
— 4–6 g/kg/day of protein.

If the child is breastfed, continue to breastfeed.

However, breast milk does not have sufficient energy and protein to support rapid catch-up growth, so give F-100 first at each feed.

Monitoring

Avoid causing heart failure. Heart failure is unlikely if you follow the gradual transition described above. However, as a precaution, monitor for early signs of heart failure (rapid pulse and fast breathing).

If both pulse and breathing rates increase (breathing by 5 breaths/minute and pulse by 25 beats/minute), and the increase is sustained for two successive 4-hourly readings, then:

- reduce the volume fed to 100 ml/kg/day for 24 hours
- then, slowly increase as follows:
  — 115 ml/kg/day for next 24 hours
  — 130 ml/kg/day for following 48 hours
  — then, increase each feed by 10 ml as described earlier.

Assess progress. After the transition, progress is assessed by the rate of weight gain:

- Weigh the child every morning before being fed, and plot the weight.
- Calculate and record the weight gain every 3 days as g/kg/day (see Appendix 4, page 150).

If the weight gain is:

— poor (<5 g/kg/day), the child requires a full re-assessment
— moderate (5–10 g/kg/day), check whether the intake targets are being met, or if infection has been overlooked.

7.2.9 Sensory stimulation and emotional support

In severe malnutrition there is delayed mental and behavioural development. The malnourished child needs interaction with other children and adults during rehabilitation. Therefore provide:

- tender loving care
- a cheerful stimulating environment
- structured play therapy for 15–30 minutes a day
- physical activity as soon as the child is well enough
- maternal involvement as much as possible (e.g. comforting, feeding, bathing, play).

Provide suitable toys for the child (see examples in Appendix 5, page 155). Ideas for the organization of play activities are also given in Appendix 5, arranged by the child's level of development. Show the child's mother what to do to help her stimulate her child effectively, and build her self-confidence so that she can take the lead and continue at home.

7.2.10 Preparation for follow-up after recovery

A child who is 90% weight-for-length (equivalent to –1SD) can be considered to have recovered. The child is still likely to have a low weight-for-age because of stunting. See Appendix 4, page 146, on how to weigh and measure children and assess recovery.

Good feeding practices and sensory stimulation should be continued at home. Show the parent how to:

- feed frequently with energy-rich and nutrient-dense foods
- give structured play therapy (see Appendix 5, page 155).

Ask the parent to bring the child back for regular follow-up (at 1, 2 and 4 weeks, then monthly for 6 months) and make sure the child receives:

— booster immunizations
— 6-monthly vitamin A.

Every attempt should be made to manage the child till recovery and to avoid relapse and death after discharge. However, some hospitals do not have the resources to look after all severely malnourished children until they have recovered. In some cases, parents will insist that their child be discharged early as they have other urgent family commitments. For some children, earlier discharge may be encouraged and planned (reducing the risk of nosocomial infection in hospital) if reliable and effective alternative supervision is available. Children who have not recovered fully are still at considerably increased risk of relapse and death.

If you have to consider discharging a child before recovery, make a careful assessment of the child and of the available community support. The child will need continuing care as an outpatient to complete rehabilitation and prevent relapse. Home-based treatment should only be considered if the criteria given below are met.

Essential criteria for home treatment

The child:

- is aged 12 months or more
- has completed antibiotic treatment
- has a good appetite
- shows good weight gain
- has lost oedema (if the child was oedematous)
- has taken 2 weeks of potassium, magnesium, mineral and vitamin supplements (or is continu-

ing with supplementation at home, if this is possible)

The mother or carer:

- is not employed outside the home
- has received specific training on appropriate feeding (types, amount, frequency)
- has the financial resources to feed the child
- is motivated to follow the advice given.

Local health workers:

- are trained to support home care.

Desirable criteria

The mother or carer:

- lives within easy access of the hospital for urgent readmission if the child becomes ill
- can be visited weekly
- has been trained to give structured play therapy.

Local health workers:

- are specifically trained to weigh and examine the child clinically at home, indicate when to refer the child, and give appropriate advice
- are motivated.

It is important to prepare the parents for home treatment by ensuring that they have learned to give adequate home care and are confident about feeding the child while still in the ward.

For children who are being treated at home, it is essential to give frequent meals with a high energy and protein content. Aim to achieve at least 150 kcal/kg/day and adequate protein (at least 4 g/kg/day).

This will require feeding the child at least 5 times per day with foods that contain approximately 100 kcal and 2–3 g protein per 100 g of food. Take a practical approach, using simple modifications of the usual home foods.

- Give appropriate meals (and the correct quantity of food) at least 5 times daily.
- Give high-energy snacks between meals (e.g. milk, banana, bread, biscuits).
- Assist and encourage the child to complete each meal.
- Give food separately to the child so that the child's intake can be checked
- Give electrolyte and micronutrient supplements. Give 20 ml (4 teaspoons) of the electrolyte/mineral solution daily, mixing it with porridge or milk.
- Breastfeed as often as the child wants to.

Organizing follow-up for children discharged before recovery

If the child is discharged early, make a plan for the follow-up of the child until recovery and contact the outpatient department, nutrition rehabilitation centre, local health clinic, or health worker who will take responsibility for continuing supervision of the child.

Write a discharge note addressed to the health worker who will follow up the child at home, which contains essential information about the inpatient treatment, any continuing treatments, the child's weight on discharge, feeding recommendations, and the action the health worker is expected to take. In general, the child should be weighed weekly after discharge. If there is failure to gain weight over a 2-week period or weight loss between any two measurements, the child should be referred back to hospital.

7.3 Treatment of associated conditions

7.3.1 Eye problems

If the child has any eye signs of vitamin A deficiency (see assessment, page 81):

- give vitamin A orally on days 1, 2 and 14 (aged <6 months, 50 000 IU; aged 6–12 months, 100 000 IU; older children, 200 000 IU). If the first dose was given in the referring centre, treat on days 1 and 14 only.

If the eyes show signs of inflammation or ulceration, give the following additional care to the affected eye(s) to prevent corneal rupture and extrusion of the lens:

- instil chloramphenicol or tetracycline eye drops, 2–3 hourly as required for 7–10 days
- instil atropine eye drops, 1 drop 3 times daily for 3–5 days
- cover with saline-soaked eye pads
- bandage eye(s).

Note: Children with vitamin A deficiency are likely to be photophobic and have their eyes closed. It is important to examine their eyes very gently to prevent corneal rupture.

7.3.2 Severe anaemia

A blood transfusion is required if:

- Hb is <4 g/dl
- Hb is 4–6 g/dl *and* the child has respiratory distress.

In severe malnutrition, the transfusion must be slower and of smaller volume than for a well-nourished child. Give:

- whole blood, 10 ml/kg *slowly* over 3 hours
- furosemide, 1 mg/kg IV at the start of the transfusion.

If the child has signs of heart failure, give 10 ml/kg of packed cells because whole blood is likely to worsen this condition.

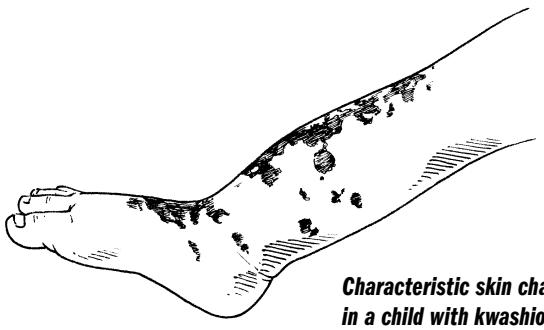
Monitor the pulse and breathing rates every 15 minutes during the transfusion. If either increases (breathing by 5 breaths/minute or pulse by 25 beats/minute), transfuse more slowly.

Note: After the transfusion, if the Hb is still low, do not repeat the transfusion within 4 days.

7.3.3 Dermatosis of kwashiorkor

Zinc deficiency is usual in children with kwashiorkor and their skin quickly improves with zinc supplementation. In addition:

- Bathe or soak the affected areas for 10 minutes/day in 1% potassium permanganate solution.
- Apply barrier cream (zinc and castor oil ointment, or petroleum jelly, or tulle gras) to the raw areas, and apply gentian violet (or, if available, nystatin cream) to skin sores.
- Omit using nappies/diapers so that the perineum can stay dry.



Characteristic skin changes in a child with kwashiorkor

7.3.4 Continuing diarrhoea

Diarrhoea is common in severe malnutrition but, with cautious refeeding, it should subside during the first week. In the rehabilitation phase, loose poorly-formed stools are not a cause for concern, provided the child's weight gain is satisfactory.

Treatment

Giardiasis

Giardiasis and mucosal damage are common causes of continuing diarrhoea. Where possible, examine the stools by microscopy.

- If cysts or trophozoites of *Giardia lamblia* are found, give metronidazole (5 mg/kg 8-hourly for 7 days).

Lactose intolerance

Diarrhoea is only rarely due to lactose intolerance. Only treat for lactose intolerance if the continuing diarrhoea is preventing general improvement. Starter F-75 is a low-lactose feed. In exceptional cases:

- substitute milk feeds with yoghurt or a lactose-free infant formula
- reintroduce milk feeds gradually in the rehabilitation phase.

Osmotic diarrhoea

This may be suspected if the diarrhoea worsens substantially with hyperosmolar F-75 and ceases when the sugar content and osmolarity are reduced. In these cases:

- use a lower osmolar cereal-based starter F-75 (see Appendix 3, page 145, for recipe) or, if necessary, use a commercially available isotonic starter F-75
- introduce catch-up F-100 gradually.

7.3.5 Tuberculosis

If tuberculosis is strongly suspected (due to contact with someone with tuberculosis, poor growth despite good food intake, chronic cough, or a chest infection not responding to antibiotics):

- perform a Mantoux test (note: *false negatives are frequent*)
- take a chest X-ray, if possible.

If these are positive or tuberculosis is highly suspected, treat according to national tuberculosis guidelines (see section 3.6, page 41).

7.4 Monitoring the quality of care

7.4.1 Mortality audit

Case-fatality rates for children with severe malnutrition vary widely. However, in general, when the necessary resources are present (such as antibiotics, ingredients for feeds, electrolyte/mineral solution, and adequate staff to supervise regular feeds), case-fatality rates of 20–50% have fallen to <10% when these guidelines are followed.

A register of admissions, discharges and deaths should be kept. This should contain information about the children (such as weight, age, sex), day of admission, date of discharge, or date and time of death.

If mortality is >5%, determine whether the majority of deaths occurred:

- *within 24 hours*: consider untreated or delayed treatment of hypoglycaemia, hypothermia, septicaemia, severe anaemia, or incorrect rehydration fluid (route, type of fluid, or amount given)
- *within 72 hours*: check whether refeeding was with too high a volume per feed or with wrong formulation
- *at night*: consider hypothermia related to insufficient covering of the child or no night feeds
- *when beginning F-100*: consider too rapid a transition from starter to catch-up formula.

7.4.2 ***Weight gain during rehabilitation phase***

Weight gain is defined as follows:

— poor: <5 g/kg/day
— moderate: 5–10 g/kg/day
— good: >10 g/kg/day.

If the weight gain is <5 g/kg/day, determine:

- whether this occurred in all cases being treated (if so, a major review of case management is required)
- whether this occurred in specific cases (reassess these children as if they were new admissions).

General areas to check, if the weight gain is poor, are described below.

Inadequate feeding

Check:

- that night feeds are given.
- that target energy and protein intakes are achieved. Is the actual intake (i.e. what was offered minus what was left over) correctly recorded? Is the quantity of feed recalculated as the child gains weight? Is the child vomiting or ruminating?
- feeding technique: is the child fed frequent feeds, unlimited amounts?
- quality of care: are staff motivated/gentle/loving/patient?
- all aspects of feed preparation: scales, measurement of ingredients, mixing, taste, hygienic storage, adequate stirring if separating out.
- whether complementary foods with catch-up F-100, if given, are suitably modified to provide more than 100 kcal/100g.
- adequacy of multivitamin composition and shelf-life.
- preparation of mineral mix and whether correctly prescribed and administered. If in a goitrous re-

Checking the weight of a young child

gion, check whether potassium iodide (KI) is added to the electrolyte/mineral mix (12 mg/2500 ml), or give all children Lugol's iodine (5–10 drops/day).
- if complementary foods are substantially replacing mineral-enriched catch-up F-100, whether electrolyte/mineral solution is added to the complementary food (20 ml/day).

Untreated infection

If feeding is adequate and there is no malabsorption, suspect a hidden infection. The following are easily overlooked: urinary tract infections, otitis media, tuberculosis and giardiasis. In such a case:

- re-examine carefully
- repeat urine microscopy for white blood cells
- examine the stool
- if possible, take a chest X-ray.

Change the antibiotic schedule only if a specific infection is identified.

HIV/ AIDS

Recovery from malnutrition is possible in children with HIV and AIDS, but it may take longer and treatment failures are more common. Initial treatment of severe malnutrition in children with HIV/AIDS should be the same as for HIV-negative children.

Psychological problems

Check for abnormal behaviour such as stereotyped movements (rocking), rumination (i.e. self-stimulation through regurgitation), and attention-seeking. Treat by giving the child special love and attention. For the child who ruminates, firmness, with affection, can assist. Encourage the mother to spend time playing with the child (see Appendix 5, page 155).

CHAPTER 8

Children with HIV/AIDS

HIV/AIDS is caused by the human immunodeficiency virus which attacks cells of the immune system, so that the affected child is more vulnerable to a wide variety of infections. In general, the management of specific conditions in HIV-infected children is similar to that of other children—see guidelines in Chapters 3 to 7. The present chapter discusses the following aspects of management of children with HIV/AIDS: counselling and testing, immunization, breastfeeding, discharge and follow-up, treatment of opportunistic infections, and palliative care for the terminally ill child.

HIV infection is a chronic progressive condition which begins with few or no symptoms. Progressive failure of the immune system leads to frequent infections and failure to grow normally. Most infections in HIV-positive children are caused by the same pathogens as in HIV-negative children, although they may be more frequent or more severe and occur repeatedly. Some, however, are due to unusual pathogens.

Many HIV-positive children die from common childhood illnesses, rather than AIDS. Most of these deaths are preventable by early diagnosis and correct management. Effective management of these conditions can make an important contribution to the quality of life of HIV-positive children. In particular, these children have a greater risk of pneumococcal infections and pulmonary tuberculosis, as well as unusual opportunistic infections which respond poorly to therapy.

The vast majority of HIV-infected children acquired the virus from their mother. However, not all children born to HIV-infected mothers become infected. The rate of mother-to-child transmission of HIV is estimated to range from 25% to 45%. Evidence from industrially developed countries shows that such transmission can be greatly reduced (to less than 5% in recent studies) by the use of antiretroviral therapy during pregnancy and at delivery and by elective caesarian section. Although this treatment is expensive, work is in progress to adapt this approach to more affordable regimens for the developing countries. In middle income countries, such as Thailand, mother-to-child transmission can be reduced to 10% by short course antiretroviral therapy among HIV-infected women who are able to successfully feed their babies without breastfeeding.

Clinical diagnosis

The clinical expression of HIV infection in children is highly variable. Some HIV-positive children develop severe HIV-related signs and symptoms in the first year of life; these are associated with a high mortality. Other HIV-positive children may remain asymptomatic or mildly symptomatic for more than a year and may survive for several years. Many HIV-infected children in industrialized countries live into teenage years.

Suspect HIV if any of the following signs, which are not common in HIV-negative children, are present.

Signs uncommon in HIV-negative children

- *Recurrent infection*: three or more severe episodes of a bacterial and/or viral infection (such as pneumonia, meningitis, sepsis, cellulitis) in the past 12 months.
- *Oral thrush*: punctate or diffuse erythema and white-beige pseudomembranous plaques on the oral mucosa. After the neonatal period, the presence of oral thrush—without antibiotic treatment, or lasting over 30 days despite treatment, or recurring—is highly suggestive of HIV infection.
- *Chronic parotitis*: the presence of unilateral or bilateral parotid swelling (just in front of the ear) for >14 days, with or without associated pain or fever.
- *Generalized lymphadenopathy*: the presence of enlarged lymph nodes in two or more extra-inguinal regions without any apparent underlying cause.
- *Hepatosplenomegaly*: in the absence of concurrent viral infections such as cytomegalovirus (CMV).
- *Persistent and/or recurrent fever*: fever (>38° C) lasting ≥7 days, or occurring more than once over a period of 7 days.
- *Neurological dysfunction*: progressive neurological impairment, microcephaly, delay in achieving developmental milestones, hypertonia, or mental confusion.

- *Herpes zoster (shingles)*: painful rash with blisters confined to one dermatome on one side.
- *HIV dermatitis*–erythematous papular rash.

Signs common in HIV-infected children, but also common in ill non-HIV infected children

- *Chronic otitis media*: ear discharge lasting ≥14 days.
- *Persistent diarrhoea*: diarrhoea lasting ≥14 days.
- *Failure to thrive*: weight loss or a gradual but steady deterioration in weight gain from the expected growth, as indicated in the child's growth card. Suspect HIV particularly in breastfed infants <6 months old who fail to thrive.

Signs or conditions very specific to HIV-infected children

Strongly suspect HIV infection if the following are present: pneumocystis pneumonia (PCP), oesophageal candidiasis, lymphoid interstitial pneumonia (LIP), shingles across several dermatomes, or Kaposi sarcoma. These conditions are very specific to HIV-infected children. However, the diagnosis is often very difficult where diagnostic facilities are limited. See section 8.2 for further details.

8.1 HIV testing and counselling

If there are reasons to suspect HIV infection (based on clinical signs or diagnoses in the family), and the child's HIV status is not known, the child should be tested for HIV, where possible.

Transplacental maternal antibodies interfere with conventional serological testing in children aged <15 months. If the child is suspected to have HIV infection on clinical grounds, the mother should be offered counselling, followed by HIV testing of both mother and child. This also provides an opportunity for clinical assessment to rule out other HIV-associated and potentially treatable clinical problems, such as tuberculosis. In the very uncommon event that it is known that the mother became infected after delivery, the presence of antibodies in the first year of life is indicative of HIV infection in the infant.

Both pre-test and post-test counselling should accompany any HIV testing. Pre-test counselling should include securing informed consent before any tests proceed. Even in high prevalence countries, HIV remains an extremely stigmatizing condition and the mother (or both partners) may feel reluctant to undergo testing.

HIV counselling should take account of the child as part of a family. This should include the psychological implications of HIV for the child, mother, father and other family members. Counselling should stress that, although cure is currently not possible, there is much that can be done to improve the quality and duration of the child's life and the mother's relationship with the child. Counselling should make it clear that the hospital staff want to help, and that the mother should not be frightened of going to a health centre or hospital early in an illness, if only to ask questions.

Counselling requires time and has to be done by trained staff. All health workers at the first referral level should be trained in the principles of HIV counselling and be able to carry it out. However, if staff at the first referral level have not been trained, assistance should be sought from other sources, such as local community AIDS support organizations.

Confidentiality of HIV-testing and counselling should be stressed. However, mothers could be encouraged to find at least one other person, preferably within their own family, with whom they can talk about this problem.

Indications for counselling

HIV counselling is indicated in the following situations.

8.1.1 Child with unknown HIV status presenting with clinical signs of HIV infection and/or risk factors (such as a mother or sibling with HIV/AIDS)

Follow these steps:

- Decide if you will do the counselling or if you will refer the child (see section 8.5, page 96).
- If you are doing the counselling, make time for the counselling session. Take advice from local people experienced in counselling so that any advice given is consistent with what the mother will receive from professional counsellors at a later stage.
- Where available, arrange an HIV test to confirm the clinical diagnosis, alert the mother to HIV-related problems, and discuss prevention of future mother-to-child transmissions (including, where possible, prevention using antiretrovirals).

  Note: If HIV testing is not available, discuss the presumptive diagnosis of HIV infection in the light of the existing signs/symptoms and risk factors.
- If counselling is not being carried out at the hospital, explain to the parent why they are being referred elsewhere for counselling.

8.1.2 *Child known to be HIV-positive and responding poorly to treatment, or needing further investigations*

Discuss the following in the counselling sessions:

- the parents' understanding of HIV infection
- management of current problems
- the need to refer to a higher level, if necessary
- support from community-based groups, if available.

8.1.3 *Child known to be HIV-positive who has responded well to treatment and is to be discharged (or referred to a community-based care programme for psychosocial support)*

Discuss the following in the counselling sessions:

- the reason for referral to a community-based care programme, if appropriate
- follow-up care
- risk factors for future illness
- immunization and HIV (see page 96).

8.2 Management of HIV-related conditions

The treatment of most infections (such as pneumonia, diarrhoea, meningitis) in HIV-infected children is the same as for other children. However, recovery in HIV-infected children is often slower and treatment failures are more frequent. In cases of failed treatment, consider using a second-line antibiotic. Treatment of recurrent infections is the same, regardless of the number of recurrences.

Some HIV-related conditions require specific management or adaptation of general management guidelines. These are described below.

8.2.1 *Tuberculosis*

In a child with suspected or proven HIV infection, it is important always to consider the diagnosis of tuberculosis. HIV infection increases both a child's susceptibility to tuberculosis and the risk of tuberculosis disease. The case-fatality rate associated with tuberculosis is higher in HIV-infected than non-infected children. This is partly due to the tuberculosis itself and partly to other HIV-related problems.

The diagnosis of tuberculosis in children with HIV infection is often difficult. Early in HIV infection, when immunity is not impaired, the signs of tuberculosis are similar to those in a child without HIV infection. Pulmonary tuberculosis is still the commonest form of tuberculosis, even in HIV-infected children. As HIV infection progresses and immunity declines, dissemination of tuberculosis becomes more common. Tuberculous meningitis, miliary tuberculosis, and widespread tuberculous lymphadenopathy occur.

- Treat tuberculosis in HIV-infected children with the same anti-tuberculosis drug regimen as for non-HIV-infected children with tuberculosis, but replace thioacetazone with an alternative antibiotic (refer to national tuberculosis guidelines or see section 3.6, page 41).

  Note: Thioacetazone is associated with a high risk of severe, and sometimes fatal, skin reactions in HIV-infected children. These reactions can start with itching, but progress to severe reactions such as exfoliative dermatitis or toxic epidermal necrolysis with mucous membrane involvement. If thioacetazone must be given, warn the parents about the risk of severe skin reactions and advise them to stop thioacetazone at once, if there is itching or skin reactions occur.

8.2.2 Pneumocystis carinii *pneumonia (PCP)*

Make a presumptive diagnosis of pneumocystis pneumonia in a child who has severe or very severe pneumonia and bilateral interstitial infiltrates on chest X-ray. Consider the possibility of pneumocystis pneumonia in children, known or suspected to have HIV, whose ordinary pneumonia does not respond to treatment. Pneumocystis pneumonia occurs most frequently in infants (especially those <6 months of age) and is often associated with hypoxia. Fast breathing is the most common presenting sign.

- Promptly give oral or preferably IV high-dose cotrimoxazole (trimethoprim 5 mg/kg/day, sulfamethoxazole 25 mg/kg/day) 4 times a day for 3 weeks.
- If the child has a severe drug reaction to cotrimoxazole, change to pentamidine (4 mg/kg once per day) by IV infusion for 3 weeks.

  Note: Children who react adversely to trimethoprim-sulfamethoxazole are usually aged under 1 year and often become hypoxic, and require oxygen therapy for several days. Their response to treatment is poor and the case-fatality rate is high. Recovery from hypoxia can be prolonged.

8.2.3 *Oral and oesophageal candidiasis*

Treat *oral thrush* with nystatin (100 000 units/ml) suspension. Give 1–2 ml into the mouth 4 times a day for 7 days. If this is not available, apply 0.25–0.5% gentian violet solution. If these are ineffective,

give 2% miconazole gel, 5 ml two times a day, if available.

Suspect *oesophageal candidiasis* if there is:

— difficulty or pain while vomiting or swallowing
— reluctance to take food
— excessive salivation
— crying during feeding.

The condition may occur with or without evidence of oral thrush. If oral thrush is not found, give a trial of treatment with ketoconazole. If there is no response or the response is poor, exclude other causes of painful swallowing (such as cytomegalovirus, herpes simplex, lymphoma and, rarely, Kaposi sarcoma), if necessary by referral to a larger hospital where appropriate testing is possible.

- Give oral ketoconazole (3–6 mg/kg once per day) for 7 days, except if the child has active liver disease. Give amphotericin B (0.5 mg/kg/dose once per day) by IV infusion for 10–14 days to these children and in cases where there is:

  — lack of response to oral therapy
  — inability to tolerate oral medications
  — risk of disseminated candidiasis (e.g. a child with leukopenia).

8.2.4 *Lymphoid interstitial pneumonitis (LIP)*

Suspect LIP if the chest X-ray shows a bilateral reticulonodular interstitial pattern, which has to be distinguished from pulmonary tuberculosis. The child is often asymptomatic in the early stages but may later have a cough, with or without difficulty in breathing, and signs of hypoxaemia such as finger-clubbing.

Give a trial of antibiotic treatment for bacterial pneumonia (see section 3.1, page 29) before starting treatment with prednisolone. Steroids are immunosuppressants and may increase the risk of tuberculosis and opportunistic infections in HIV-positive children. Weigh the likely benefits of treatment against these potential adverse effects. In many small hospital settings in developing countries, the benefits of long-term steroid treatment in these children will be outweighed by the uncertainty in diagnosis and adverse effects of treatment.

Start treatment with steroids, ***only*** if there are chest X-ray findings of lymphoid interstitial pneumonitis plus any of the following signs:

— fast or difficult breathing
— cyanosis
— finger-clubbing
— pulse oximetry reading of O2 saturation less than 90%.

- Give oral prednisolone, 1–2 mg/kg daily. Adjust the dosage and duration of treatment according to the clinical and radiological response.
- Only start treatment if it is possible to complete the full treatment course (which may take about six weeks depending on the resolution of signs of hypoxia), since partial treatment is not effective and could be harmful.

8.2.5 *Kaposi sarcoma*

Consider Kaposi sarcoma in children presenting with nodular skin lesions and diffuse lymphadenopathy. Diagnosis needs to be confirmed by a nodule biopsy of skin lesions or lymph node biopsy, where possible. Suspect also in children with persistent diarrhoea, weight loss, intestinal obstruction or abdominal pain. Consider referral to a larger hospital for management (for details of management, refer to a standard textbook of paediatrics).

8.3 HIV transmission and breastfeeding

HIV mother-to-child transmission may occur through breastfeeding. There is evidence that the additional risk of HIV transmission through breastfeeding is about 15%. Recent studies have shown that a substantial proportion of this is late post-natal transmission (after 3–6 months of age).

In sick children, defer counselling on HIV transmission until the child's condition has stabilized. If the mother continues to breastfeed because the child is already infected, breastfeeding should still be discussed for future pregnancies. This should be carried out by a trained and experienced counsellor.

- *If a child is known to be HIV-positive and is being breastfed*, encourage the mother to continue breastfeeding.
- *If the mother is known or clinically suspected to be HIV-positive and the child's HIV status is unknown*, the mother should be counselled about the benefits of breastfeeding as well as the risk of HIV transmission through breastfeeding. The decision whether or not to breastfeed should take into account the following:

  — the duration of breastfeeding
  — the child's clinical condition
  — whether an affordable substitute is readily available and can be prepared safely
  — impact on the mother's own health.

Infants born to HIV-positive mothers who have escaped perinatal infection have a lower risk of acquiring HIV if they are not breastfed. However, their risk of death may be increased if they are not breastfed in situations where there is no regular access to nutritionally adequate, safely prepared breast milk substitutes.

The counselling should be carried out by a trained and experienced counsellor. Take advice from local people experienced in counselling so that any advice given is consistent with what the mother will receive from professional counsellors at a later stage.

If it is decided to use breast milk substitutes, counsel the mother about their correct use and safe preparation and to seek help when necessary.

8.4 Immunization

Check that all children are fully immunized according to their age.

- Children who have, or are suspected to have, HIV infection but are not yet symptomatic should be given all appropriate vaccines (according to the national EPI programme schedule), including BCG and, where relevant, yellow fever vaccine. Because most HIV-positive children have an effective immune response in the first year of life, immunization should be given as early as possible after the recommended age of vaccination.
- Children with symptomatic HIV infection (including AIDS) should be given measles and oral poliomyelitis vaccines as well as non-live vaccines (DPT and, if locally relevant, hepatitis B). *Do **not** give BCG and yellow fever vaccines to children with symptomatic HIV infection.*
- Give all children with HIV infection (regardless of whether they are symptomatic or not) a dose of measles vaccine at the age of 6 months, as well as the standard dose at 9 months.

8.5 Follow-up

Discharge from hospital

Serious illnesses in HIV-positive children should be managed as for any other children. However, HIV-infected children may respond slowly or incompletely to the usual treatment. They may have persistent fever, persistent diarrhoea and chronic cough. If the general condition of these children is good, they do not need to remain in the hospital, but can be seen regularly as outpatients.

Referral

If facilities are not available in your hospital, consider referring a child suspected to have HIV infection:

- for HIV testing with pre- and post-test counselling
- to another centre or hospital for further investigations or second-line treatment if there has been little or no response to treatment
- to a trained counsellor for HIV and infant feeding counselling, if the local health worker cannot do this
- to a community/home-based care programme, or a community/institution-based voluntary counselling and testing centre, or a community-based social support programme for further counselling and continuing psychosocial support.

Discuss with the mother or carer the reason for referring the child, as well as the services available at the referral site. The referral note should be comprehensive, concise and clear, while maintaining confidentiality, with a request for written feedback on the child's condition.

Clinical follow-up

Children who are known or suspected to be HIV-positive should, when not ill, attend well-baby clinics like any other children. It is important that they receive prompt treatment of common childhood infections. In addition, they need regular clinical follow-up at first-level facilities at least twice a year to monitor:

- their clinical condition
- growth
- nutritional intake
- immunization status
- psychosocial support (where possible, this should be given through community-based programmes).

In a child with repeated serious infections, consider antibiotic prophylaxis. Research on the benefits of prophylaxis with cotrimoxazole (trimethoprim 5 mg/kg, sulfamethoxazole 25 mg/kg, twice a day for 3 days per week), conducted mainly in industrially developed countries, has shown that it reduces the incidence of pneumocystis pneumonia and bacterial infection in HIV-positive children. The decision to start prophylaxis should take into account national guidelines (which consider the cost of prophylaxis and the possible impact on development of cotrimoxazole resistance) and the availability of an adequate supply of the drug over a long period of treatment.

8.6 Palliative care in terminal HIV/AIDS

An HIV-infected child in the terminal stages often has considerable discomfort, so good palliative care is essential. Be prepared to handle untreatable conditions and complications of HIV infection in children and offer them palliative care focused on symptom control. Take all decisions together with the mother, and communicate them clearly to other staff (including night staff). Consider palliative care at home as an alternative to hospital care.

Give palliative care *only if* :

- — the child has had a progressively worsening illness
- — everything possible has been done to treat the presenting illness.

Some treatments for pain control and relief of distressing conditions (such as oesophageal candidiasis or convulsions) can significantly improve the quality of the child's remaining life. Ensuring that the family has appropriate support to cope with the impending death of the child is an important part of care in the terminal stages of HIV/AIDS. Parents should be supported in their efforts to give palliative care at home so that the child is not kept in hospital unnecessarily.

Pain control

Pain may be related to the disease itself or associated infections, or the procedures the child frequently has to undergo during diagnosis and treatment. The management of pain in HIV-infected children follows the same principles as for other chronic diseases such as cancer or sickle-cell disease. Particular attention should be paid to ensuring that care is culturally appropriate and sensitive. The underlying principles should be:

- — give analgesia *by mouth*, where possible (IM treatment is painful)
- — give it *regularly*, so that the child does not have to experience the recurrence of severe pain in order to get the next dose of analgesia
- — give it in *increasing doses*, or start with mild analgesics and progress to strong analgesics as the requirement for pain relief rises or tolerance develops
- — set the *dose for each child*, because children will have different dose requirements for the same effect.

Use the following drugs for effective pain control:

1. ***Local anaesthetics***: for painful lesions in the skin or mucosa or during painful procedures.
   - — Lidocaine: apply on a gauze to painful mouth ulcers before feeds (apply with gloves, unless the family member or health worker is HIV-positive and does not need protection from infection); it acts in 2–5 minutes.
   - — TAC (tetracaine, adrenaline, cocaine): apply to a gauze pad and place over open wounds; it is particularly useful when suturing.
2. ***Analgesic***s: for mild and moderate pain (such as headaches, postraumatic pain, and pain from spasticity).
   - — paracetamol
   - — aspirin
   - — non-steroidal anti-inflammatory drugs, such as ibuprofen.
3. Potent analgesics such as opiates: for moderate and severe pain not responding to treatment with analgesics.
   - — morphine, an inexpensive and potent analgesic: give orally or IV every 4–6 hours, or by continuous IV infusion.
   - — pethidine: give IM every 4–6 hours
   - — codeine: give orally every 6–12 hours, combined with non-opioids to achieve additive analgesia.

   Note: Monitor carefully for respiratory depression. If tolerance develops, the dose will need to be increased to maintain the same degree of pain relief.
4. **Other drugs**: for specific pain problems. These include diazepam for muscle spasm, carbamazepine for neuralgic pain, and corticosteroids (such as dexamethasone) for pain due to an inflammatory swelling pressing on a nerve. See Appendix 2, pages 141–143, for dosage regimens, although as noted above, dosages should be tailored to the needs of each individual child.

Management of anorexia, nausea and vomiting

Loss of appetite in a terminal illness is difficult to treat. Encourage carers to continue providing meals and to try:

- — small feeds given more frequently, particularly in the morning when the child's appetite may be better
- — cool foods rather than hot foods
- — avoiding salty or spicy foods.

If there is very distressing nausea and vomiting, give oral metoclopramide (1–2 mg/kg) every 2–4 hours, as required. If they persist despite treatment, consider the balance of benefits versus discomfort between an IV line and a nasogastric tube. Treat dehydration by oral or IV rehydration, as appropri-

ate. Show the carer how to give nasogastric feeds if this becomes necessary.

Prevention and treatment of pressure sores

Teach the carers to turn the child at least once every 2 hours. If pressure sores develop, keep them clean and dry. Use local anaesthetics such as TAC to relieve pain.

Care of the mouth

Teach the carers to wash out the mouth after every meal. If mouth ulcers develop, clean the mouth at least 4 times a day, using clean water or salt solution and a clean cloth rolled into a wick. Apply 0.25% or 0.5% gentian violet to any sores. Give paracetamol if the child has a high fever, or is irritable or in pain. Crushed ice wrapped in gauze and given to the child to suck may give some relief. If the child is bottle-fed, advise the carer to use a spoon and cup instead. If a bottle continues to be used, advise the carer to clean the teat with water before each feed.

If oral thrush develops, apply miconazole gel to the affected areas at least 3 times daily for 5 days, *or* give 1 ml nystatin suspension 4 times daily for 7 days, pouring slowly into the corner of the mouth so that it reaches the affected parts.

If there is pus due to a secondary bacterial infection, apply tetracycline or chloramphenicol ointment. If there is a foul smell in the mouth, give IM benzylpenicillin (50 000 units/kg every 6 hours), plus oral metronidazole suspension (7.5 mg/kg every 8 hours) for 7 days.

Airway management

If the child is unconscious, manage the airway as described in Chapter 1, page 3. If the parents want the child to die at home, show them how to nurse an unconscious child and how to keep the airway clear. If a manual suction device is available, the parents can be taught how to use it. Suction should be restricted to keeping the nose clear, without going deep into the pharynx.

If respiratory distress develops as the child nears death, put the child in a comfortable sitting position and manage the airway, as required. Give priority to keeping the child comfortable rather than prolonging life.

Psychosocial support

Helping parents and siblings through their emotional reaction towards the dying child is one of the most important aspects of care in the terminal stage of HIV disease. How this is done depends on whether care is being given at home, in hospital or in a hospice. At home, much of the support can be given by close family members, relatives and friends.

Keep up to date on how to contact local community-based home care programmes and HIV/AIDS counselling groups. Find out if the carers are receiving support from these groups. If not, discuss the family's attitude towards these groups and the possibility of linking the family with them.

CHAPTER 9

Supportive care

This chapter gives more detailed guidelines on important aspects of supportive care for many of the problems of sick children, which have been described in Chapters 3 to 8 concerning nutrition, fluids, fever, wheeze, and oxygen therapy. Some of these guidelines are applicable to children who attend a hospital outpatient clinic with a diagnosis or problem, which can be managed at home with supportive care (e.g. in dealing with nutrition and fever).

To provide good inpatient care, hospital policies and working practices should promote the basic principles of child care, such as:

- communicating with the parents
- arranging the paediatric ward so that the most seriously ill children get the closest attention
- allowing the mother to stay with the child
- keeping the child comfortable
- preventing the spread of nosocomial infection by encouraging staff to handwash regularly, providing water and soap, and other measures
- keeping warm the area in which young infants or children with severe malnutrition are being looked after, in order to prevent hypothermia.

All these are important elements in the general care of the child.

9.1 Nutritional management

Admission to hospital provides an opportunity to counsel mothers about nutrition of the young child during and after the illness. Appropriate feeding can significantly reduce the adverse effects of infections on nutritional status. Nutrition counselling should focus on the child's most important remediable feeding problems, rather than provide general nutritional advice.

The health worker should follow the counselling process outlined in sections 11.2 and 11.3 (pages 117–118). A mother's card containing a pictorial representation of the advice should be given to the mother to take home as a reminder (see page 119).

Baby starting to breastfeed (note the nipple touching the lip, mouth open, and tongue forward)

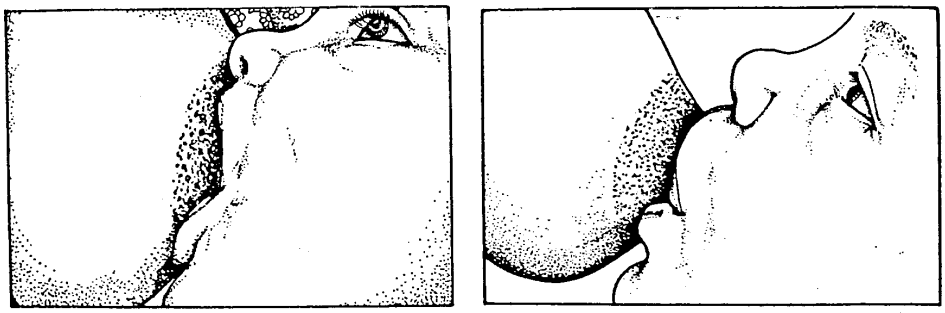
9.1.1 Supporting breastfeeding

Breastfeeding is most important for the protection of infants from illness and for their recovery from illness. It provides the nutrients needed for a return to good health.

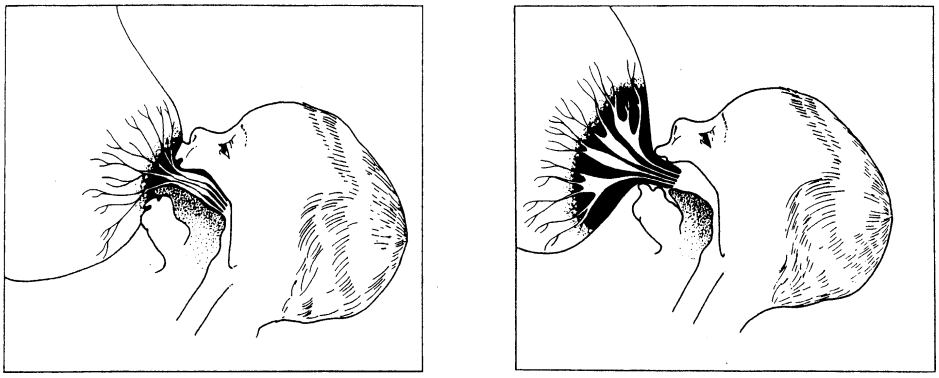
- *Exclusive breastfeeding* is recommended from birth until at least 4 months, and if possible 6 months of age.
- *Continued breastfeeding, together with adequate complementary foods*, is recommended up to 2 years of age or older.

Health workers treating sick young children have a responsibility to encourage mothers to breastfeed and to help them overcome any difficulties. Psychological factors such as worry, stress, pain and doubt can temporarily hinder the reflex controlling the flow of milk. Mothers need to be reassured about their ability to breastfeed. Health workers should give advice in a supportive manner.

See section 8.3, page 95, for a discussion on breastfeeding and HIV transmission.



Good (left) and poor (right) attachment of infant to the mother's breast

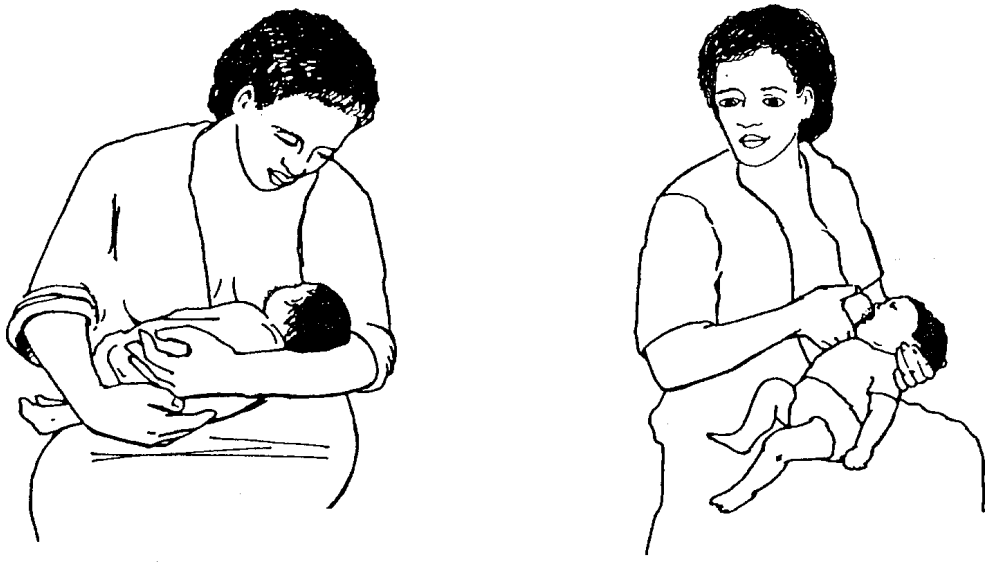


Good (left) and poor (right) attachment—cross-sectional view of the breast and baby

Assessing a breastfeed

Take a breastfeeding history by asking about the baby's feeding and behaviour. Observe the mother while breastfeeding to decide whether she needs help. Observe:

- *How the baby is attached to the breast* (see figure above). There should be more areola above the baby's mouth than below. The baby's mouth should be wide open and the lower lip turned out, and the baby's chin should touch the breast. The mother should feel no pain in her breast. If one or more of these signs is not present, the baby is poorly attached.
- *How the mother holds her baby* (see figures below). The baby should be held close to the mother, facing the breast, with the baby's body in a straight line with the head. The baby's whole body should be supported by the mother's arm or her lap or with cushions or clothes.



Good (left) and poor (right) positioning of infant for breastfeeding

- *How the mother holds her breast*. She should not hold her breast too near the nipple; instead she should rest her fingers on her chest and her first finger should form a support at the base of her breast.

Overcoming difficulties

1. 'Not enough milk'

Almost all mothers can produce enough breast milk for one or even two babies. Usually, even when a mother thinks that she does not have enough breast milk, her baby is getting enough. However, sometimes the baby is not getting enough breast milk. The signs are:

- poor weight gain (<500 g a month, or <125 g a week, or less than the birth weight after two weeks)
- passing a small amount of concentrated urine (less than 6 times a day, yellow and strong-smelling).

How to help a mother to position her baby

- Explain what might help, and ask if she would like you to show her.
- Make sure that she is comfortable and relaxed.
- Sit down yourself in a comfortable, convenient position.
- Explain how to hold her baby, and show her if necessary.

  The **four key points** are:
  — with his head and body straight;
  — with his face facing her breast, and his nose opposite her nipple;
  — with his body close to her body;
  — supporting his whole body.
- Show her how to support her breast:

  — with her fingers against her chest wall below her breast;
  — with her first finger supporting the breast;
  — with her thumb above.
  Her fingers should not be too near the nipple.
- Explain or show her how to help the baby to attach:

  — touch her baby's lips with her nipple;
  — wait until her baby's mouth is opening wide;
  — move her baby quickly onto her breast, aiming his lower lip well below the nipple.
- Notice how she responds and ask her how her baby's suckling feels.
- Look for signs of good attachment.

  — If the attachment is not good, try again.

Common reasons why a baby may not be getting enough breast milk are:

- *Poor breastfeeding practices*: poor attachment, delayed start of breastfeeding, feeding at fixed times, no night feeds, short feeds, use of bottles, pacifiers, other foods and other fluids.
- *Psychological factors in the mother*: lack of confidence, worry, stress, dislike of breastfeeding, rejection of baby, tiredness.
- *Mother's physical condition*: contraceptive pill, diuretics, pregnancy, severe malnutrition, alcohol, smoking, retained piece of placenta (rare), poor breast development (very rare).
- *Baby's condition*: illness, or congenital anomaly which interferes with feeding.

A mother whose breast milk production is reduced needs to increase it, while a mother who has stopped breastfeeding may need to relactate (see explanatory note on page 49). The same methods apply both for increasing a reduced supply and for relactation. However, relactation is more difficult and takes longer; the mother must be well motivated and needs a lot of support to succeed.

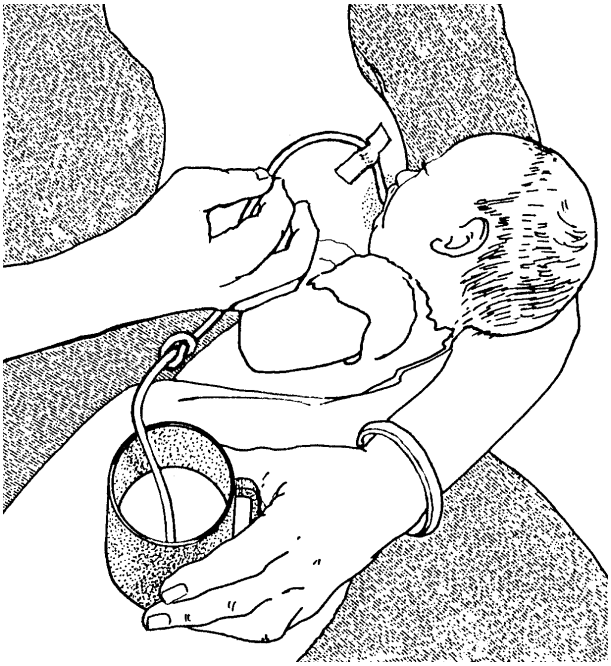
Help a mother to breastfeed again by:

- keeping the baby close to her and not giving him/her to other carers
- having plenty of skin-to-skin contact at all times
- offering the baby her breast whenever the baby is willing to suckle
- helping the baby to take the breast by expressing breast milk into the baby's mouth, and positioning the baby so that the baby can easily attach to the breast
- avoiding use of bottles, teats and pacifiers. If artificial feeds are needed until an adequate milk production is established, feed them by cup.

2. How to increase the milk production

The main way to increase or restart the supply of breast milk is for the baby to suckle often in order to stimulate the breast. If particular herbs, drinks or foods are thought locally to be lactogenic, encourage the mother to take them, provided they are harmless, to increase her confidence.

- Allow the baby to suckle at least 10 times in 24 hours, or more if the baby is willing. The mother should offer her breast whenever the baby seems willing, and allow the baby to suck for as long as the baby desires. She should keep the baby with skin-to-skin contact and breastfeed at night.
- Give other feeds from a cup while waiting for breast milk to come. Do not use bottles or pacifiers. Reduce the other milk by 30–60 ml per day as



Getting a baby to suckle using a breastfeeding supplementer

her breast milk starts to increase. Monitor the baby's weight gain.

- If the baby refuses to suckle an "empty" breast, find a way to give the baby milk while suckling—for example, with a dropper or by a tube attached to her breast and to a cup of milk at the other end.

The time required for a woman's breast milk production to increase varies greatly—from days to weeks. If the milk production does not increase within two weeks, it may be helpful to prescribe to the mother metoclopramide (10 mg every 8 hours) or chlorpromazine (25 mg every 8 hours) for a week to stimulate milk production. However, these drugs will have no effect unless all the other steps are being taken and the baby is suckling frequently.

3. Refusal or reluctance to breastfeed

Refusal or reluctance of a young infant to breastfeed adequately is a common reason for stopping breastfeeding. It can often be overcome. The main reasons why a baby might refuse to breastfeed are:

- *The baby is ill, in pain or sedated*
  - — Treat the baby's illness.
  - — If the baby is unable to suckle, the mother may need to express breast milk and feed by cup or tube until the baby is able to breastfeed again. See pages 103–104 for guidance on expressing milk and feeding by cup.
  - — If the baby is in hospital, arrange for the mother to stay with the baby in order to breastfeed.
  - — Help the mother to find a way to hold her baby without pressing on a painful place.
  - — Explain to the mother how to clear a blocked nose. Suggest short feeds, more often than usual, for a few days.
  - — A sore mouth may be due to *Candida* infection (thrush) or teething. Treat the infection with nystatin (100 000 units/ml) suspension. Give 1–2 ml dropped into the mouth, 4 times a day for 7 days. If this is not available, apply 0.25% gentian violet solution. Encourage the mother of a teething baby to be patient and keep offering the baby her breast.
  - — If the mother is on regular sedation, try to reduce the dose, or stop the medication, or find a less sedating alternative.
- *There is difficulty with the breastfeeding technique*

  Possible causes could be:
  - — feeding from a bottle or sucking on a pacifier interferes with the baby's suckling
  - — not getting enough milk because of poor attachment or breast engorgement
  - — pressure on the back of the baby's head by poor positioning technique
  - — the mother holding or shaking the breast, interfering with attachment
  - — restriction of breastfeeds to certain times
  - — overproduction of milk causing milk to come too fast and the baby to choke
  - — early difficulty in learning to suckle effectively.
    - — *Help the mother with her technique*: ensure that the baby is positioned and attached well without pressing on the baby's head, or shaking the breast.
    - — *Advise her not to use a feeding bottle or pacifier*: if necessary, use a cup.
    - — *Treat engorgement by removing milk from the breast*. If the baby is not able to suckle, help the mother to express her milk. A warm compress on the breast or gently massaging the breast can make breastfeeding or expressing the milk easier. After the feed or expressing of milk, put a cold compress on her breasts.

— *Help reduce overproduction*. To reduce the milk supply, the mother can breastfeed on only one side at each feed. It may also be helpful for the mother to express some milk before a feed, or hold her breast with her fingers like a "scissor" to slow the flow.

- *A change has upset the baby*

  Changes such as separation from the mother, a new carer, illness of the mother, or in the family routine or even the mother's smell (due to a different soap, food or menstruation) can upset the baby and cause refusal to breastfeed. Discuss with the mother the need to minimize such changes and to persist patiently with breastfeeding.

Sometimes, babies behave in ways that make their mothers think they are refusing to breastfeed, when this is not the case. A newborn may "root" for the breast, moving his/her head from side to side. Between 4 and 8 months of age, babies are easily distracted and may suddenly stop suckling. This is a sign that they are becoming alert. After the age of 1 year, a baby may wean him- or herself. Reassure mothers that these behaviours are normal.

Low-birth-weight and sick babies

Low-birth-weight babies (<2.5 kg at birth) need breast milk even more than larger babies; often, however, they cannot breastfeed immediately after birth.

For the first few days, a baby may not be able to take oral feeds and may need to be fed intravenously. Begin oral feeds as soon as the baby can tolerate them.

Babies of 30–32 (or fewer) weeks gestational age usually need to be fed by nasogastric tube. Give expressed breast milk by tube. The mother can let the baby suck on her finger while being tube fed. This may stimulate the baby's digestive tract and help weight gain.

Babies of 32 (or more) weeks gestational age are able to start suckling on the breast. Let the mother put her baby to the breast as soon as the baby is well enough. Continue giving expressed breast milk by cup or tube to make sure that the baby gets all the nutrition needed.

Babies of 34–36 (or more) weeks gestational age can usually take all that they need directly from the breast.

Babies who cannot breastfeed

Non-breastfed babies should receive either:

- expressed breast milk (preferably from their own mothers)
- formula milk prepared with clean water according to instructions on the label
- animal milk (dilute cow's milk by adding 1 cup of water to 2 cups of milk, then add 1 level teaspoon of sugar to each cup of feed).

Expressed breast milk (EBM) is the best choice—in the following amounts:

Babies ≥2.5 kg: give 150 ml/kg body weight daily, divided into 8 feeds, at 3-hour intervals.

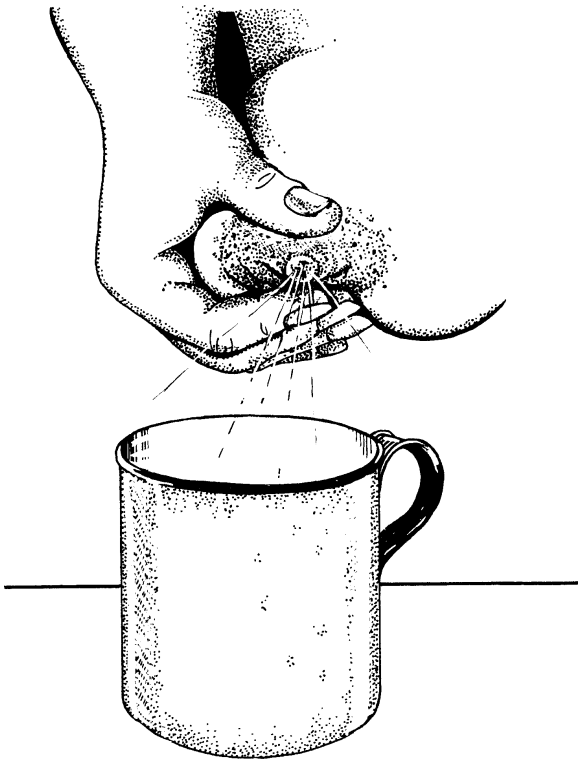
Babies <2.5 kg: give 60 ml/kg body weight on the first day, increased by 20 ml/kg each day until the baby is taking a total of 200 ml/kg body weight daily; divide into 8-12 feeds a day every 2–3 hours.

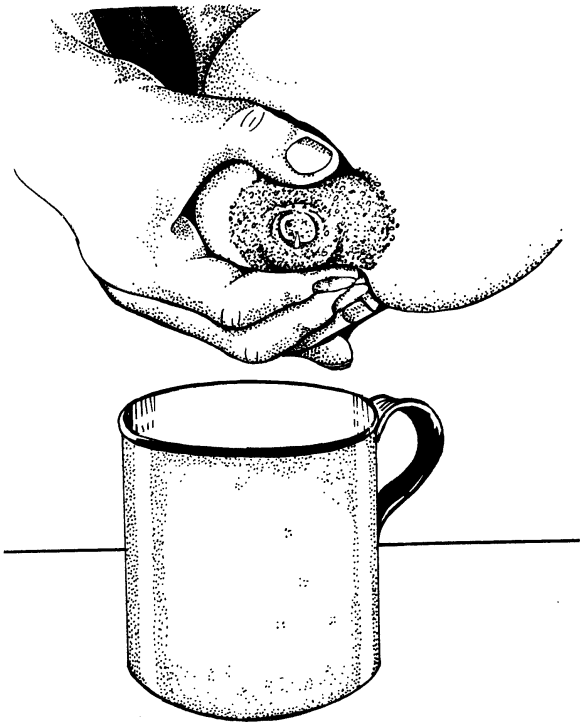
How to teach a mother to express her milk

Do not express her milk for her. Touch her only to show her what to do and be gentle. Teach her to:

- Wash her hands thoroughly
- Prepare a container for the EBM. Choose a cup, glass, jug or jar with a wide mouth. Wash the cup in soap and water. Pour boiling water in the container and leave it for a few minutes. When ready to express pour the water out
- Stand or sit comfortably and hold the container near her breast
- Put her first finger and thumb either side of the areola
- Press her thumb and first finger back towards the chest wall
- Compress and release the breast between her finger and thumb
- Compress in the same way all around the breast to make sure milk flows from all the lobes
- Express one breast for at least 2–4 minutes until the flow slows, then express the other side; and then repeat both sides again. Continue until the milk stops flowing.

Explain that it takes 20–30 minutes to express adequately, especially in the first few days when only a little colostrum or milk may be produced. It is important not to try to express in a shorter time. A mother should express at least every three hours, including during the night, to build up and maintain her milk supply.





Expressing breast milk

Feeding infant with expressed breast milk using a cup

Explain to the mother that it takes 20–30 minutes to express breast milk adequately. To keep up the breast milk production for a baby who is unable to suckle, express as often as the baby would breastfeed. If the mother only expresses 2 or 3 times a day, her breast milk production will decrease.

Use a cup to feed the baby, rather than a bottle. A cup is easy to clean and does not interfere with suckling at the breast.

9.1.2 ***Age-specific feeding guidelines***

Age: under 6 months

All infants under 4 months should be exclusively breastfed. At the age of 4 and 5 months, most infants will continue to show adequate growth and less illness if they are exclusively breastfed. However, some infants in this age group will need complementary feeds in order to maintain adequate growth. These are infants who are failing to gain sufficient weight or are hungry despite unrestricted breastfeeding.

These infants should be offered the same complementary foods as the child aged 6–12 months, once or twice a day, after breastfeeding (see below).

Age: 6–12 months

By 6 months of age, all infants should start on complementary foods. Breastfeeding, however, should still be a major source of nutrients, particularly for sick children (see section 8.3, page 95, for discussion on breastfeeding and HIV infection). In addition to continued breastfeeding on demand, locally available and affordable nutrient- and energy-rich (i.e. energy density of at least 100 kcal/100g) complementary foods are recommended. These foods should be given at least 3 times a day if the child is breastfed, and 5 times a day if not breastfed.

Age: 12 months to 2 years

Breast milk can still make a significant contribution to the diet of these older children, particularly during illness. In addition to the complementary feeds recommended for children aged 6–12 months, the older child should be introduced to family foods, which are usually energy-dense and adequate in nutrients.

Age: 2 years and older

Snacks, such as biscuits and bread, are a useful addition to family food when the time for food preparation is limited. Nutritious snacks should be given twice a day, in addition to the three daily meals with the family.

Feeding a young child with cup and spoon

A good daily diet should be adequate in quantity, and combine foods which are rich in energy with those which are good sources of protein, minerals (e.g.iron) and vitamins. Some diets adequate in energy may be lacking in micronutrients, and lead to stunted growth or to signs of specific deficiency, such as xerophthalmia due to lack of vitamin A.

When the time for discharge from the hospital is near, check that the mother understands how to feed the child appropriately at home, *and is able to do this*. Whenever possible, the mother should be actively involved in feeding her child in hospital and the foods given should resemble those she can prepare at home.

Complementary foods

Good complementary foods are energy-rich, nutrient-rich, and locally affordable. Examples in some areas are thick cereal with added oil, milk or milk products, fruits, vegetables, pulses, meat, eggs and fish. If the child receives cow's milk or any other breast-milk substitute, these and any other drinks should be given by cup, not by bottle.

In some countries, national or regional feeding recommendations have been drawn up as part of the Integrated Management of Childhood Illness (IMCI) initiative. These include complementary foods which are energy- and nutrient-rich and acceptable to mothers. An example of this is given in Chart 15 on page 106, in which the blanks are filled in with local recommendations.

9.1.3 ***Nutritional management of sick children***

Illness may compromise the nutritional status of children by reducing their appetite, increasing their need for specific nutrients and energy, increasing faecal losses of nutrients, or reducing their food intake owing to painful mouth lesions or nausea and vomiting.

The principles for feeding sick infants and young children are:

- continue breastfeeding
- do not withhold food
- give frequent small feeds, every 2–3 hours
- coax, encourage, and be patient
- feed by nasogastric tube if the child is severely anorexic
- promote catch-up growth after the appetite returns.

Chart 15. **Feeding recommendations during sickness and health**

Up to 4 months of age

- Breastfeed as often as the child wants, day and night, at least 8 times in 24 hours.
- Do not give other foods or fluids.

4 months up to 6 months

- Breastfeed as often as the child wants, day and night, at least 8 times in 24 hours.
- Only if the child:
  - — shows interest in semisolid foods, or
  - — appears hungry after breastfeeding, or
  - — is not gaining weight adequately,

  add complementary foods (listed under **6 months up to 12 months**).

  Give these foods 1 or 2 times per day after breastfeeding.

6 months up to 12 months

- Breastfeed as often as the child wants.
- Give adequate servings of:

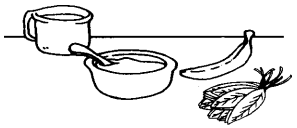
  _____

  _____

  _____

  _____

  - — 3 times per day if breastfed;
  - — 5 times per day if not breastfed.



12 months up to 2 years

- Breastfeed as often as the child wants.
- Give adequate servings of:

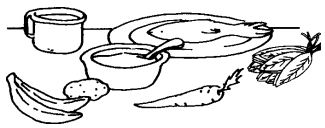
  _____

  _____

  _____

  _____

  or family foods 5 times per day.



2 years and older

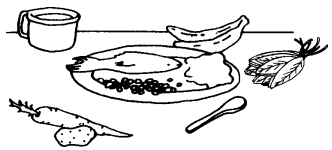
- Give family foods at 3 meals each day. Also, twice daily, give nutritious food between meals, such as:

  _____

  _____

  _____

  _____



* A good daily diet should be adequate in quantity and include an energy-rich food (for example, thick cereal with added oil); meat, fish, eggs, or pulses; and fruits and vegetables.

Table 21 ***Examples of local adaptations of feeding recommendations from Bolivia, Indonesia, Nepal, South Africa and Tanzania***

Country	Age group: 6 months up to 12 months	12 months up to 2 years	2 years and older
Bolivia	Cereal gruel, vegetable puree, minced meat or egg yolk, fruit. From 9 months: fish, whole egg	Family meals plus additional seasonal fruit, milk-based desserts (custard, milk rice), yoghurt, cheese, give milk twice a day	
Indonesia	Give adequate amounts of rice porridge with egg / chicken / fish / meat / tempe / tahu / carrot / spinach/ green beans / oil / coconut milk. Give also snacks 2 times a day between meals such as green beans, porridge, banana, biscuit, nagasari		Give adequate amounts of family foods in 3 meals each day consisting of rice, side dishes, vegetables and fruits. Also, twice daily, give nutritious foods between meals, such as green beans, porridge, banana, biscuit, nagasari etc
Nepal	Give adequate servings of (mashed) foods such as rice, lentils (dal), mashed bread (roti), biscuits, milk, yoghurt, seasonal fruits (such as banana, guava, mango etc), vegetables (such as potatoes, carrots, green leafy vegetables, beans etc), meat, fish and eggs		
South Africa	Porridge with added oil, peanut butter or ground peanuts, margarine and chicken, beans, full-cream milk, fruit and vegetables, mashed avocado or family food	Porridge with added oil, peanut butter or ground peanuts, margarine and chicken, beans, full-cream milk, fruit and vegetables, mashed avocado or banana, canned fish or family food	Bread and peanut butter, fresh fruit or full cream
Tanzania	Thick gruel, mixed food containing milk, mashed foods (rice, potato, ugali). Add beans, other legumes, meat, fish, or groundnuts. Add greens or fruit such as pawpaw, mango, banana, or avocado. Add spoonful of extra oil into food.		Give twice daily such as thick enriched uji, milk fruits or other nutritious snacks.

The food provided should be:

- palatable (to the child)
- easily eaten (soft or liquid consistency)
- easily digested
- nutritious, and rich in energy and nutrients.

The basic principle of nutritional management is to provide a diet with sufficient energy-producing foods and high-quality proteins. Foods with a high oil or fat content are recommended. Up to 30–40% of the total calories can be given as fat. In addition, feeding at frequent intervals is necessary to achieve high energy intakes.

The exact nature of the diet will depend on local food availability and tastes, but may include mixtures of cereal and locally available beans, or of cereal and meat or fish. In all cases, oil should be added to the food.

The child should be encouraged to eat relatively small amounts frequently. If young children are left to feed by themselves, or have to compete with siblings for food, they may not get enough to eat.

A blocked nose, with dry or thick mucus, may interfere with feeding. Put drops of salted water or saline into the nose with a moistened wick to help soften the mucus.

Children with severe (or very severe) pneumonia, bronchiolitis or asthma may have difficulty in eating because of fast or difficult breathing. In addition, there is a risk of aspiration. Do not force children to eat; this increases the risk of aspiration. If the child has a high fever, lowering the temperature may improve the appetite.

In a minority of children who are unable to eat for a number of days (e.g. due to impaired consciousness in meningitis or respiratory distress in severe pneumonia), it may be necessary to feed by nasogastric tube. The risk of aspiration can be reduced if small volumes are given frequently.

To supplement the child's nutritional management in the hospital, feeding should be increased during convalescence to make up for any lost weight. It is important that the mother or carer should offer food to the child more frequently than normal (at least one additional meal a day) after the child's appetite increases.

9.2 Fluid management

Table 22 ***Maintenance fluid requirements***

Body weight of child	Fluid (ml/day)
<10 kg	100–120 ml/kg
10–19 kg	90–120 ml/kg
>20 kg	50–90 ml/kg
Thus, for example:	
2 kg	220 ml/day
4 kg	440 ml/day
6 kg	660 ml/day
8 kg	900 ml/day
10 kg	1100 ml/day
12 kg	1300 ml/day
14 kg	1400 ml/day
16 kg	1600 ml/day
18 kg	1700 ml/day
20 kg	1800 ml/day
22 kg	1900 ml/day
24 kg	2000 ml/day
26 kg	2100 ml/day

Give the sick child more than the above amounts if there is fever (increase by 10% for every 1 °C of fever). Modify these general guidelines and the kind of fluid to be given, according to the specific clinical condition of the child.

Monitoring fluid intake

Pay careful attention to maintaining adequate hydration in very sick children, who may have had no oral fluid intake for some time. Fluids should preferably be given orally (by mouth or nasogastric tube).

If fluids need to be given intravenously, it is important to monitor closely any infusion of IV fluid given to a sick child because of the risk of fluid overload leading to heart failure. If it is impossible to monitor the IV fluid infusion closely, then the IV route should be used only for the management of severe dehydration, septic shock, the delivery of IV antibiotics, and in children in whom oral fluids are contraindicated, such as in perforation of the intestine or other surgical abdominal problems.

9.3 Management of fever

Temperatures referred to in these guidelines are **rectal temperatures**, unless otherwise stated. The rectal temperature provides a close approximation to the core body temperature. Oral and axillary temperatures are lower by approximately 0.5 °C and 0.8 °C respectively. Axillary temperatures are usually used in outpatient services.

Fever is not an indication for antibiotic treatment, and may help the immune defences against infection. However, high fever (>39 °C) can have harmful effects such as:

- reducing the appetite
- making the child irritable
- precipitating convulsions in some children aged between 6 months and 5 years
- increasing oxygen consumption (but this is only important for a child with very severe pneumonia)
- neurological damage when the temperature exceeds 42 °C, which is very rare.

All children with fever should be examined for signs and symptoms which will indicate the underlying cause of the fever, and should be treated accordingly (see Chapter 5, page 57).

Antipyretic treatment

Paracetamol

Treatment with oral paracetamol should be restricted to children aged ≥2 months who have a fever of ≥39 °C (≥102.2 °F), and are uncomfortable or distressed because of the high fever. Children who are alert and active are unlikely to benefit from paracetamol treatment. The dose of paracetamol is 15 mg/kg 6-hourly.

Other agents

Aspirin is not recommended as a first-line antipyretic because it has been linked with Reye's syndrome, a rare but serious condition affecting the liver and brain. However, if paracetamol is not available, aspirin may be used as a second-line drug in doses of 15 mg/kg 6-hourly. Avoid giving aspirin to children with chickenpox, dengue fever and other haemorrhagic disorders. Restrict its use to circumstances in which the control of very high fever is important for the management of the child.

Other agents are not recommended because of their toxicity and inefficacy (dipyrone, phenylbutazone) or expense (ibuprofen).

Supportive care

Children with fever should be lightly clothed, kept in a warm but well-ventilated room, and encouraged to increase their oral fluid intake. Sponging with tepid water lowers the temperature during the period of sponging only. However, it may have a role in a child with very high fever (>42 °C or >107.6 °F), where rapid temperature reduction is desirable while waiting for the paracetamol to take effect.

9.4 Management of anaemia

Anaemia (non-severe)

In any child with palmar pallor, check the haemoglobin level. Young children (aged <6 years) are anaemic if their haemoglobin is <9.3 g/dl (approximately equivalent to a haematocrit of <27%). If anaemia is present, begin treatment—except if the child is severely malnourished, in which case see page 88.

- Give (home) treatment with iron (daily dose of iron/folate tablet or iron syrup) for 14 days.

Note: If the child is taking sulfadoxine-pyramethamine for malaria, do not give iron tablets that contain folate until a follow-up visit after 2 weeks. The folate may interfere with the action of the antimalarial. See Chapter 7 for use of iron in severely malnourished children.

- Ask the parent to return with the child after 14 days. Treatment should be given for 3 months, where possible. It takes 2–4 weeks to correct the anaemia and 1–3 months after the haemoglobin reverts to normal to build up iron stores.
- If the child has not had mebendazole in the previous 6 months, give one dose of mebendazole (500 mg) for possible hookworm or whipworm (see page 143).
- Advise the mother about good feeding practices.

Severe anaemia

This is suggested by the presence of severe pallor and a fast pulse rate, difficulty in breathing, or confusion or restlessness. There may be signs of heart failure such as gallop rhythm, an enlarging liver and, rarely, pulmonary oedema (fine basal crackles on auscultation).

- Give a *blood transfusion* as soon as possible (see Appendix 1, A1.3, page 130) to:
  - — all children with a haematocrit of ≤12% or Hb of ≤4 g/dl
  - — less severely anaemic children (haematocrit 13–18%; Hb 4–6 g/dl) with any of the following clinical features:
    - — clinically detectable dehydration
    - — shock
    - — impaired consciousness
    - — heart failure
    - — deep and laboured breathing
    - — very high malaria parasitaemia (>10% of red cells with parasites).
- If packed cells are available, give 10 ml/kg body weight over 3–4 hours in preference to whole blood. If not available, give fresh whole blood (20 ml/kg body weight) over 3–4 hours.
- Check the respiratory rate and pulse rate every 15 minutes. If either shows a rise, transfuse more slowly. If there is any evidence of fluid overload due to the blood transfusion, give IV furosemide, 1–2 mg/kg body weight, up to a maximum total of 20 mg.
- After the transfusion, if the haemoglobin remains as before, repeat the transfusion.
- In severely malnourished children, fluid overload is a common and serious complication. Give whole blood, 10 ml/kg body weight (rather than 20 ml/kg), once only and do not repeat the transfusion (see page 88 for details).

9.5 Oxygen therapy

Indications

Where the oxygen supply is *limited*, priority should be given to children with very severe pneumonia, bronchiolitis, or asthma who:

- have central cyanosis, *or*
- are unable to drink (where this is due to respiratory distress).

Where the oxygen supply is *more plentiful*, it should be given to children with any of the following:

- severe lower chest wall indrawing
- respiratory rate of 70/min or above
- grunting with every breath (in young infants)
- head nodding (see page 76).

Delivery of oxygen from an oxygen cylinder (note pressure gauge, flow meter and use of nasal prongs)

Sources

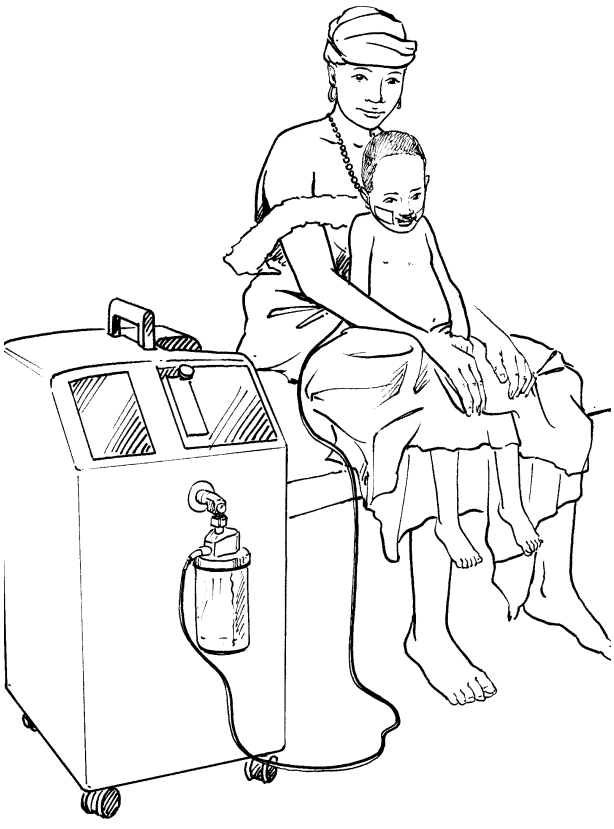
Oxygen supplies should be available at all times. The two main sources of oxygen are cylinders and oxygen concentrators. It is important that all equipment is checked for compatibility.

Oxygen cylinders

See list of recommended equipment for use with oxygen cylinders and instructions for their use in the WHO technical review paper, *Oxygen therapy in the management of a child with an acute respiratory infection* (see Reference 4, page 123).

Oxygen concentrators

The concentrator, with a built-in flow control device, should meet WHO specifications for operation. Non-crush plastic tubing for oxygen delivery is required. If a nasopharyngeal catheter is used, a bubble humidifier is needed. If the oxygen source is used for more than one child, a flow splitter, 0.5 and 1.0 litre/minute nozzles, blanking plugs and flow indicators, together with additional tubing (and humidifiers) are required. Instructions for the use of oxygen concentrators are given in the WHO technical review paper, *Oxygen therapy in the management of a child with an acute respiratory infection* (see Reference 4, page 123).



Delivery of oxygen therapy from an oxygen concentrator

Oxygen delivery

Three methods are recommended for the delivery of oxygen: nasal prongs, nasal catheter and nasopharyngeal catheter. The advantages and disadvantages of the different methods of oxygen administration are compared in the Table 23, page 112. Nasal prongs or a nasal catheter are preferred in most circumstances. Nasal prongs are the best method for delivering oxygen to young infants and children with severe croup or pertussis (do not use a nasopharyngeal catheter or a nasal catheter as they provoke paroxysms of coughing).

Oxygen therapy: nasal prongs correctly positioned and secured

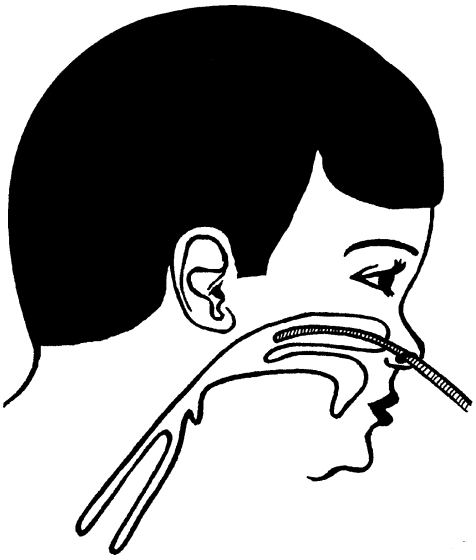
Use of a nasopharyngeal catheter calls for close monitoring and prompt action, in case the catheter enters the oesophagus or other serious complications develop. The use of face masks or headboxes is *not* recommended. It is important to have the proper equipment to control low flow rates (0.5–2 litres/minute)—see details in the WHO technical review paper cited above.

Nasal prongs. These are short tubes inserted into the nostrils. Place them just inside the nostrils and secure with a piece of tape on the cheeks near the nose (see Figure). Care should be taken to keep the nostrils clear of mucus, which could block the flow of oxygen.

Set a flow rate of 1–2 litres/min (0.5 litre/min in young infants) to deliver an inspired oxygen concentration of 30–35%. Humidification is not required with nasal prongs.

Nasal catheter. This is a 6 or 8FG catheter which is passed to the back of the nasal cavity. Place the cath-

eter at a distance equal to that from the side of the nostril to the inner margin of the eyebrow. The tip of the catheter should NOT be visible below the uvula (see Figure below). Set a flow rate of 1–2 litres/min. Humidification is not required with a nasal catheter.



Oxygen therapy: correct position of nasal catheter (cross-sectional view)

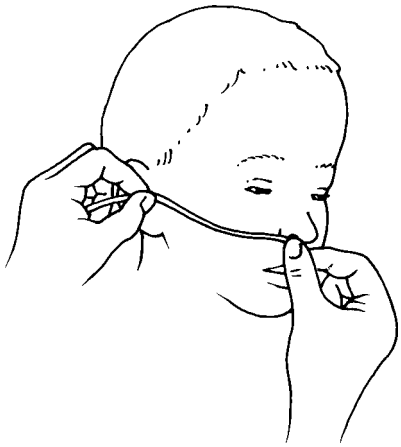
Nasopharyngeal catheter. This is a 6 or 8FG catheter which is passed to the pharynx just below the level of the uvula. Place the catheter at a distance equal to that from the side of the nostril to the front of the ear (see Figure on right, A). The tip of the catheter should be visible just below the uvula (see Figure, C). If it is placed too far down, gagging and vomiting and, rarely, gastric distension can occur.

Set a flow rate of 1–2 litres/min, which delivers an inspired oxygen concentration of 45–60%. It is important that this flow rate is not exceeded because of the risk of gastric distension.

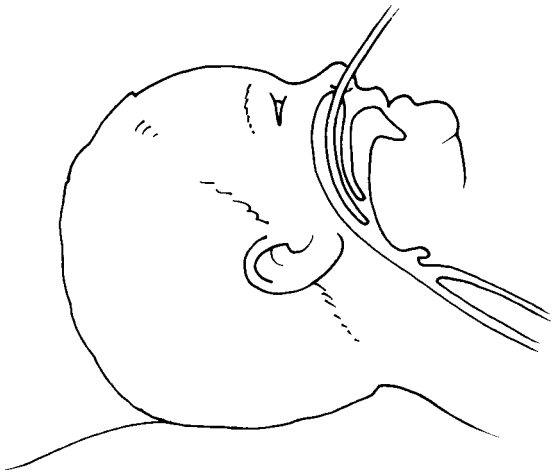
Humidification is required. The bubble humidifier should be filled to the correct level with previously boiled, clean warm water. Connections should be regularly checked for leaks. The water should be changed daily and the humidifier cleaned with detergent. Once a week, the humidifier should be washed in a mild antiseptic solution and allowed to dry completely.

Monitoring

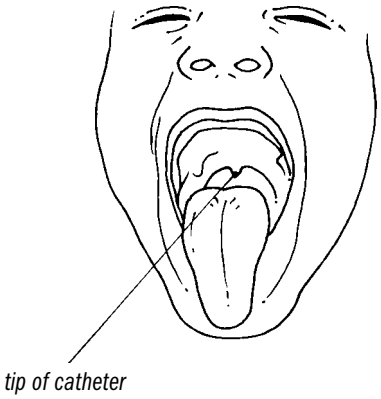
Train the nurses to place and secure the nasal prongs or catheter correctly. Check regularly that the equipment is working properly, and remove and clean the prongs or catheter at least twice a day.



A: Measuring the distance from nose to the tragus of the ear for the insertion of a nasopharyngeal catheter



B. Cross sectional view of the position of the nasopharyngeal catheter



C. Tip of the nasopharyngeal catheter visible just below the soft palate

Table 23 ***Comparison of different methods of oxygen administration***

Method	**Oxygen concentration** (% from 1 litre per minute in 5 kg child)	**Humidification**	**Change in concentration with mouth breathing**	**Obstruction of airways by mucus may increase hypoxaemia**	**Chance that device will dislodge, changing oxygen concentration**	**Risk of gastric distension with wrong position or high flow**
Nasal prongs	30–35	Not required	+++	+	++	No
Nasal catheter	35–40	Not required	++	++	+	+
Nasopharyngeal catheter	45–60	Required	+	+++	++	+++
[Headbox: not recommended]	29 [a]	Not required	None	No	+++	No
[Face mask: not recommended]	variable	Not required	None	No	+++	No

Key: + = least change/risk; +++ = most change/risk.
[a] With a venturi device in the tubing to draw in room air for a total flow of 10 litres/min.

Monitor the child at least every 4 hours to identify and correct any problems, including:

- nasal catheter or prongs out of position
- leaks in the oxygen delivery system
- oxygen flow rate not correct
- airways obstructed by mucus (clear the nose with a moist wick or by gentle suction)
- gastric distension (check the catheter's position and correct it, if necessary).

Whenever signs of deterioration are noted in the child, including an increase in respiratory rate or increased chest indrawing, check the equipment as above. If no problem is found, increase the oxygen flow rate and check for other complications of the condition such as pneumothorax. Treat accordingly (see Chapter 2) .

CHAPTER 10

Monitoring the child's progress

Monitoring the clinical course of a sick child and the response to treatment is an essential element in the treatment process. All hospitals should have a system for the regular monitoring of patients, which includes recording essential clinical information and ensuring that action to change treatment is taken promptly when this is required. Unfortunately, the progress of a sick child is often inadequately monitored and this may be an important reason for the high case-fatality rates in some settings. This chapter outlines a general approach to monitoring, and offers guidelines on the monitoring process. Specific recommendations for monitoring children, according to their illness and treatment, are given in Chapters 1 to 8.

The key aspects in monitoring the progress of a sick child are:

- Making a plan, at the time the child enters hospital, to monitor the child regularly—the frequency will depend on the nature and severity of the child's clinical condition.
- Using a standard chart to record essential information, which will facilitate the prompt identification of any problems that require a change in treatment.
- Bringing these problems to the attention of the doctors or other senior staff who have the experience and authority to act on the findings and, if necessary, change the treatment.

10.1 Monitoring procedures

In order for monitoring to be effective, the health worker needs to know:

- the correct administration of the treatment
- the expected progress of the child
- the possible adverse effects of the treatment
- the complications that may arise and how these can be identified
- the possible alternative diagnoses in a child not responding to treatment.

Children treated in hospital should be checked regularly so that any deterioration in their condition, as well as complications, adverse effects of treatment, or errors in the administration of treatment can be identified promptly. The frequency of monitoring depends on the severity and nature of the illness (see relevant sections in Chapters 3 to 8).

Details of the child's condition and progress should be recorded so that they can be reviewed by other members of staff. A senior health worker who is responsible for the care of the child, and has the authority to change treatment, should supervise these records and examine the child on a regular basis.

Children who are seriously ill should be visited soon after admission by a doctor (or other senior health professional) who will check the results of urgent investigations, review the diagnosis and treatment given, and identify children who are not responding to the treatment. This process of monitoring gives the opportunity to review the initial diagnosis and treatment at an early stage. Further monitoring visits should be carried out regularly until the child is well and discharged from hospital. These visits should also be seen as an opportunity to encourage communication between the families of sick children and hospital staff.

10.2 Monitoring chart

A monitoring chart should include the following items (see Chart 16, page 114).

1. Patient's details

Record the child's name, age, and diagnoses or main problems requiring treatment in hospital.

2. Vital signs

These are indicated by the coma score or level of consciousness, temperature, respiratory rate, pulse rate, and weight.

- Specify which signs to record because some signs, e.g. level of consciousness, will not be relevant for some children.

Chart 16. **Example of a Monitoring Chart**

Date: _____ **Hospital Record number:** _____

1. Child's name: **Mother's name:**

Age: Weight on admission:

2. Diagnoses/Main problems:

1.

2.

3.

4.

3. Vital signs	**DAY 1**				**DAY 2**				**DAY 3**				**DAY 4**			
● Consciousness level (AVPU)																
● Temperature																
● Respiratory rate																
● Pulse rate																

4. Fluid balance (record volumes and times)

IV																
By nasogastric tube																
Oral																
Fluid output																

5. Treatments given (sign on chart when given)

Name of treatment:	Dose:															
1.																
2.																
3.																
4.																

6. Feeding/Nutrition

Child breastfed																
Drink taken																
Food taken																
Feeding problems (give details)																
Weight																

7. Outcome (circle one of the following): Discharged well / Absconded / Transferred / Died

- Specify how frequently these should be recorded.
- The chart should leave space for the measurements to be recorded. For example, this might be 4 times daily for the first two days, then twice a day when the condition has improved.

3. Fluid balance

- Record accurately all fluids given IV or by nasogastric tube.
- Record fluid output, where this is possible and relevant to the care of the child.

4. Presence of clinical signs, complications and positive investigation findings

Record all clinical signs whose presence/absence will influence the management and treatment. At each review of the child, record whether or not these signs are still present. Record any new signs or complications when they are found, and keep track of them (e.g. noting any changes) till their resolution. This will help in assessing the child's progress and, where necessary, in making decisions quickly about modifying the treatment.

- List all important clinical signs.
- During monitoring reviews, record their continued presence or any change.
- Note down any *new* signs or complications as they appear.
- Record, during monitoring, the presence or absence of these signs and complications.

5. Treatments given

- List the main treatments to be given (including fluids by nasogastric tube and IV) and the regimen to be followed.
- When treatment is changed, add the new treatment to the list.
- Record when each treatment is given.

6. Feeding/nutrition

Record the child's weight on admission and at appropriate intervals during treatment. There should be a daily record of the child's drinking/breastfeeding and eating. Record the amount of food taken and details of any feeding problems.

Monitoring of information on feeding will help draw attention to the importance of feeding in all sick children. In the case of children with malnutrition, more detailed information on intake has to be collected and recorded.

7. Outcome

Record the outcome concerning each patient admitted to the hospital, e.g. discharged well, absconded, transferred, or died. A record of the outcome on the monitoring chart will help the hospital's assessment of patient care by a review of the patients' notes.

An example of a simple monitoring chart is given on page 114.

Note: The chart should be structured so that the findings can be recorded by a tick or initials in most cases, which makes it easier to complete and review. However, children with serious problems and complex treatments (e.g. severe malnutrition or multiple problems) may require, in addition to the chart recordings, more detailed notes (for example, concerning complications that arise).

10.3 Audit of paediatric care

The quality of care given to sick children in hospital can be improved if there is a system for reviewing the outcomes of each child admitted to the hospital. As a minimum, the system should keep records of all the children who died in the hospital. Trends in case-fatality rates over a period of time could then be compared and the treatment that was given could be discussed with all staff with the aim of identifying the problems and finding better solutions.

An audit of hospital paediatric care can be carried out by comparing the quality of care actually given with a recognized standard, such as the WHO recommendations contained in this manual. Information on selected key aspects of care (e.g. which antibiotic was used, what dose was prescribed, or which essential investigations were correctly carried out), as recorded for each patient, will be taken from the case records and then compared with the recommended standard practice. Areas of mismatch can be identified and discussed at staff audit meetings, so that the quality of paediatric care can be improved.

Some hospitals have prepared one-page charts for specific paediatric problems, on which the staff are requested to record key clinical information for each child. These charts (called integrated or critical care pathways) remind the staff of recommended standard practice, and allow them to carry out an audit of paediatric care by comparing their practices with the recommended standards.

A successful audit calls for the full and constructive participation of all medical and nursing staff. The aim is to improve care and solve problems, without attributing blame for errors. The audit should be simple and not take up too much time, which is required to care for the sick children. One suggestion is to ask medical and nursing staff for their views on improving the quality of care, and to give priority to these conditions or problems.

CHAPTER 11

Counselling and discharge from hospital

Studies of deaths in childhood from acute illnesses in developing countries have shown that many children died after contact with the health services, in some cases shortly after the child's discharge from hospital. Many deaths can therefore be prevented by giving careful attention to planning the child's discharge and follow-up. This chapter presents guidelines on when and how to discharge the child from hospital.

Careful monitoring of the child's overall response to treatment and correct planning of discharge from the hospital are just as important as making the diagnosis and initiating treatment.

The discharge process for all children should include:

- correct timing of discharge from hospital
- counselling the mother on treatment and feeding of the child at home
- ensuring that the child's immunization status and record card are up-to-date
- communicating with the health worker who referred the child or who will be responsible for follow-up care
- instructions on when to return to the hospital for follow-up and on symptoms and signs indicating the need to return urgently
- assisting the family with special support (e.g. providing equipment for a child with a disability, or linking with community support organizations for children with HIV/AIDS).

If the above guidelines are followed:

- the discharge will not be too early, thereby reducing the risk of a relapse at home with serious consequences, including death
- the discharge will not be delayed too long, thus reducing the child's exposure to the risk of hospital-acquired infections and freeing bed space for the admission of other very sick children
- links will be strengthened between the hospital and nearby first-level health services, from where sick children are referred to the hospital
- families will develop more confidence to provide proper follow-up care at home for children who have been discharged from hospital.

11.1 Timing of discharge from hospital

Children must stay in hospital if they require close observation and monitoring, as well as treatment which is available only in a hospital (e.g. oxygen therapy or parenteral antibiotics). Remaining in hospital also allows other essential treatments to be given by experienced hospital staff, rather than at home by a mother with no experience. Premature discharge of a sick child could interrupt these treatments and greatly increase the risk of a relapse and death. On the other hand, keeping a child in hospital for too long may expose the child to unnecessary risks of serious infection from other sick children and may mean that bed space and staff time are not available for other acutely ill children who need to be admitted.

The timing of discharge from hospital is therefore very important. The guidelines in this manual give treatment instructions for individual clinical conditions, specifying the standard course and duration of treatment.

In general, in the management of acute infections, the child can be considered ready for discharge after the clinical condition has improved markedly (afebrile, alert, eating and sleeping normally) and oral treatment has been started.

Decisions on when to discharge should be made on an individual basis, taking into consideration a number of factors, such as:

- the family's home circumstances and how much support is available to care for the child
- the staff's judgement of the likelihood that the treatment course will be completed at home
- the staff's judgement of the likelihood that the family will return immediately to the hospital if the child's condition should worsen.

Timing of discharge of a child with severe malnutrition is particularly important and is discussed on page 87. In every case, the family should be given as much warning as possible of the discharge date so that appropriate arrangements can be made to support the child at home.

If the family removes the child prematurely against the advice of the hospital staff, counsel the mother on how to continue treatment at home and encourage her to bring the child for follow-up after 1–2 days, and to make contact with the local health worker for help in the follow-up care of the child.

11.2 Counselling

Key elements of good counselling

Use the following skills when counselling mothers.

- **Listen**. Listen carefully to the answers to your questions. Find out what the mother is already doing for her child. Then you will know what she is doing well, and what practices need to be changed.
- **Praise**. It is likely that the mother is doing something helpful for the child, e.g. breastfeeding. Praising the mother for this will give her confidence in her ability to look after her sick child. Be sure that the praise is genuine, and only praise actions that are actually helpful to the child.
- **Advise**. Limit your advice to what is relevant to the mother at the time and use language she will understand. If possible, use pictures or real objects to help explain. For example, show the amount of fluid to be given using a cup or container which the mother is likely to have at home. Advise against any harmful practice the mother may have used, and explain why it is harmful. When correcting a harmful practice, be clear but also take care not to make the mother feel guilty or incompetent.
- **Check the mother's understanding**. Ask questions to find out what she has understood about caring for her child at home, and what needs further explanation. Avoid questions which suggest the right answer, and questions that can be answered by yes or no. Examples of good checking questions are:

  — *"What foods will you give your child?"*
  — *"How often will you give them?"*

If you get an unclear response, ask another checking question. Praise the mother if she has understood correctly or, if necessary, repeat your advice with a clear explanation.

Mother's Card (see Chart 17, page 119)

A simple, pictorial card reminding the mother of home care instructions, when to return for follow-up care, and the signs indicating the need to return immediately to the hospital can be given to each mother. This Mother's Card will help her to remember the appropriate foods and fluids, and when to return to the health worker.

Appropriate Mother's Cards are being developed as part of local training for Integrated Management of Childhood Illness (IMCI). Check first whether one has been produced in your area and use that. If not, see the example in Chart 17. The reverse of this card contains the feeding recommendations (Chart 15, page 106).

A Mother's Card is useful for several reasons:

- to remind the staff of important points to cover when counselling mothers about foods, fluids, and when to return for follow-up
- to remind the mother of what to do when she gets home
- to show to other family members or neighbours, so that others will learn the messages the card contains
- to take home something tangible, which mothers often appreciate
- to record, on multi-visit cards, what treatments and immunizations were given.

When reviewing the Mother's Card (see example on page 119) with the mother:

- Hold the card so that she can easily see the pictures, or allow her to hold it herself.
- Point to the pictures as you talk, and explain each one; this will help her to remember what the pictures represent.
- Mark the information that is relevant to the mother. For example, put a circle round the feeding advice for the child's age, and round the signs to return immediately. If the child has diarrhoea, tick the appropriate fluid(s) to be given. Record the date for the next immunization.
- Watch to see if the mother looks worried or puzzled. If so, encourage questions.
- Ask the mother to tell you in her own words what she should do at home. Encourage her to use the card to help her remember.
- Give her the card to take home. Suggest she show it to other family members. (If you do not have a large enough supply of cards to give to every mother, keep several in the clinic to show to mothers.)

11.3 Nutrition counselling

Identifying feeding problems

First, identify any feeding problems which have not been fully resolved.

Ask hospital staff about the feeding assessment carried out on the child while in hospital. If the child

is not exclusively breastfeeding, it will be important to make an assessment of the foods that are likely to be given to the child at home.

Ask the following questions:

- ***Do you breastfeed your child?***
  — How many times during the day?
  — Do you also breastfeed during the night?
- ***Does the child take any other food or fluids?***
  — What food or fluids?
  — How many times a day?
  — What do you use to feed the child?
  — How large are the servings?
  — Does the child receive his/her own serving?
  — Who feeds the child and how?

Compare the child's actual feeding with the recommended guidelines for feeding a child of that age (see section 9.1.2, page 104). Identify any differences and list these as feeding problems.

In addition to the issues addressed above, consider:

- ***Difficulty in breastfeeding***
  — The mother may mention that breastfeeding is uncomfortable for her, or that her child seems to have difficulty in breastfeeding. If so, assess how she breastfeeds her child (see page 100). Correcting the infant's positioning and attachment may resolve the difficulty.
- ***Use of a feeding bottle***
  — Feeding bottles should not be used. They are difficult to clean, and germs easily grow in them. Fluids tend to be left in them and soon become spoiled or sour. The child may drink the spoiled fluid and become ill. Also, sucking on a bottle may interfere with the child's desire to breastfeed. A cup may be used in place of a feeding bottle.
- ***Lack of active feeding***
  — Young children often need to be encouraged and assisted to eat. This is especially true if a child has very low weight. If young children are left to feed themselves, or if they have to compete with siblings for food, they may not get enough to eat. By asking, "Who feeds the child and how", you should be able to find out if the child is being actively encouraged to eat.
- ***Not feeding well during the illness***
  — Children often lose their appetite during an illness and may eat much less, or eat different foods. However, they should be encouraged to eat the types of food recommended for their age, as often as the guidelines state, even if they do not eat much. If possible, they should be offered their favourite nutritious foods to encourage eating.

Advise the mother how to overcome problems and how to feed the child.

Refer to local feeding recommendations for children of different ages. These recommendations should include details of locally appropriate energy-rich and nutrient-rich complementary foods. It is important that the calories (kcal) and protein content per 100 ml of these recommended foods have been calculated and that they have been checked for acceptability in a household trial.

Even when specific feeding problems are not found, give all mothers advice that promotes:

— breastfeeding
— improved complementary feeding using locally available energy- and nutrient-rich foods
— giving nutritious snacks to children aged ≥2 years.

Healthy feeding can counter the harmful effects of infections on nutritional status. Examples of nutritionally adequate diets (see Chart 15, page 106) could be printed on the reverse of a locally adapted Mother's Card.

11.4 Home treatment

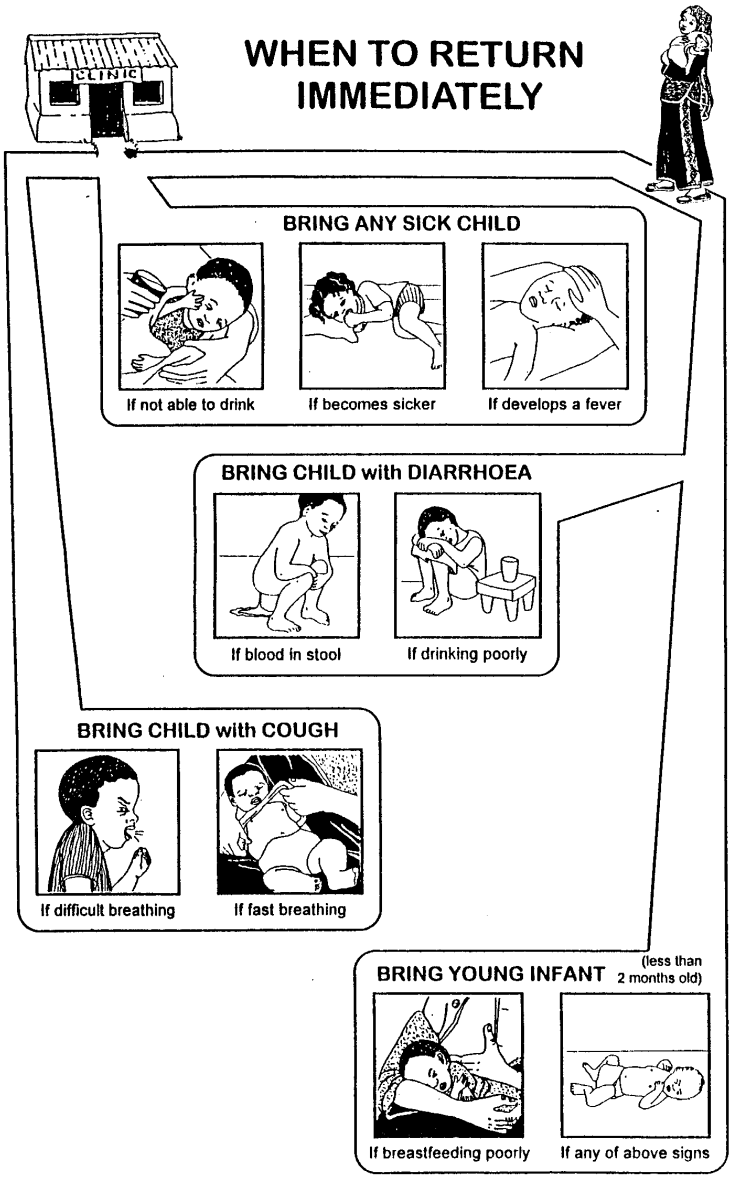
If treatment needs to be continued at home, it is very important to make sure that the mother understands what to do and is able to give the child the recommended treatment.

- Use words the mothers understand.
- Use teaching aids that are familiar (e.g. common containers for mixing ORS).
- Allow the mothers to practise what she must do, e.g. preparing ORS solution or giving an oral medication, and encourage her to ask questions.
- Counsel in a helpful and constructive manner, praising mothers for correct answers or good ;practice.

Teaching mothers is not just about giving instructions. It should include the following steps:

- ***Give information***. Explain to the mother how to give the treatment, e.g. preparing ORS, giving an oral antibiotic, or applying eye ointment.
- ***Show an example***. Show the mother how to give the treatment by demonstrating what to do.
- ***Let her practise***. Ask the mother to prepare the medicine or give the treatment while you watch her. Help her as needed, so that she does it correctly.
- ***Check her understanding***. Ask the mother to repeat the instructions, or ask her questions to see that she has understood correctly.

Chart 17. **Mother's Card**



Name: _____ M F Date of Birth: _____

Address: _____

Always bring this card with you to the clinic.

FLUIDS

FOR ANY SICK CHILD

- Breastfeed frequently.
- Increase fluid. Give soup, rice water, yoghurt drinks, or clean water.

FOR CHILD WITH DIARRHOEA

Giving more fluid can be lifesaving!

- Give these extra fluids, as much as the child will take:
  - ☐ ORS Solution
  - ☐ Food-based fluids, such as soup, rice water, yoghurt drinks
  - ☐ Clean water
- Breastfeed more frequently and longer at each feeding.
- Continue giving extra fluids until diarrhoea stops.

IMMUNIZATIONS (Record Date Given)

☐ BCG	☐ DPT 1	☐ DPT 2	☐ DPT 3	
☐ OPV 0	☐ OPV 1	☐ OPV 2	☐ OPV 3	☐ MEASLES

Return for next immunization on:

_____ _____

_____ _____

11.5 Checking the mother's own health

If the mother is sick, provide treatment for her and help to arrange follow-up at a first-level clinic close to her home. Check the mother's nutritional status and give any appropriate counselling. Check the mother's immunization status and, if needed, give her tetanus toxoid. Make sure the mother has access to family planning and counselling about preventing sexually-transmitted diseases and HIV. If the child has tuberculosis, the mother should have a chest X-ray.

11.6 Checking immunization status

Checking procedure

Ask to see the child's immunization card, and determine whether all the immunizations recommended for the child's age have been given. Note any immunizations the child still needs and explain this to the mother; then carry them out before the child leaves hospital and record them on the card. If this is not possible, advise the mother to attend the next immunization clinic close to her home. Ask the mother about the immunization records of other siblings and offer to bring them up to date.

If the mother does not have an immunization card with her, ask her what immunizations the child has received. Use your judgement to decide if her statements are reliable.

If you have any doubt, immunize the child. Depending on the child's age, give OPV, DPT and measles vaccine. Give the mother an immunization card, duly filled in, and ask her to bring it with her each time she brings the child to the clinic.

Recommended immunization schedule

Table 24 lists WHO's international recommendations. National recommendations will take account of local disease patterns.

Contraindications

It is important to immunize all children, including those who are sick and malnourished, unless there are contraindications. There are ***only 3 contraindications*** to immunization:

- Do not give BCG or yellow fever vaccines to a child with *symptomatic* HIV infection/AIDS, but do give the other vaccines. Give all immunizations, including BCG and yellow fever vaccines, to a child with *asymptomatic* HIV infection.
- Do not give DPT-2 or -3 to a child who has had convulsions or shock within 3 days of the most recent dose.

Table 24 ***WHO immunization recommendations***

Age	Vaccine
Birth	BCG, oral polio vaccine (OPV-0)
6 week	DPT-1, OPV-1
10 weeks	DPT-2, OPV-2
14 weeks	DPT-3, OPV-3
9 months	measles*

* In exceptional situations, where measles morbidity and mortality before 9 months of age represent more than 15% of cases and deaths, give an extra dose of measles vaccine at 6 months of age. The scheduled dose should also be given as soon as possible after 9 months of age. The extra measles dose is also recommended for groups at high risk of measles death, such as infants in refugee camps, infants admitted to hospitals, HIV-positive infants, and infants affected by disasters and during outbreaks of measles.

- Do not give DPT to a child with recurrent convulsions or an active neurological disease of the central nervous system.

A child with diarrhoea who is due to receive OPV should be given a dose of OPV. However, this dose should ***not*** be counted in the schedule. Mark the fact that it coincided with diarrhoea on the child's immunization record, so that the health worker will know this and give the child an extra dose.

11.7 Communicating with the first-level health worker

Providing health care to children over the first few years of life involves many health professionals at the community level, first-level health centre, and small hospital. All of them need to work together so that patients can be referred from one level to another as required.

If very sick children are not referred promptly to hospital, many could die unnecessarily at home. Equally, if many children who are not very sick are referred inappropriately, the hospital services will be overloaded, and this could interfere with the care of those who require hospital treatment.

If hospitals do not inform first-level health staff about the outcome of the hospital referral, these workers will not have feedback on the child they had referred, including whether their initial treatment was correct. More importantly, without such feedback, follow-up care is less likely to take place and children who, after discharge, have a relapse or develop complications may not be identified in time for appropriate action.

Information needed

The first-level health worker who referred the child to hospital should receive the following information about the child's care in hospital:

- diagnosis / diagnoses
- treatment(s) given (and duration of stay in hospital)
- response of the child to this treatment
- instructions given to the mother for follow-up treatment or other care at home
- other matters for follow-up (e.g. immunizations).

If the child has a health card, the above information can be recorded on it and the mother should be requested to show this to the health worker. Where this card does not exist, these details should be recorded in a short note.

Such feedback to first-level health staff, over a period of time, will lead to more appropriate referrals to hospital and better relationships between hospital and community health workers.

11.8 Providing follow-up care

Children who are discharged after inpatient treatment

Children who are discharged home after inpatient hospital treatment may need to attend for follow-up care. This may be for a number of reasons:

- to check that treatment at home was continuing
- to check that the child's illness was resolving satisfactorily (if this had not already happened at the time of discharge)
- to check for delayed (or hidden) complications that may arise after the child has recovered (e.g. hearing loss or disability after meningitis)
- to check the child's nutritional status after discharge (e.g. cases that were admitted with severe malnutrition).

The child should return to the hospital for follow-up care. If this not possible, a referral note should be given so that follow-up can take place at a first-level health facility.

Further details of follow-up are given in appropriate chapters of this manual. Details will vary with each individual depending on the child's condition at the time of discharge, the type and severity of the illness, the presence of complications, and the child's home circumstances.

Children who do not require hospital admission but can be treated at home

Advise all mothers who are taking their children home, after assessment in the hospital, when to go to a health worker for follow-up care in the home. Mothers may need to return to hospital:

- for a follow-up visit in a specific number of days (e.g. when it is necessary to check progress or the response to an antibiotic)
- if signs appear that suggest the illness is worsening
- for the child's next immunization.

It is especially important to teach the mother the signs indicating the need to return to hospital immediately (see Chart 17, page 119). Guidance on the follow-up of specific clinical conditions is given in appropriate sections of this manual.

Follow-up times

Table 25 below summarizes the follow-up times for the commonest acute problems when treatment is being completed at home after discharge. If the treatment was finalized in hospital, the follow-up times may be longer than those given in Table 25. Advise the mother to come for follow-up at the earliest time listed for the child's problems.

Table 25 ***Recommended times for follow-up of children***

If the child has:	Return for follow-up in:
Pneumonia Dysentery Malaria (if the fever persists) Measles with eye or mouth complications	2 days
Persistent diarrhoea Acute ear infection Chronic ear infection Feeding problem Any other illness (if not improving at home)	5 days
Anaemia	14 days
Very low weight-for-age	30 days [a]

[a] See recommendations in section 7.2.10, page 87.

Follow-up for feeding and nutritional problems

- If a child has a feeding problem and you have recommended changes in feeding, follow up in 5 days to see if the mother has made the changes, and give further counselling if needed.
- If a child has anaemia, follow up in 14 days to give more oral iron.
- If the child has a very low weight, additional follow-up is needed in 30 days. This follow-up would involve weighing the child, reassessing feeding practices, and giving further nutritional counselling.

When to return immediately

Advise the mother to return immediately if the child develops any of the following signs:

- not able to drink or breastfeed
- becomes more sick
- develops a fever
- signs of illness return again after successful treatment in hospital.
- in a child with a cough or cold: fast or difficult breathing
- in a child with diarrhoea: blood in stool or drinking poorly.

Next well-child visit

Remind the mother of the child's next visit for immunization and record the date on the Mother's Card or the child's immunization record.

Special community support

Assist the family in obtaining any special community support that may be required (e.g. equipment for a child with a disability; nutritional support for the severely malnourished child; or in the case of an HIV-positive child, link-up with an AIDS community support organization).

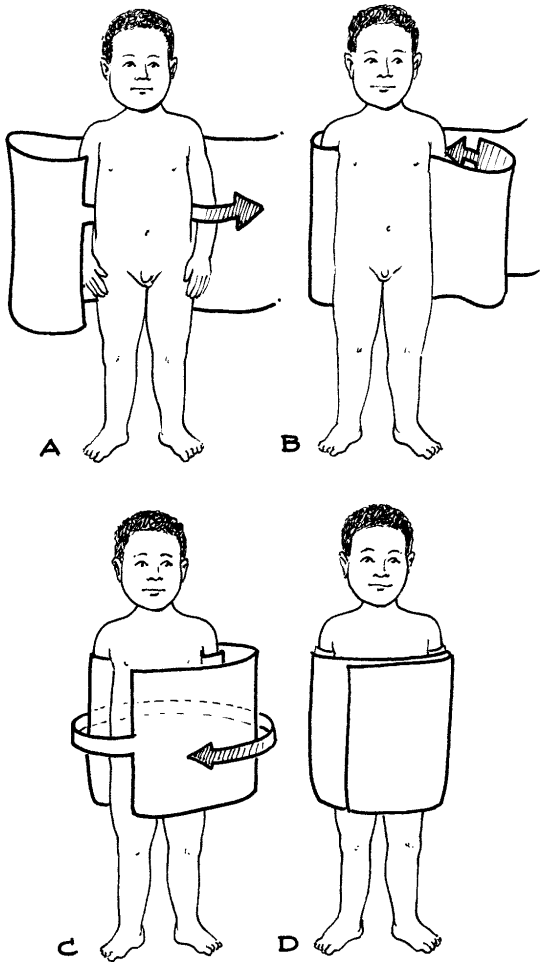
References

1. *Antibiotics in the treatment of acute respiratory infections in young children*. WHO/ARI/90.10. Geneva, World Health Organization, 1990.
2. *Bronchodilators and other medications for the treatment of wheeze-associated illnesses in young children*. WHO/ARI/93.29. Geneva, World Health Organization, 1993.
3. *The management of fever in a young child with an acute respiratory infection*. WHO/CDR/93.30. Geneva, World Health Organization, 1995.
4. *Oxygen therapy in the management of a child with an acute respiratory infection*. WHO/CAR/95.3. Geneva, World Health Organization, 1995.
5. *TB/HIV: a clinical manual*. WHO/TB/96.200. Geneva, World Health Organization, 1996.
6. *Technical bases for the WHO recommendations on the management of pneumonia in children at first-level health facilities*. WHO/ARI/91.20. Geneva, World Health Organization, 1993.
7. *Technical basis for the case management of measles*. WHO/CAR/EPI/1995. Geneva, World Health Organization, 1995.
8. *The treatment of diarrhoea: A manual for physicians and other senior health workers*. WHO/CDR/95.3. Geneva, World Health Organization, 1995.
9. *Treatment of tuberculosis: Guidelines for national programmes*. WHO/TB/97.220. Geneva, World Health Organization, 1997.
10. Thermal protection of the newborn: a practical guide. WHO/RHT/MSM/97.2. Geneva, World Health Organization, 1997.
11. *Breastfeeding counselling: a training course*. WHO/CDR/93.5 (WHO/UNICEF/NUT/93.3). Geneva, World Health Organization, 1993.
12. *Relactation. Review of experience and recommendations for practice*. WHO/CHS/CAH/98.14. Geneva, World Health Organization, 1998.
13. *Management of severe malnutrition: a manual for physicians and other senior health workers*. Geneva, World Health Organization, 1999.
14. *Management of severe and complicated malaria: a practical handbook*. Geneva, World Health Organization, 1991.
15. *Safe blood and blood products. Distance learning material*. WHO/BLS/98.3. Geneva, World Health Organization, 1998.
16. *General surgery at the district hospital*, edited by J. Cook et al. Geneva, World Health Organization, 1988.
17. *Clinical use of blood*. WHO/BTS/99.2. Geneva, World Health Organization, in preparation.

APPENDIX 1

Practical procedures

Practical procedures are best learned by instruction and closely supervised repeated practice whilst treating sick children. The procedure should first be explained to the parents and any risks discussed with them. Older children should also be told about what is to happen. Parents can help reassure the child during a minor procedure but should not be made responsible for restraining the child or for taking any active part in a major procedure. A second staff member should be present to help, if needed. Procedures on young infants should be carried out in warm surroundings. Good light is essential. Analgesia should be given, where necessary.



Wrapping the child to hold securely during a practical procedure

One end of a folded sheet should be pulled through under the arms on both sides (A and B). The other end is then brought across the front and wrapped around the child (C and D).

Restraining the child for examination of eyes, ears or mouth

A1.1 Giving injections

First, find out whether the child has reacted adversely to drugs in the past. Wash your hands thoroughly. Where possible, use disposable needles and syringes. Or else, sterilize reusable needles and syringes. Explain the injection procedure to the mother and ask her to reassure the child. Make sure the mother is close to the child and gently restraining the child, if necessary.

Clean the chosen site with an antiseptic solution. Carefully check the dose of the drug to be given and draw the correct amount into the syringe. Expel the air from the syringe before injecting. Follow the guidelines given below for each type of injection. Always record the name and amount of the drug given. Discard disposable syringes in a safe container. Observe the child for 20 minutes after the injection.

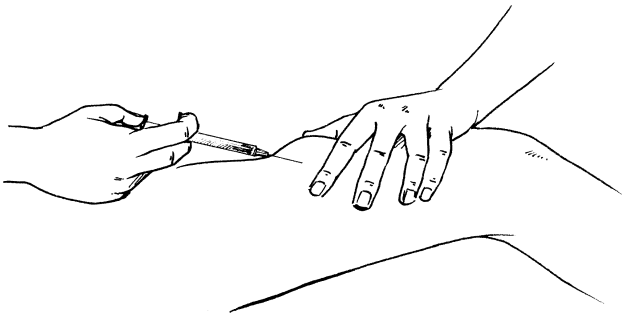
A1.1.1 ***Intramuscular***

In >2-year-old children, give the injection in the upper, outer quadrant of the buttock. Choose the site carefully, well away from the sciatic nerve. In younger or severely malnourished children, use the outer side of the thigh midway between the hip and the knee, or over the deltoid muscle in the upper arm. Hold the muscle at the injection site between the thumb and first finger and push the needle (23–25 gauge) into the muscle at a 90° angle (45° angle in the thigh). Draw back the plunger to make sure there is no blood (if there is, withdraw slightly and try again). Give the drug by pushing the plunger slowly till the end. Remove the needle and press firmly over the injection site with a small swab or cotton wool.

Intramuscular injection into the thigh

A1.1.2 ***Subcutaneous***

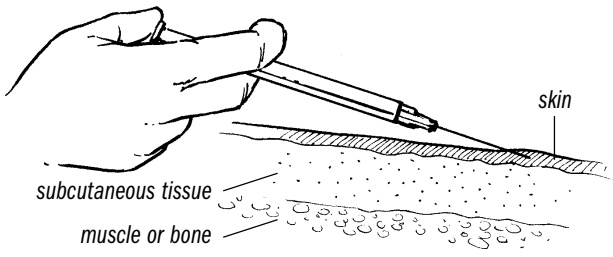
Select the site, as described above for intramuscular injection. Pinch up skin and subcutaneous tissue between finger and thumb. Push the needle (23–25 gauge) under the skin at a 45° angle into the subcutaneous fatty tissue. Do not go deep to enter the underlying muscle. Draw back the plunger to make sure there is no blood (if there is, withdraw slightly and try again). Give the drug by pushing the plunger slowly till the end. Remove the needle and press firmly over the injection site with cotton wool.



Giving a subcutaneous injection

A1.1.3 ***Intradermal***

Select an area of skin, which has no infection or damage, for the injection (e.g. over the deltoid in the upper arm). Stretch the skin between the thumb and forefinger of one hand; with the other, slowly insert the needle (25 gauge), bevel upwards, for about 2 mm just under and almost parallel to the surface of the skin. Considerable resistance is felt when injecting intradermally. A raised, blanched bleb showing the surface of the hair follicles is a sign that the injection has been given correctly.



Intradermal injection (for example in Mantoux test)

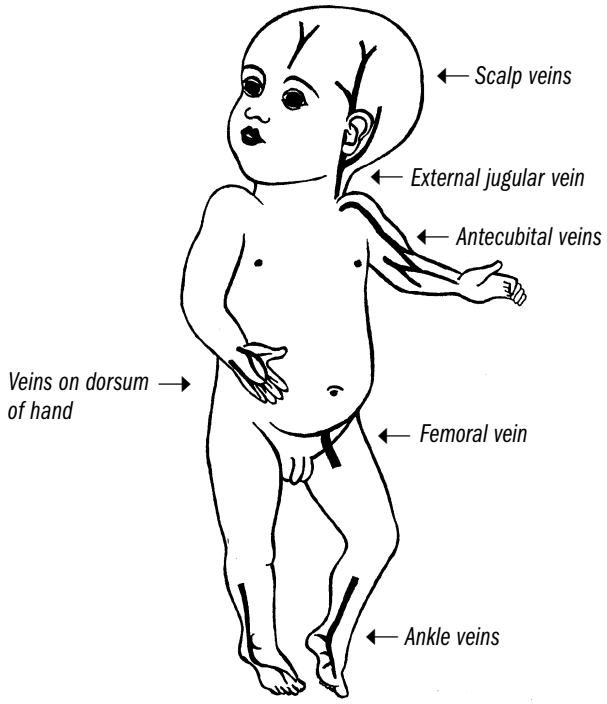
A1.2 Giving parenteral fluids

A1.2.1 ***Insertion of an indwelling IV cannula in a peripheral vein***

Select a suitable vein to place the cannula or gauge 21 or 23 butterfly needle. Note it is often helpful to first pierce the skin over the vein with an 18G needle before trying to insert a cannula through the skin and into the vein.

Peripheral vein

- Identify an accessible peripheral vein. In young children aged >2 months, this is usually the cephalic vein in the antecubital fossa or the fourth interdigital vein on the back of the hand.
- An assistant should keep the position of the limb steady and should act as a tourniquet by obstruct-



Sites for IV access in infants and young children

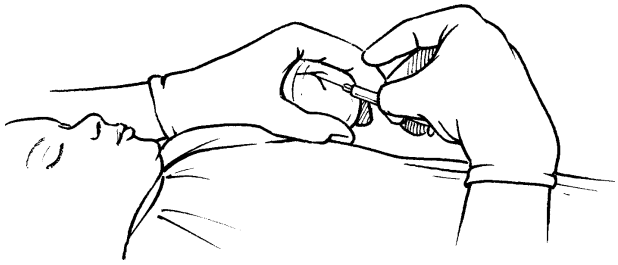
ing the venous return with his fingers lightly closed around the limb.

- Clean the surrounding skin with an antiseptic solution (such as spirit, iodine, isopropyl alcohol, or 70% alcohol solution), then introduce the cannula into the vein and insert most of its length. Fix the cannula securely with tape. Apply a splint with the limb in an appropriate position (e.g. elbow extended, wrist slightly flexed).
- If the cannula is to be used for intermittent delivery of IV drugs, inject 0.5 ml heparin solution (10–100 units of heparin sodium per ml) to flush the blood from the cannula through the injection port. If heparin is not available, normal saline or 5% glucose solution can be used, but the risk of clot formation in the cannula is higher.

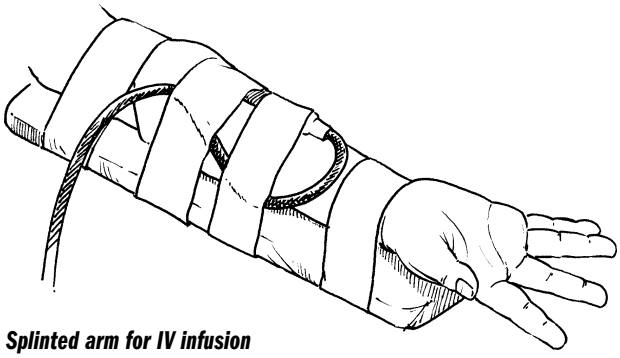
Scalp veins

These are often used in children aged <2 years but work best in young infants. The frontal superficial, temporal posterior, auricular, supra-orbital and posterior facial veins can be used. Scalp vein infusions have the advantage of not greatly restricting the child's movements.

- Find a suitable scalp vein (usually in the midline of the forehead, the temporal area, or above or behind the ear).
- Shave the area and clean the skin with an antiseptic solution. The assistant should occlude the



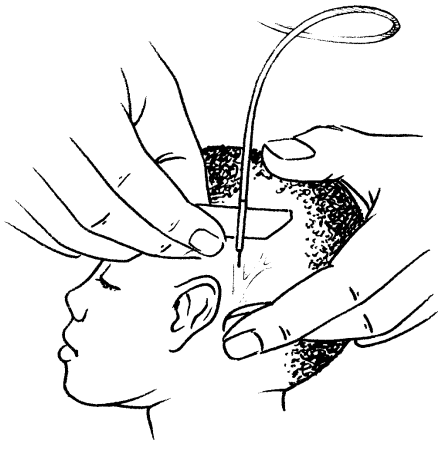
Inserting an IV cannula into a vein on the back of the hand. The hand is bent to obstruct venous return and thus make the veins visible.



Splinted arm for IV infusion to prevent bending of the elbow

vein proximal to the site of puncture. Fill a syringe with normal saline and flush the butterfly set. Disconnect the syringe and leave the end of the tubing open. Introduce the butterfly needle as described above. Blood flowing back slowly through the tubing indicates that the needle is in the vein.

- Use adhesive plaster and a gauze pad under the needle to secure the needle at an angle to the scalp.



Inserting a butterfly needle into a scalp vein to set up an IV infusion in a young infant

Care should be taken not to cannulate an artery, which is recognized by palpation. If there should be a pulsatile spurting of blood, withdraw the needle and apply pressure until the bleeding stops; then look for a vein.

Care of the cannula

Secure the cannula when introduced. This may require the splinting of neighbouring joints to limit the movement of the catheter. Keep the overlying skin clean and dry. Clean it daily with an antiseptic solution. Fill the cannula with heparin solution, as described above, immediately after the initial insertion and after each injection.

To minimize the risk of infection, the cannula should not be kept in the same site for longer than necessary, and should be removed if complications develop.

Common complications

Superficial *infection* of the skin at the cannula site is the commonest complication. With proper care of the cannula site as described above, this usually resolves. However, the infection may lead to a *thrombophlebitis* which will occlude the vein and result in fever. The surrounding skin is red and tender and the underlying vein will at first be tender and may later become hard due to thrombus formation. Remove the cannula to reduce the risk of further spread of the infection. Apply a warm moist compress to the site for 30 minutes every 6 hours. If fever persists for more than 24 hours, antibiotic treatment (effective against staphylococci) should be given, e.g. cloxacillin. The local infection will subside rapidly after the cannula has been removed. Introduce a new cannula into another suitable vein.

Occasionally IV injection through a cannula presents a problem—for example, when the cannula is no longer lying in the vein (in which case the injected fluid will cause swelling of the surrounding skin while injecting) or a thrombus forms in the vein. In both situations, withdraw the cannula and insert a new one in another site.

IV drug administration through an indwelling cannula

Attach the syringe containing the IV drug to the injection port of the cannula and introduce the drug. Once all the drug has been given, inject 0.5 ml heparin solution (10–100 units/ml) into the cannula until all the blood has been expelled and the catheter is filled with the solution.

A1.2.2 ***Failure to gain access to peripheral veins***

If infusion through a peripheral vein or scalp vein is not possible, and it is essential to give IV fluids to keep the child alive:

- use a central vein
- perform a venous cut down
- *or* set up an intraosseous infusion.

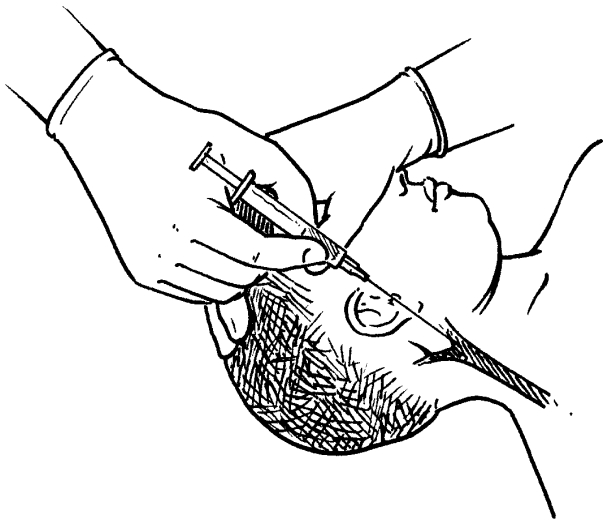
The choice should be determined by the training received by the health staff. All three techniques are usually successful when carried out by experienced staff. In an emergency, if one method fails, try the other immediately.

Central veins

These should not be used routinely, and only when IV access is urgent. Remove the cannula from a central vein as soon as possible (i.e. when IV fluid is no longer essential or when a peripheral vein can be cannulated successfully).

External jugular vein

- Hold the child securely, with the head turned to one side away from the puncture site and slightly lower than the body (15–30 degree head down position). (The vein will fill in this position and should be visible as it travels towards the clavicle in the supraclavicular fossa). Restrain the child as necessary in this position.



Inserting a needle into the external jugular vein

- After cleaning the skin with an antiseptic solution, identify the external jugular vein as it passes over the sternocleidomastoid muscle at the junction of its middle and lower thirds. An assistant should occlude the vein to keep it distended and

keep its position steady by pressing over the lower end of the visible part of the vein just above the clavicle. Pierce the skin over the vein, pointing in the direction of the clavicle. A short firm thrust will push the needle into the vein. Proceed with cannulation of the vein, as described above with a peripheral vein.

Femoral vein

- An assistant should restrain the child. Note that the right side is easier to cannulate for right-handed operators. Do not attempt in young infants.
- The child should be supine with buttocks 5 cm elevated on a rolled up towel so that the hip is slightly extended. Abduct and externally rotate the hip joint and flex the knee. An assistant should hold the leg in this position and the other leg out of the way. If the child is responsive to pain, infiltrate the area with 1% lignocaine.
- Clean the skin with an antiseptic solution as above. Palpate the femoral artery (below the inguinal ligament in the middle of the femoral triangle). The femoral nerve lies lateral and the femoral vein runs medial to the artery.
- Clean the skin with antiseptic. Introduce the needle at 10–20 degrees to the skin, 1–2 cm distal to the inguinal ligament, 0.5–1 cm medial to the femoral artery.
- Venous blood will flow into the syringe when the needle is in the femoral vein.
- Proceed with cannulation of the vein by advancing it at an angle of 10 degrees to the skin. Sometimes it is necessary to aspirate blood into the syringe at the time of insertion and then infuse the blood as the cannula is advanced into the vein to open up the vein.
- Stitch the cannula in place and place a sterile occlusive dressing on the skin under the cannula and one over the top of the cannula. Place adhesive tape over the edges of the dressing to adhere it firmly to the skin. It may be necessary to splint the leg to prevent flexion of the hip (which may loosen the cannula).
- Monitor the site closely for as long as the cannula is in place, taking care to keep the leg immobile during the infusion. A femoral line can last for up to 5 days with correct care.
- Withdraw the cannula after the IV infusion has been given, and apply firm pressure for 2–3 minutes over the site.

Venous cut down

This is less appropriate if speed is essential. The intraosseous route gives more immediate IV access.

- Immobilize the lower leg of the child and clean the skin, as above. Identify the long saphenous vein. In the infant this can be found half a fingerbreadth superior and anterior to the medial malleolus; in the older child it is one fingerbreadth superior and anterior.
- Infiltrate the skin with 1% lignocaine if the child is responsive to pain, then make an incision through the skin perpendicular to the course of the vein. Bluntly dissect the subcutaneous tissue with haemostat forceps.
- Identify the vein and free 1–2 cm in length. Pass a proximal and distal ligature.
- Tie off the distal end of the vein keeping the ties as long as possible.
- Make a small hole in the upper part of the exposed vein and insert the cannula into this whilst holding the distal tie to stabilize the position of the vein.
- Secure the cannula in place with the upper ligature.
- Attach a syringe filled with normal saline and ensure that fluid flows freely up the vein. If it does not, check that the cannula is in the vein or try withdrawing it slightly to improve the flow.
- Tie the distal ligature around the catheter, then close the skin incision with interrupted sutures. Fix the cannula to the skin and cover with a sterile dressing.

Intraosseous infusion

When carried out by a well trained and experienced health worker, intraosseous infusion is a safe, simple and reliable method of giving fluid and drugs *in an emergency*. Almost all parenteral fluids and drugs recommended in these guidelines can be given by this route.

Intraosseous infusion. Infusion needle in place in the proximal medial part of the tibia.

In an emergency this may be the first choice if access to a peripheral vein does not appear to be obtainable. It takes 1–2 minutes to establish intraosseous access. The procedure is painful, but no anaesthetic is required as it should only be used in an emergency (e.g. when a child is in shock).

Contraindications:

- infection at the intended puncture site
- fracture of the bone.

Site for puncture

The first choice for the puncture is the proximal tibia. The site for needle insertion is in the middle of the antero-medial surface of the tibia, 1–2 cm below the tibial tuberosity. An alternative site for needle insertion is the distal femur, 2 cm above the lateral condyle.

- Prepare the necessary equipment, i.e.:
  - bone marrow aspiration or intraosseous needles (15–18 gauge or, if not available, 21 gauge. If no special needles are available, large bore hypodermic or butterfly needles can be used in young children)
  - antiseptic solution and sterile gauze to clean the site
  - a sterile 5-ml syringe filled with normal saline
  - a second sterile 5-ml syringe
  - IV infusion equipment
  - sterile gloves.
- Place padding under the child's knee so that it is bent 30° from the straight (180°) position, with the heel resting on the table.
- Select the site for cannulation:
  - first, palpate the tibial tuberosity
  - then, locate one finger's breadth below and medial to the tuberosity (the bone can be felt under the skin at this site).
- Wash the hands and put on sterile gloves.
- Clean the skin over and surrounding the site with an antiseptic solution.
- Stabilize the proximal tibia with the left hand (this hand is now not sterile) by grasping the thigh and knee above and lateral to the cannulation site, with the fingers and thumb wrapped around the knee but not directly behind the insertion site.
- Palpate the landmarks again with the sterile glove (right hand).
- Insert the needle at a 90° angle with the bevel pointing towards the foot. Advance the needle using a gentle but firm, twisting or drilling motion.
- Stop advancing the needle when you feel a sudden decrease in resistance. The needle should be fixed in the bone.
- Remove the stylet.
- Aspirate 1 ml of the marrow contents (looks like blood), using the 5-ml syringe, to confirm that the needle is in the marrow cavity.
- Attach the second 5-ml syringe filled with normal saline. Stabilize the needle and slowly inject 3 ml while palpating the area for any leakage under the skin. If no such infiltration is seen, start the infusion.
- Apply dressings and secure the needle in its place.

Note: While the fluid is being infused, only a slight resistance should be felt, and there should be no visible or palpable infiltration in the area of infusion. Failure to aspirate marrow contents does not mean that the needle is not correctly placed. The fluid infusion can be started.

- Monitor the infusion by the ease with which the fluid flows and by the clinical response of the patient.
- Check that the calf does not swell during the infusion.

Stop the intraosseous infusion as soon as venous access is available. In any case, it should not continue for more than 8 hours.

Complications include:

- Incomplete penetration of the bony cortex

  Signs: The needle is not well fixed; infiltration occurs under the skin.
  Action: The needle must be pushed in further.

- Penetration of the posterior bone cortex (more common)

  Sign: Infiltration occurs (calf becomes tense), with the needle well fixed.
  Action: Remove the needle and repeat at another site. This problem may be avoided by placing the index finger against the skin to prevent the needle from going in too deeply.

- Blockage of the needle by marrow (uncommon)

  Sign: Infusion stops.
  Action: The line must be flushed by 5 ml of normal saline.

- Infection

  Signs: Cellulitis at the site of the infusion (this is rare if the infusion is left for less than 24 hours; osteomyelitis is very rare).
  Action: Remove the intraosseous needle unless it is essential; give local skin care and antibiotic treatment.

- Necrosis and sloughing of the skin at the site of the infusion (this occurs particularly when drugs such as adrenaline, calcium chloride or sodium bicarbonate pass into the tissues).

Action: Avoid by infusing gently and not under pressure.

A1.3 Blood transfusion

Blood is often given as whole blood (i.e. with all constituents, plus added anticoagulant). However, children with heart failure or risk of heart failure (e.g. due to severe anaemia or severe malnutrition) should be given packed cells (i.e. blood with most of the plasma removed), which will raise the haematocrit without overloading the circulation with excess fluid.

A1.3.1 Storage of blood

Use safe fresh blood. Do *not* use blood that has been stored for more than 35 days at 2–6 °C before transfusion, or as indicated by the Blood Bank. Do not start to transfuse blood from a pack which has been out of the refrigerator for longer than 2 hours. Never re-use a blood pack that was opened earlier, or if it is visibly spoiled.

Large transfusions of blood stored at 4 °C may cause hypothermia, especially in small babies. If time permits, allow the blood to warm slowly at room temperature for 30 minutes.

A1.3.2 Problems with blood transfusion

Blood could be the vehicle for transmitting the agents of infections (e.g. malaria, syphilis, hepatitis B and C, HIV). Therefore, screen donors for as many of these infections as possible. Blood might be contaminated by other bacterial organisms as well (e.g. staphylococci). To minimize the risk, only give blood transfusions when ***essential***.

A1.3.3 Indications for blood transfusion

The need for blood transfusion is discussed in detail in the sections on the management of shock (Chapter 1, page 2), the treatment of severe malaria (Chapter 5, page 59), and the management of severe anaemia (Chapter 9, page 109) and of severe anaemia in severe malnutrition (Chapter 7, page 88).

There are four general indications for blood transfusion:

- acute blood loss, when 20–30% of the total blood volume has been lost and bleeding is continuing
- severe anaemia
- septic shock (if IV fluids are insufficient to maintain adequate circulation and in addition to antibiotic therapy)
- to provide plasma and platelets for clotting factors.

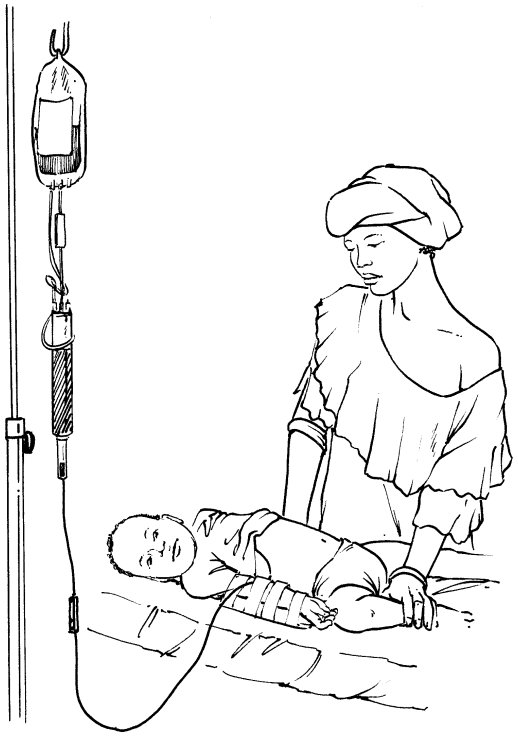
A1.3.4 Giving a blood transfusion

Before transfusion, check the following:

- the blood is the correct group and the patient's name and number are on both the label and the form (in an emergency, reduce the risk of incompatibility or transfusion reactions by rapid cross-matching or giving O-negative blood if available)
- the blood transfusion bag has not been opened and has no leaks
- the blood pack has not been out of the refrigerator for more than 2 hours, the plasma is not pink and the red cells do not look purple or black
- the IV line is patent and the needle used is large enough (22 gauge in babies) so that the blood does not clot in the needle while the transfusion is in progress
- any signs of heart failure. If present, give 1mg/kg of furosemide IV at the start of the transfusion in children whose circulating blood volume is normal. Do not inject it into the blood pack.

Do a baseline recording of the child's temperature, respiratory rate and pulse rate.

The volume transfused should initially be 20 ml/kg body weight of whole blood (see severe anaemia, page 109 for details), given over 3–4 hours. This



Giving a blood transfusion. Note: A burette is used to measure the blood volume, and the arm is splinted to prevent flexion of the elbow.

should increase haemoglobin concentration by about 4–6 g/dl unless there is continued haemolysis or bleeding. No unit of blood should be left hanging for longer than 4 hours.

During transfusion:

- if available, use an infusion device to control the rate of the transfusion
- check that the blood is flowing at the correct speed
- look for signs of a transfusion reaction (see below) or cardiac failure; monitor particularly carefully in the first 15 minutes of the transfusion to detect early signs and symptoms of adverse effects
- record the child's general appearance, temperature, pulse and respiratory rate every 30 minutes
- Record the time the transfusion started and finished, the volume of blood and the presence of any reactions

After transfusion:

- reassess the child. If more blood is needed, a similar quantity should be transfused and the dose of furosemide (if given) repeated.
- reassess the child 4 hours after completing the transfusion.

A1.3.5 Acute transfusion reactions

The risk of transfusion reactions is greatest when an emergency cross-match is used instead of a full cross-match. Use the following categories to check for and record the severity of the transfusion reaction and decide on management.

Mild reactions (due to mild hypersensitivity)

Diagnosis
- itchy rash.

Management
- slow the transfusion
- give IV 200 mg hydrocortisone, or chlorpheniramine 0.1mg/kg IM, if available
- continue the transfusion at the normal rate if there is no progression of symptoms after 30 minutes
- if symptoms persist, treat as moderate reaction (see below).

Moderately severe reactions (due to moderate hypersensitivity, non-haemolytic reactions, pyrogens or bacterial contamination)

Diagnosis (signs usually develop 30–60 minutes after start of transfusion)
- severe itchy rash (urticaria)
- flushing
- fever >38 °C or >100.4 °F (note fever may have been present before the transfusion)
- rigors
- restlessness
- raised heart rate.

Management
- stop the transfusion, replace the giving set and keep IV line open with normal saline
- give IV 200 mg hydrocortisone, or chlorpheniramine 0.1mg/kg IM, if available
- give bronchodilator, if wheezing (see page 36)
- if improvement, restart transfusion slowly with new blood and observe carefully
- if no improvement in 15 minutes, treat as life-threatening reaction
- report to doctor in charge and to the Blood Blank
- send the following to the Blood Bank: the blood-giving set that was used, blood sample from another site, and urine samples collected over 24 hours.

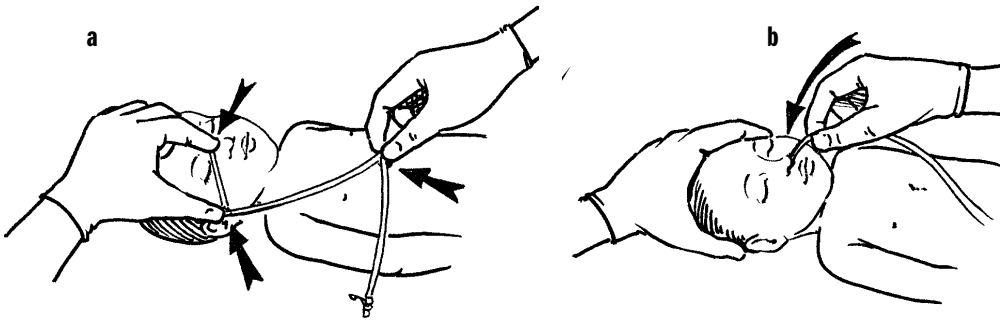
Life-threatening reactions (due to haemolysis, bacterial contamination and septic shock, fluid overload or anaphylaxis)

Diagnosis
- fever >38 °C or >100.4 °F (note fever may have been present before the transfusion)
- rigors
- restlessness
- raised heart rate
- fast breathing
- black or dark red urine (haemoglobinuria)
- unexplained bleeding
- confusion
- collapse.

Note that in an unconscious child, uncontrolled bleeding or shock may be the only signs of a life-threatening reaction.

Management
- stop the transfusion, replace the giving set and keep IV line open with normal saline
- maintain airway and give oxygen (see page 3)
- give epinephrine (adrenaline) 0.01mg/kg body weight
- treat shock (see page 3)
- give IV 200 mg hydrocortisone, or chlorpheniramine 0.1mg/kg IM, if available
- give bronchodilator, if wheezing (see page 36)
- report to doctor in charge and to blood laboratory as soon as possible
- maintain renal blood flow with IV furosemide 1mg/kg
- give antibiotic treatment as for septicaemia (see page 67).

For further details of the safe and correct use of blood, see reference *16,* page 123.

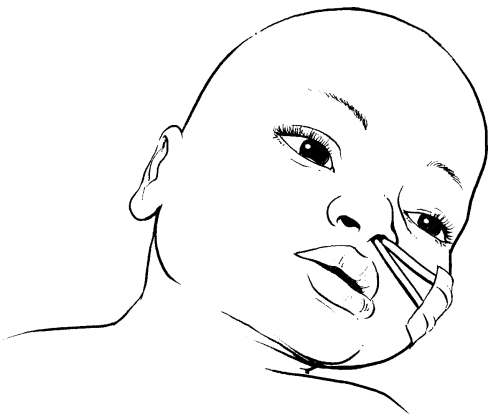


Inserting a nasogastric tube. The distance is measured from the nose to the ear and then to the epigastrium, and then the tube is inserted to the measured distance.

A1.4 Insertion of a nasogastric tube

A nasogastric tube (size 8 French for children) for fluids or food may have to be passed into the child's stomach, e.g. to feed a severely malnourished child who is anorexic, or to give fluids to an unconscious child.

- Holding the tip of the tube against the child's nose, measure the distance from the nose to the ear lobe, then to the xiphisternum (epigastrium). Mark the tube at this point.
- Hold the child firmly. Lubricate the tip of the catheter with water and pass it directly into one nostril, pushing it slowly in. It should pass easily down into the stomach without resistance. When the measured distance is reached, fix the tube with tape at the nose.
- Aspirate a small amount of stomach contents with a syringe to confirm that the tube is in place (check that it turns blue litmus paper pink). If no aspirate is obtained, confirm position by taking an abdominal X-ray or inject air down the tube and listen over the abdomen with a stethoscope (note, however, that the latter method can lead to errors if not carried out carefully). If the tube is in the stomach, air can be heard entering the stomach.



Child with nasogastric tube and oxygen catheter in recommended position (through the same nostril) to minimize obstruction of the nasal airways.

- If the tube is **not** in the stomach, any aspirate obtained will **not** turn litmus paper pink and the sound of injected air will **not** be heard over the abdomen. If there is any doubt about the location of the tube, withdraw it and start again. The major complication is when the tube inadvertently passes into the trachea. This leads to distress in the child, an abnormal cry in infants, or cyanosis. If this happens, remove the tube immediately and try again to pass it into the stomach after the child has recovered.
- When the tube is in place, fix a 20-ml syringe (without the plunger) to the end of the tube, and pour food or fluid into the syringe, allowing it to flow by gravity.

The nasogastric tube can be left in position for several days. If there is doubt about the position of the tube, check that it is correctly in place before giving the feed.

Obstruction of nasal breathing can cause distress in some young infants. If oxygen therapy is to be given by nasopharyngeal catheter at the same time, pass both tubes down the ***same nostril*** and try to keep the other nostril patent by wiping away crusts and secretions.

A1.5 Lumbar puncture

A lumbar puncture is usually performed to detect meningitis in a sick child.

The following signs are *contraindications*:

- signs of raised intracranial pressure (unequal pupils, rigid posture or paralysis in any of the limbs or trunk, irregular breathing)
- skin infection in the area through which the needle will have to pass.

If contraindications are present, the potential value of the information gained from a lumbar puncture should be carefully weighed against the risk of the procedure. If in doubt, it might be better to start treating for suspected meningitis, and delay performing a lumbar puncture.

- *Position the child*
  This is very important for success of the procedure. An experienced assistant holding the child correctly makes the procedure much easier to perform.

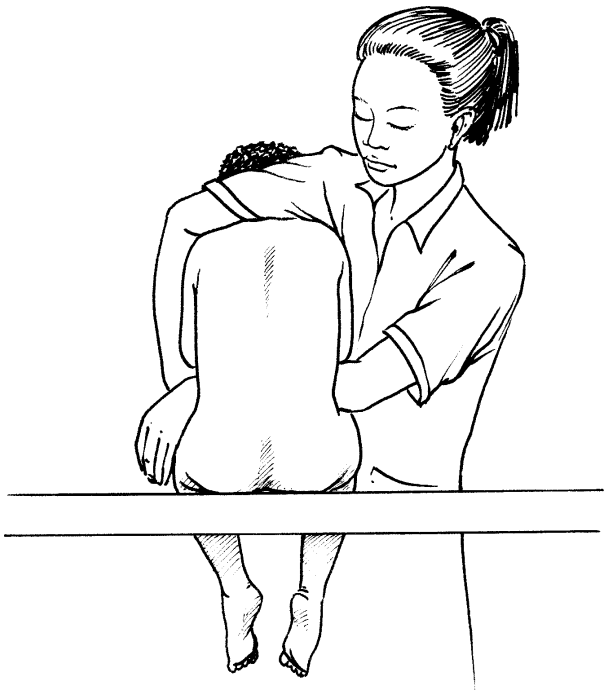
  There are 2 possible positions:
  — the child lying down on the left side (particularly for young infants), or
  — in the sitting position (particularly for older children)

Holding a lying child for lumbar puncture. Note: the spine is curved to open up the spaces between the vertebra.

Lumbar puncture when the child is lying on the side

- A hard surface should be used. Place the child on the side so that the vertebral column is parallel to this surface and the transverse axis of the back is vertical (see dotted lines in the above Figure).
- The assistant should flex the neck of the child with the chin touching the chest, pull up the knees towards the chest, and hold the child at the buttocks so that the back is bent. Hold the child firmly in this position. Make sure that the child can breathe normally.
- *Check anatomical landmarks*
  — Locate the space between the third and fourth or between the fourth and fifth lumbar vertebrae. (The third lumbar vertebra is at the junction of the line between the iliac crests and the vertebral column).
- *Prepare the site*
  — Use aseptic technique. Scrub the hands and wear sterile gloves.
  — Prepare the skin around the site with an antiseptic solution.
  — Sterile towels may be used.
  — In older children who are alert, give a local anaesthetic (1% lignocaine) infiltrated in the skin over the site.
- *Perform the lumbar puncture*
  — Use an LP needle with stylet (22 gauge for a young infant, 20 gauge for an older infant and child. If these are not available, hypodermic needles might be used). Insert the needle into the middle of the intervertebral space and aim the needle towards the umbilicus.
  — Advance the needle slowly. The needle will pass easily, until it encounters the ligament between the processes of the vertebrae. Slightly more pressure is needed to penetrate the ligament, after which a decrease in resistance is felt as the dura is penetrated.
  — Withdraw the stylet, and cerebrospinal fluid will drop out of the needle. If no cerebrospinal fluid is obtained, the stylet can be reinserted and the needle advanced slightly.
  — Obtain a sample of 0.5–1 ml CSF and place in a sterile container.
  — Withdraw the needle completely and put pressure over the site for a few seconds. Put a sterile dressing over the needle puncture site.

If the needle is introduced too far a lumbar vein may be punctured. This will result in a "traumatic tap" and the spinal fluid will be bloody. The needle should be withdrawn and the procedure repeated in another intervertebral space.



Restraining an older child in sitting position in order to carry out a lumbar puncture.

Lumbar puncture in a sitting child

An alternative is the lumbar puncture in a sitting child. The assistant should hold the child firmly from the front (see Figure, page 133). The identification of the site of the puncture and the procedure is as described above.

A1.6 Insertion of a chest drain

Children with severe or very severe pneumonia may have the complication of a pleural effusion or empyema. In these children the chest is dull on percussion and the breath sounds are absent or reduced. If the diagnosis is in doubt, carry out a chest X-ray which will show fluid or pus on one or both sides of the chest, confirming the presence of an effusion or empyema.

Pleural effusions should be drained, except when small. It is sometimes necessary to drain both sides of the chest. You may have to drain the chest 2 or 3 times if the fluid keeps coming back:

Diagnostic puncture

- — Wash the hands and put on sterile gloves.
- — Lay the child on the back.
- — Clean the skin over the chest for at least 2 minutes with an antiseptic solution (for example, 70% alcohol).
- — Select a point in the mid-axillary line (at the side of the chest) just below the level of the nipple (fifth intercostal space, see Figure on the right).
- — Inject about 1ml of 1% lignocaine into the skin and subcutaneous tissue at this point.
- — Insert a needle or catheter through the skin and pleura and aspirate to confirm the presence of pleural fluid. Withdraw a sample for microscopy and other available tests and place in a container.

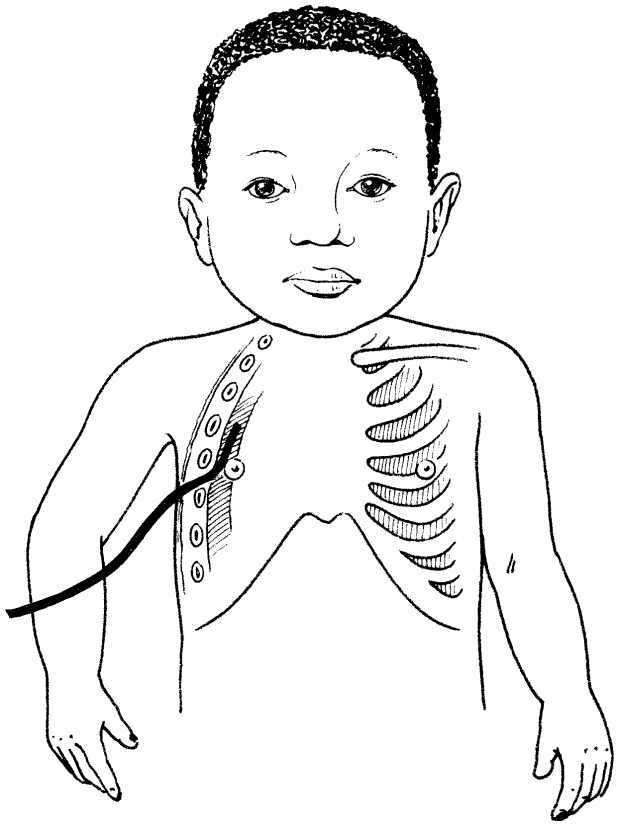
If the fluid is clear (straw coloured or brownish), pull out the needle or catheter after withdrawing enough fluid to relieve distress and put a dressing over the hole in the chest. Consider a differential diagnosis of tuberculosis and check for other evidence of tuberculosis (see section 3.6, page 41)

If the fluid is thin pus or cloudy (like milk), leave the catheter in place so that you can suck out more pus several times a day. Make sure you seal the end of the catheter so that no air can get in. Consider inserting a chest tube for permanent drainage (see below).

If the fluid is thick pus which cannot pass easily through the needle or catheter, insert a chest tube (see below), or refer to where this can be done.

Insertion of a chest tube

- Prepare and select the site as above.
  - — Make a 2–3 cm skin incision along the line of the intercostal space, just above the rib below (to avoid damaging the vessels which lie under the lower edge of each rib).
  - — Use sterile forceps to push through the subcutaneous tissue just above the upper edge of the rib and puncture the pleura.
  - — Pass a gloved finger into the incision and clear a path to the pleura (this is not possible in infants).
  - — Use the forceps to hold the drainage catheter (16 gauge) and introduce it into the chest for several centimetres, pointing upwards. Ensure that all drainage holes of the catheter are inside the chest.
  - — Connect the catheter to a collection bottle with an underwater seal
  - — Suture the catheter in place, secure with tape, and apply a gauze dressing.



Insertion of a chest tube: the site is selected in the mid-axillary line in the 5th intercostal space on the superior aspect of the 6th rib.

APPENDIX 2

Drug dosages/regimens

A2.1 **Antibiotics**

Antibiotic	Dosage	Form	Dose according to body weight				
			3–<6 kg	6–<10 kg	10–<15 kg	15–<20 kg	20–29 kg
Amoxicillin	15 mg/kg three times per day	250 mg tablet	¼	½	¾	1	1½
		Syrup (containing 125 mg/5 ml)	2.5 ml	5 ml	7.5 ml	10 ml	–
Ampicillin	Oral: 25 mg/kg four times a day*	250 mg tablet	½	1	1	1½	2
	IM/IV: 50 mg/kg every 6 hours	Vial of 500 mg mixed with 2.1 ml sterile water to give 500mg/2.5ml	1 ml[a]	2 ml	3 ml	5 ml	6 ml
* *These oral doses are for mild disease. If oral ampicillin is required after a course of injectable ampicillin for severe disease, the oral dose must be 2–4 times higher than that given here.*							
Cefotaxime	50 mg/kg every 6 hours	IV Vial of 500 mg mixed with 2 ml sterile water OR vial of 1 g mixed with 4 ml sterile water OR vial of 2 g mixed with 8 ml sterile water	0.8 ml**	1.5 ml	2.5 ml	3.5 ml	5 ml
** *For premature babies, give this dose every 12 hours; in the first week of life, every 8 hours.*							
Ceftriaxone	80 mg/kg/day as a single dose given over 30 min	IV Vial of 1 g mixed with 9.6 ml sterile water to give 1g/10ml OR vial of 2 g mixed with 19 ml of sterile water to give 2g/20ml	3 ml	6 ml	10 ml	14 ml	20 ml
	Meningitis dose: 50 mg/kg every 12 hours (max single dose 4 g)		2 ml	4 ml	6 ml	9 ml	12.5 ml
	Ophthalmia neonatorum dose: 50 mg/kg single IM dose (max 125 mg)		2 ml	4 ml	6ml	9 ml	12.5 ml
Cefalexin	12.5 mg/kg four times per day	250 mg tablet	¼	½	¾	1	1¼

Antibiotic	Dosage	Form	Dose according to body weight 3–<6 kg	6–<10 kg	10–<15 kg	15–<20 kg	20–29 kg
Chloramphenicol* Calculate EXACT dose based on body weight. Only use these doses if this is not possible *See footnote on premature babies and dose in first week of life*	25 mg/kg every 6 hours (for meningitis only)	IV: vial of 1 g mixed with 9.2 ml sterile water to give 1g/10ml	0.75–1.25 ml*	1.5–2.25 ml	2.5–3.5 ml	3.75–4.75 ml	5–7.25 ml
	every 8 hours (for other conditions) (maximum 1 g per dose)	IM: vial of 1 g mixed with 3.2 ml sterile water to give 1g/4ml	0.3–0.5 ml*	0.6–0.9 ml	1–1.4 ml	1.5–1.9 ml	2–2.9 ml
		Oral: 125 mg/5ml suspension (palmitate)	3–5 ml	6–9 ml	10–14 ml	15–19 ml	–
		Oral: 250 mg capsule	–	–	1	1½	2
	Cholera: 20 mg/kg every 6 hours for 3 days						
Oily chloramphenicol (epidemic use)	100 mg/kg single dose; maximum of 3 grams	IM: vial of 0.5 gram in 2 ml	1.2–2 ml	2.4–3.6 ml	4–5.6 ml	6–7.6 ml	8–11.6 ml
Ciprofloxacin	10–15 mg/kg per dose given twice per day for 5 days	Oral: 100 mg tablet Oral: 250 mg tablet	½ ¼	1 ½	1½ ½	2 1	3 1½
Ciprofloxacin in children: use is only warranted if the benefits outweigh the risks of arthropathy (maximum dose 500 mg per dose).							
Cloxacillin/ flucloxacillin/ oxacillin[a]	25–50 mg/kg every 6 hours (50 mg/kg dose in brackets)	IV cloxacillin: vial of 500 mg mixed with 8ml sterile water to give 500mg/10mls	2–(4) ml	4–(8) ml	6–(12) ml	8–(16) ml	12–(24) ml
		IM: vial of 250 mg mixed with 1.3 ml sterile water to give 250mg/1.5ml	0.6 (1.2) ml[a]	1 (2) ml	1.8 (3.6) ml	2.5 (5) ml	3.75 (7.5) ml
		250 mg capsule	½ (1)	1 (2)	1 (2)	2 (3)	2 (4)
	Dose for treating abscesses: 15mg/kg every 6 hours	250 mg capsule	¼	½	1	1½	2½
Cotrimoxazole** (trimethoprim-sulfamethoxazole, TMP-SMX)	4 mg trimethoprim/kg and 20 mg sulfa-methoxazole/kg two times per day	Oral: adult tablet (80 mg TMP + 400 mg SMX)	¼**	½	1	1	1
		Oral: paediatric tablet (20 mg TMP + 100 mg SMX)	1**	2	3	3	4
		Oral: syrup (40 mg TMP + 200 mg SMX per 5 ml)	2 ml**	3.5 ml	6 ml	8.5 ml	–

* *Do not give chloramphenicol to premature neonates. Calculate the exact dose based on body weight, rather than the doses in this Table, wherever possible. For young infants <1 month old, the dose is 25 mg/kg every 12 hours. Phenobarbital reduces and phenytonin increases chloramphenicol levels when given together.*

** *If the child is aged <1 month, give cotrimoxazole (½ paediatric tablet or 1.25 ml syrup) twice daily. Avoid cotrimoxazole in neonates who are premature or jaundiced.*

Note: in treating cholera, cotrimoxazole dosage is 5 mg TMP /25 mg SMX twice daily for 3 days; in treating interstitial pneumonia in children with HIV, dosage is TMP 5mg/kg 4 times a day for 3 weeks.

Antibiotic	Dosage	Form	Dose according to body weight 3–<6 kg	6–<10 kg	10–<15 kg	15–<20 kg	20–29 kg
Erythromycin*	12.5 mg/kg 4 times a day for 3 days	Oral: 250 mg tablet	¼	½	1	1	1½
** Must NOT be given together with theophylline (aminophylline) due to risk of serious adverse reactions.*							
Furazolidone	1.25 mg/kg 4 times per day for 3 days	Oral: 100 mg tablet	–	–	¼	¼	¼
Gentamicin* Calculate EXACT dose based on body weight. Only use these doses if this is not possible	7.5 mg/kg[b] once per day	IM/IV: vial containing 20 mg (2ml at 10 mg/ml) undiluted	2.25–3.75 ml[c]	4.5–6.75 ml	7.5–10.5 ml	–	–
		IM/IV: vial containing 80 mg (2ml at 40 mg/ml) mixed with 6 ml sterile water	2.25–3.75ml[c]	4.5–6.75 ml	7.5–10.5 ml	–	–
		IM/IV: vial containing 80 mg (2ml at 40 mg/ml) undiluted	0.5–0.9 ml[c]	1.1–1.7 ml	1.9–2.6 ml	2.8–3.5 ml	3.75–5.4 ml
** Must NOT be given together with theophylline (aminophylline) due to risk of serious adverse reactions.*							
Kanamycin Calculate EXACT dose based on body weight. Only use these doses if this is not possible	20 mg/kg[b] once a day	IM/IV: vial containing 250 mg (2 ml at 125 mg/ml)	0.5–0.8 ml	1–1.5 ml	1.6–2.2 ml	2.4–3 ml	3.2–4.6 ml
Nalidixic acid	15 mg/kg 4 times a day for 5 days	Oral: 250 mg tablet	¼	½	1	1	1½
Metronidazole	7.5 mg/kg 3 times a day for 7 days**	Oral: 200 mg tablet 400 g tablet	– –	¼ –	½ ¼	½ ¼	1 ½
*** For the treatment of giardiasis, the dose is 5 mg/kg; for amoebias, 10 mg/kg.*							
Pivmecillinam	20 mg/kg 4 times a day for 5 days	Oral: 200 mg tablet	½	¾	1	1½	2
PENICILLIN							
Benzathine benzylpenicillin	50 000 units/kg once a day[c]	IM: vial of 1.2 million units mixed with 4 ml sterile water	0.5 ml	1 ml	2 ml	3 ml	4 ml
Benzylpenicillin (penicillin G)	50 000 units/ kg every 6 hours	IV: vial of 600 mg mixed with 9.6 ml sterile water to give 1,000,000 units/10ml	2 ml	3.75 ml	6 ml	8.5 ml	12.5 ml
General dosage		IM: vial of 600 mg (1 000 000 units) mixed with 1.6 ml sterile water to give 1,000,000 units/2ml	0.4 ml[c]	0.75 ml	1.2 ml	1.7 ml	2.5 ml
Dosage for meningitis	100 000 units/kg every 6 hours	IV	4 ml	7.5 ml	12 ml	17 ml	25 ml
		IM	0.8 ml	1.5 ml	2.5 ml	3.5 ml	5 ml

Antibiotic	Dosage	Form	Dose according to body weight				
			3–<6 kg	6–<10 kg	10–<15 kg	15–<20 kg	20–29 kg
Procaine benzylpenicillin	50 000 units/kg once a day	IM: vial of 3 g (3 000 000 units) mixed with 4 ml sterile water	0.25 ml	0.5 ml	0.8 ml	1.2 ml	1.7 ml
Tetracycline*	12.5 mg/kg 4 times a day for 3 days	250 mg tablet	–	½	½	1	1

** Give to children only for treatment of cholera because of permanent staining of teeth*

[a] Cloxacillin, flucloxacillin, oxacillin, nafcillin, methicillin and parenteral ampicillin: for infants in the first week of life, give this dose every 12 hours; in the second through to fourth weeks of life, every 8 hours.

[b] In administering an aminoglycoside (gentamicin, kanamycin), it is preferable to calculate the **exact** dose based on the child's weight and to avoid using undiluted 40 mg/ml gentamicin.

[c] For the first week of life: benzylpenicillin 50 000 units/kg every 12 hours *PLUS either* gentamicin 5 mg/kg or kanamycin 20 mg/kg once a day.

A2.2 **Anti-tuberculosis antibiotics**

Calculate exact dose based on body weight.

Essential anti-TB drug (abbreviation)	Mode of action	Daily dose: mg/kg (range)	Intermittent dose: 3 times/week mg/kg (range)
Rifampicin (R)	Bactericidal	10 (8–12)	10 (8–12)
Isoniazid (H)	Bactericidal	5 (4–6)	10 (8–12)
Pyrazinamide (Z)	Bactericidal	25 (20–30)	35 (30–40)
Ethambutol (E)	Bacteriostatic	15 (15–20)	30 (25–35)
Streptomycin (S)	Bactericidal	15 (12–18)	15 (12–18)
Thioacetazone (T)	Bacteriostatic	3	Not applicable

A2.3 **Antimalarials**

Antimalarial	Dosage	Form	Dose according to body weight				
			3–<6 kg	6–<10 kg	10–<15 kg	15–<20 kg	20–29 kg
Chloroquine	Once a day for 3 days: 10 mg/kg on days 1 and 2 5 mg/kg on day 3	Oral: 150 mg tablet		Day 1: ½ Day 2: ½ Day 3: ½	Day 1: 1 Day 2: 1 Day 3: ½	Day 1: 1½ Day 2: 1 Day 3: 1	Day 1: 1½ Day 2: 1½ Day 3: 1
		Oral: 100 mg tablet	Day 1: ½ Day 2: ½ Day 3: ½	Day 1: 1 Day 2: 1 Day 3: ½	Day 1: 1½ Day 2: 1½ Day 3: ½	Day 1: 2 Day 2: 2 Day 3: 1	Day 1: 2½ Day 2: 2½ Day 3: 1
		Oral: 50 mg base/ 5 ml syrup	Day 1: 5.0 ml Day 2: 5.0 ml Day 3: 2.5 ml	Day 1: 7.5 ml Day 2: 7.5 ml Day 3: 5.0 ml	Day 1: 15 ml Day 2: 15 ml Day 3: 10 ml	– – –	– – –
Quinine (mg/kg expressed as mg of quinine hydrochloride base)	If IV infusion is not possible, quinine dihydrochloride can be given in the same dosages by IM injection.	IV (undiluted): quinine dihydrochloride injection 150 mg/ml (in 2 ml ampoules)	0.3 ml	0.6 ml	1 ml	1.2 ml	2 ml
		IV (undiluted): quinine dihydrochloride injection 300 mg/ml (in 2 ml ampoules)	0.2 ml	0.3 ml	0.5 ml	0.6 ml	1 ml
		IM quinine dihydrochloride (diluted): in normal saline to a concentration of 60 mg salt/ml	1 ml	1.5 ml	2.5 ml	3 ml	5 ml
		Oral: quinine sulfate 200 mg tablet	¼	½	¾	1	1½
		Oral: quinine sulfate 300 mg tablet	–	–	½	½	1

Note: IV Administration of quinine
The IV dosage (10 mg salt/kg) shown here is a maintenance dose. The loading dose is 2 times this and should be given slowly over 4 hours. At 12 hours after the start of the loading dose, give the maintenance dose listed here over 2 hours. Repeat every 12 hours. Switch to oral treatment (10 mg/kg 3 times daily) when the child is able to take it, to complete a 7 days' treatment with quinine tablets or give a single dose of SP (see below).

Dilute both loading and maintenance doses with 10 ml/kg of IV fluid.

Artesunate (IV)	The IV dose shown here (1.2 mg/kg) is the maintenance dose. The loading dose is twice this (2.4 mg/kg) and should be given by IV bolus.	60 mg artesumic acid (already dissolved in 0.6 ml of saline/sodium bicarbonate) in 3.4 ml of saline/glucose	0.4 ml	0.7 ml	1.2 ml	1.5 ml	2.5 ml

Note: Artesunate (IV)
The solution should be prepared just before use. Dilute both the loading and maintenance doses by dissolving 60 mg artesunic acid (which is already dissolved in 0.6 ml of 5% sodium bicarbonate) in 3.4 ml of 5% glucose. Give the maintenance dose at 12 and 24 hours, and then daily for 6 days. If the patient is able to swallow, give the daily dose orally.

Antimalarial			Dose according to body weight				
	Dosage	**Form**	**3–<6 kg**	**6–<10 kg**	**10–<15 kg**	**15–<20 kg**	**20–29 kg**
Artemether (IM)	The IM dose shown here (1.6 mg/kg) is the maintenance dose. The loading dose (IM) is twice this (3.2 mg/kg).	80 mg/1ml ampoule	0.1 ml	0.2 ml	0.3 ml	0.4 ml	0.6 ml
		40 mg/1 ml ampoule	0.2 ml	0.4 ml	0.6 ml	0.8 ml	1.2 ml

Artemether (IM)
Give the maintenance dose daily for a minimum of 3 days until the patient can take oral treatment with an effective anti-malarial.

Quinidine	The IV dosage shown here (7.5 mg base/kg) is the maintenance dose. The loading dose is twice this (15 mg/kg)	IV (undiluted) quinidine gluconate injection (80 mg/ml)	0.5 ml	0.8 ml	1.3 ml	1.7 ml	2.5 ml

Note:

IV Quinidine is more cardio-toxic than quinine; it should only be used if parenteral quinine, artesunate or artemether are not available

IV Quinidine: The loading dose (15 mg/kg) should be given by IV infusion over 4 hours. Then, give the maintenance dose 8 hourly (from the beginning of each infusion period until the child can swallow). Then switch to quinine tablets (as above) 8 hourly to complete 7 days' treatment, or give a full treatment course of SP (see below)

Sulfadoxine-pyrimethamine (SP)	Single dose (25 mg sulfdoxine and 1.25 mg pyrimethamine/kg)	Oral: tablet (500 mg sulfadoxine + 25 mg pyrimethamine)	¼	½	¾	1	1½

The following treatments used in the past for the treatment of malaria are now considered to be either useless or dangerous, and should NOT be given: corticosteroids or other anti-inflammatory drugs, urea, invert glucose, low molecular dextran, adrenaline, heparin, prostacyclin and cyclosporin A.

A2.4 **Antipyretics**

Antipyretic			Dose according to body weight				
	Dosage	**Form**	**3–<6 kg**	**6–<10 kg**	**10–<15 kg**	**15–<20 kg**	**20–29 kg**
Paracetamol	10–15 mg/kg, up to 4 times a day, to control high fever in a distressed child	100 mg tablet	–	1	1	2	3
		500 mg tablet	–	¼	¼	½	½

A2.5 **Vitamins/Minerals**

	Dosage	Form	Dose according to body weight				
			3–<6 kg	6–<10 kg	10–<15 kg	15–<20 kg	20–29 kg
Iron	Once per day for 14 days	Iron/folate tablet (ferrous sulfate 200 mg + 250 µg folate = 60 mg elemental iron	–	–	½	½	1
		Iron syrup (ferrous fumarate, 100 mg per 5 ml = 20 mg/ml elemental iron)	1 ml	1.25 ml	2 ml	2.5 ml	4 ml
Potassium	2–4 mmol/kg/day						
Vitamin A	Once per day for 2 days	200 000 IU capsule	–	½	1	1	1
		100 000 IU capsule	½	1	2	2	2
		50 000 IU capsule	1	2	4	4	4

Notes:

1. *The daily dosages for children under 5 years for the following minerals: copper sulfate 0.2 mg/kg; folate 5 mg/kg on day 1, then 1 mg/kg; magnesium 0.3–0.6 mmol/kg/day; zinc 2 mg/kg.*
2. *Use of vitamin A*
   a. *Immunization contacts in an area where vitamin A deficiency and xerophthalmia are common:*
      – *BCG, OPV or DPT up to 6 weeks of age: give 200 000 units to mother if she has not received vitamin A immediately after delivery.*
      – *Measles vaccine contact: give dose to child aged 9 months to 5 years following Table 24.*
      – *Booster doses/delayed initial immunization: give dose to child aged 1–4 years following the above dose chart .*
   b. *Other health service contacts: Screen children from the age of 6 months and give vitamin A to any child living in an area where vitamin A deficiency and xerophthalmia are common. Give single dose as above, according to age, every 4–6 months. This schedule is for prevention in high-risk areas. Do not give to children who have received a routine vitamin A supplement in the previous 30 days. Children with signs of xerophthalmia should receive the same treatment schedule as for measles (immediately on diagnosis, the next day, and 2–3 weeks later). Children with acute corneal lesions should be referred to hospital.*

A2.6 **Anticonvulsants (doses for treatment of acute convulsions)**

Anticonvulsant	Dosage	Form	Dose according to body weight				
			3–<6 kg	6–<10 kg	10–<15 kg	15–<20 kg	20–29 kg
Diazepam	0.5 mg/kg	Rectal: 10 mg/2 ml solution	0.4 ml[a]	0.75 ml	1.2 ml	1.7 ml	2.5 ml
	0.2–0.3 mg/kg	IV: 10 mg/2 ml solution	0.25 ml[a]	0.4 ml	0.6 ml	0.75 ml	1.25 ml
Paraldehyde	Rectal: 0.3–0.4 ml/kg		1.4 ml	2.4 ml	4 ml	5 ml	7.5 ml
	IM: 0.2 ml/kg		0.8 ml	1.5 ml	2.4 ml	3.4 ml	5 ml
Phenobarbital	15 mg/kg	IM: 200 mg/ml solution	0.4 ml[a]	0.6 ml	1.0 ml	1.5 ml	2.0 ml

[a] Give phenobarbital (20 mg/kg IV or IM) instead of diazepam to neonates. If convulsions continue, give 10 mg/kg IV or IM after 30 minutes.

The maintenance dose of oral phenobarbital is 2.5–5 mg/kg.

A2.7 **Bronchodilators/Anti-inflammatory agents for treatment of wheeze**

Drug by route of delivery	Dosage	Dosing intervals		Products
		Acute episode	Maintenance	
Aminophylline				
Oral	6 mg/kg dose	Every 6 hours	–	Tablets: 100 mg or 200 mg
IV Note: give IV aminophylline slowly over 20–60 minutes	**Initial** dose: 5–6 mg/kg (max. 300 mg) if the child has not taken aminophylline or theophylline within 24 hours			
	Maintenance dose: 5 mg/kg OR continuous infusion: 0.9 mg/kg/hour	Every 6 hours or continuous infusion	–	250 mg/10 ml ampoule
Prednisolone [a]	1 mg/kg twice a day for 3 days			
Salbutamol				
Oral	2–11 months: 1 mg dose 1–4 years: 2 mg dose	Every 6–8 hours	Every 8 hours	Syrup: 2 mg/5 ml Tablets: 2 and 4 mg
Metered dose inhalation (aerosol with spacer)	200 µg/2 doses	Every 4 hours[b]	Every 6–8 hours	200 doses per inhaler
Nebulized	2.5 mg/dose	Every 4 hours[b]	Every 6–8 hours	5 mg/ml solution 2.5 mg in 2.5 ml single dose units
Epinephrine (adrenaline)	As a rapid-acting bronchodilator if salbutamol is not available: 0.01 ml/kg (up to a maximum of 0.3 ml) of 1:1000 solution given subcutaneously with a 1 ml syringe			

[a] 1 mg prednisolone is equivalent to 5 mg hydrocortisone or 0.15 mg dexamethasone.

[b] In severe asthmatic attacks, it can be given up to 1 hourly.

A2.8 **Analgesics**

Analgesics	Dosage	Form	Dose according to body weight				
			3–<6 kg	6–<10 kg	10–<15 kg	15–<20 kg	20–29 kg
Paracetamol	10–15 mg/kg up to four times a day, as required for analgesia	100 mg tablet	–	1	1	2	3
		500 mg tablet	–	¼	¼	½	½
Aspirin Note: avoid in young children, if possible, because of the risk of Reye's syndrome	10–20 mg/kg orally 4–6 hourly	300 mg tablet	–	¼	½	¾	1
Ibuprofen	5–10 mg/kg orally 6–8 hourly to a maximum of 500 mg per day	200 mg tablet	–	¼	¼	½	¾
		400 mg tablet	–	–	–	¼	½
Morphine	Oral: 0.2–0.4 mg/kg 4–6 hourly; increase if necessary for severe pain IM: 0.1–0.2 mg/kg 4–6 hourly IV: 0.05–0.1 mg/kg 4–6 hourly or 0.005–0.01 mg/kg/hour by IV infusion Calculate EXACT dose based on weight of the child						

Note: Reduce dose to 25% in severe malnutrition or in infants under 6 months. For palliative care, adjust dosage to the needs of the individual child.

Topical lignocaine: Apply topically before painful procedures.

Topical TAC (tetracaine, adrenaline, cocaine): Apply topically before painful procedures.

A2.9 **Other drugs**

	Dosage	Form	Dose according to body weight 3–<6 kg	6–<10 kg	10–<15 kg	15–<20 kg	20–29 kg
Amphotericin (for oesophageal candidiasis)	0.5 mg/kg/day by IV infusion over 6 hours once daily for 10–14 days	50 mg vial	–	4 mg	6 mg	9mg	12mg
Dexamethasone	single dose 0.6mg/kg (in severe viral croup)	oral 0.5 mg tablets IM: 5 mg/ml	0.5 ml	0.9 ml	1.4 ml	2 ml	3 ml
Epinephrine (adrenaline) (in severe viral croup)	a trial of 2 ml of 1:1,000 nebulized solution		–	2 ml	2 ml	2 ml	2 ml
Frusemide (furosemide)	As a diuretic in cardiac failure–1–2 mg/kg every 12 hours	20 mg tablets	¼–½	½–1	½–1	1–2	1¼–2½
		IV 10 mg/ml	0.4–0.8 ml	0.8–1.6 ml	1.2–2.4 ml	1.7–3.4 ml	2.5–5 ml
	OR at the start of a blood transfusion in normovolaemic children with signs of cardiac failure–1 mg/kg	IV 10 mg/ml	0.4 ml	0.8 ml	1.2 ml	1.7 ml	2.5 ml
Ketoconazole (for oesophageal candidiasis)	3–6 mg/kg/day for 7 days	200 mg tablet	–	¼	¼	½	½
Mebendazole	100 mg 2 times a day for 3 days	100 mg tablet	–	–	1	1	1
	500 mg once only	100 mg tablet	–	–	5	5	5
Metoclopramide (for nausea/ vomiting)	0.1–0.2 mg/kg every 8 hours as required	10 mg tablets	–	–	¼	¼	½
		Injection: 5 mg/ml	–	–	0.5 ml	0.7 ml	1 ml
Spectinomycin (for neonatal ophthalmia)	25 mg/kg single dose IM (maximum of 75 mg)	2 gram vial in 5 ml diluent	0.25 ml	–	–	–	–
Oral digoxin: give as an initial loading dose followed by twice daily maintenance doses, starting 6 hours after the loading dose as set out below:							
First Dose Loading Dose	15 micrograms per kg, once only	62.5 microgram tablets	¾–1	1½–2	2½–3½	3½–4½	–
		125 microgram tablets	–	–	1–1½	1¾–2	2½–3
Maintenance Dose (Start 6 hours after loading dose)	5 micrograms per kg every 12 hours (max 250 micrograms per dose)	62.5 microgram tablets	¼–½	½–¾	¾–1	1¼–1½	1½–2¼

APPENDIX 3

Formulas and recipes for severely malnourished children

A3.1 Formula for ReSoMal: rehydration solution for severely malnourished children

ReSoMal recipe

Ingredient	Amount
Water	2 litres
WHO-ORS	One 1-litre packet*
Sucrose	50 g
Electrolyte/mineral solution**	40 ml

* 3.5 g sodium chloride, 2.9 g trisodium citrate dihydrate, 1.5 g potassium chloride, 20 g glucose.

** See section A3.2 for the recipe for the electrolyte/mineral solution. If this cannot be made up, use 45 ml of KCl solution (100 g KCl in 1 litre of water) instead.

ReSoMal contains approximately 45 mmol Na, 40 mmol K, and 3 mmol Mg per litre.

For the use of ReSoMal in the management of dehydration in severely malnourished children, follow the guidelines given in Chapter 7, page 83.

A3.2 Formula for concentrated electrolyte/mineral solution

This is used in the preparation of starter and catch-up feeding formulas and ReSoMal. Sachets containing premixed electrolytes and minerals are produced by some manufacturers. If these are not available or affordable, prepare the solution (2500 ml) using the following ingredients:

	g	mol/20 ml
Potassium chloride: KCl	224	24 mmol
Tripotassium citrate	81	2 mmol
Magnesium chloride: $MgCl_2$. $6H_2O$	76	3 mmol
Zinc acetate: Zn acetate.$2H_2O$	8.2	300 µmol
Copper sulfate: $CuSO_4$. $5H_2O$	1.4	45 µmol
Water: make up to	2500 ml	

If available, also add selenium (0.028 g of sodium selenate, $NaSeO_4.10H_20$) and iodine (0.012 g of potassium iodide, KI) per 2500 ml.

- Dissolve the ingredients in cooled boiled water.
- Store the solution in sterilized bottles in the fridge to retard deterioration. Discard if it turns cloudy. Make fresh each month.
- Add 20 ml of the concentrated electrolyte/mineral solution to each 1000 ml of milk feed.

  If it is not possible to prepare this electrolyte/mineral solution and pre-mixed sachets are not available, give K, Mg and Zn separately. Make a 10% stock solution of potassium chloride (100 g in 1 litre of water) and a 1.5% solution of zinc acetate (15 g in 1 litre of water).
- *For the oral rehydration solution ReSoMal*, use 45 ml of the stock KCl solution instead of 40 ml electrolyte/mineral solution.
- *For milk feeds F-75 and F-100*, add 22.5 ml of the stock KCl solution instead of 20 ml of the electrolyte/mineral solution to 1000 ml of feed. Give the 1.5% zinc acetate solution by mouth 1 ml/kg/day. Give 0.3 ml/kg of 50% magnesium sulfate intramuscularly once to a maximum of 2 ml.

A3.3 Recipes of refeeding formulas F-75 and F-100

	F-75[a,b] (starter)	F-75[c] (starter: cereal-based)	F-100[d] (catch-up)
Dried skimmed milk (g)	25	25	80
Sugar (g)	100	70	50
Cereal flour (g)	—	35	—
Vegetable oil (g)	27	27	60
Electrolyte/mineral soln (ml)	20	20	20
Water: make up to (ml)	1000	1000	1000
Contents per 100 ml			
Energy (kcal)	75	75	100
Protein (g)	0.9	1.1	2.9
Lactose (g)	1.3	1.3	4.2
Potassium (mmol)	4.0	4.2	6.3
Sodium (mmol)	0.6	0.6	1.9
Magnesium (mmol)	0.43	0.46	0.73
Zinc (mg)	2.0	2.0	2.3
Copper (mg)	0.25	0.25	0.25
% energy from protein	5	6	12
% energy from fat	32	32	53
Osmolality (mOsm/l)	413	334	419

[a] A comparable starter formula can be made from 35 g whole dried milk, 100 g sugar, 20 g oil, 20 ml electrolyte/mineral solution, and water to make 1000 ml. If using fresh cow's milk, take 300 ml milk, 100 g sugar, 20 ml oil, 20 ml electrolye/mineral solution, and water to make 1000 ml.

[b] Isotonic versions of F-75 (280 mOsmol/l) are available commercially, in which maltodextrins replace some of the sugar, and in which all the extra nutrients (K, Mg and micronutrients) are incorporated.

[c] Cook for 4 minutes. This may be helpful for children with dysentery or persistent diarrhoea.

[d] A comparable catch-up formula can be made from 110 g whole dried milk, 50 g sugar, 30 g oil, 20 ml electrolyte/mineral solution, and water to make 1000 ml. If using fresh cow's milk, take 880 ml milk, 75 g sugar, 20 ml oil, 20 ml electrolyte/mineral solution, and water to make 1000 ml.

Mix the milk, sugar, oil and electrolyte/mineral solution to a paste, and then slowly add the warm boiled water. Make up to 1000 ml. If available, use an electric blender or hand whisk.

APPENDIX 4

Assessing nutritional status and recovery

A4.1 Calculating the child's weight-for-length

Measuring length

Two people are needed to measure the child's length.

One person should:

- assist in positioning the child face-up on the measuring board, supporting the head and placing it against the headboard
- position the crown of the head against the headboard, compressing the hair
- check that the child lies straight along the centre line of the board and is not slanted, and does not change position.

(It is usual for this person to stand or kneel behind the headboard).

The second person should:

- support the trunk as the child is positioned on the board
- lay the child flat along the board
- place one hand on the shins above the ankles or on the knees and press down firmly. With the other hand, place the footpiece firmly against the heels
- measure the length (to the nearest 0.1 cm) and record immediately.

The measuring board should be checked for accuracy every month.

Measuring weight

- Leave a cloth in the weighing pan to prevent chilling the child.
- Adjust the scales to zero with the cloth in the pan.
- Place the naked child gently on the cloth in the weighing pan.
- Wait for the child to settle and the weight to stabilize.
- Measure the weight (to the nearest 10 g) and record immediately.

Standardization of the scales should be performed weekly or whenever the scales are moved.

Determining the child's % weight-for-length or SD weight-for-length

Refer to Table 26 on page 147.

- Locate the row containing the child's length in the central column of Table 26.
- Look to the left in that row for boys, and to the right for girls.
- Note where the child's weight lies with respect to the weights recorded in this row.
- Select the weight closest to that of the child.
- Look up this column to read the weight-for-length of the child.

Example 1: Boy: length 61 cm, weight 5.3 kg;

this child is –1SD weight-for-length (90% of the median).

Example 2: Girl: length 67 cm, weight 4.3 kg;

this child is less than –4SD weight-for-length (less than 60% of the median).

Table 26 ***WHO/NCHS normalized reference weight-for-length (49–84 cm) and weight- for-height (85–110 cm), by sex***

Boys' weight (kg)						Girls' weight (kg)				
–4SD 60%	–3SD 70%	–2SD 80%	–1SD 90%	Median	Length (cm)	Median	–1SD 90%	–2SD 80%	–3SD 70%	–4SD 60%
1.8	2.1	2.5	2.8	3.1	**49**	3.3	2.9	2.6	2.2	1.8
1.8	2.2	2.5	2.9	3.3	**50**	3.4	3	2.6	2.3	1.9
1.8	2.2	2.6	3.1	3.5	**51**	3.5	3.1	2.7	2.3	1.9
1.9	2.3	2.8	3.2	3.7	**52**	3.7	3.3	2.8	2.4	2
1.9	2.4	2.9	3.4	3.9	**53**	3.9	3.4	3	2.5	2.1
2	2.6	3.1	3.6	4.1	**54**	4.1	3.6	3.1	2.7	2.2
2.2	2.7	3.3	3.8	4.3	**55**	4.3	3.8	3.3	2.8	2.3
2.3	2.9	3.5	4	4.6	**56**	4.5	4	3.5	3	2.4
2.5	3.1	3.7	4.3	4.8	**57**	4.8	4.2	3.7	3.1	2.6
2.7	3.3	3.9	4.5	5.1	**58**	5	4.4	3.9	3.3	2.7
2.9	3.5	4.1	4.8	5.4	**59**	5.3	4.7	4.1	3.5	2.9
3.1	3.7	4.4	5	5.7	**60**	5.5	4.9	4.3	3.7	3.1
3.3	4	4.6	5.3	5.9	**61**	5.8	5.2	4.6	3.9	3.3
3.5	4.2	4.9	5.6	6.2	**62**	6.1	5.4	4.8	4.1	3.5
3.8	4.5	5.2	5.8	6.5	**63**	6.4	5.7	5	4.4	3.7
4	4.7	5.4	6.1	6.8	**64**	6.7	6	5.3	4.6	3.9
4.3	5	5.7	6.4	7.1	**65**	7	6.3	5.5	4.8	4.1
4.5	5.3	6	6.7	7.4	**66**	7.3	6.5	5.8	5.1	4.3
4.8	5.5	6.2	7	7.7	**67**	7.5	6.8	6	5.3	4.5
5.1	5.8	6.5	7.3	8	**68**	7.8	7.1	6.3	5.5	4.8
5.3	6	6.8	7.5	8.3	**69**	8.1	7.3	6.5	5.8	5
5.5	6.3	7	7.8	8.5	**70**	8.4	7.6	6.8	6	5.2
5.8	6.5	7.3	8.1	8.8	**71**	8.6	7.8	7	6.2	5.4
6	6.8	7.5	8.3	9.1	**72**	8.9	8.1	7.2	6.4	5.6
6.2	7	7.8	8.6	9.3	**73**	9.1	8.3	7.5	6.6	5.8
6.4	7.2	8	8.8	9.6	**74**	9.4	8.5	7.7	6.8	6
6.6	7.4	8.2	9	9.8	**75**	9.6	8.7	7.9	7	6.2
6.8	7.6	8.4	9.2	10	**76**	9.8	8.9	8.1	7.2	6.4
7	7.8	8.6	9.4	10.3	**77**	10	9.1	8.3	7.4	6.6
7.1	8	8.8	9.7	10.5	**78**	10.2	9.3	8.5	7.6	6.7
7.3	8.2	9	9.9	10.7	**79**	10.4	9.5	8.7	7.8	6.9
7.5	8.3	9.2	10.1	10.9	**80**	10.6	9.7	8.8	8	7.1
7.6	8.5	9.4	10.2	11.1	**81**	10.8	9.9	9	8.1	7.2
7.8	8.7	9.6	10.4	11.3	**82**	11	10.1	9.2	8.3	7.4
7.9	8.8	9.7	10.6	11.5	**83**	11.2	10.3	9.4	8.5	7.6
8.1	9	9.9	10.8	11.7	**84**	11.4	10.5	9.6	8.7	7.7

Table 26 ***(continued)***

Boys' weight (kg)						Girls' weight (kg)				
–4SD 60%	–3SD 70%	–2SD 80%	–1SD 90%	Median	Length (cm)	Median	–1SD 90%	–2SD 80%	–3SD 70%	–4SD 60%
7.8	8.9	9.9	11	12.1	**85**	11.8	10.8	9.7	8.6	7.6
7.9	9	10.1	11.2	12.3	**86**	12	11	9.9	8.8	7.7
8.1	9.2	10.3	11.5	12.6	**87**	12.3	11.2	10.1	9	7.9
8.3	9.4	10.5	11.7	12.8	**88**	12.5	11.4	10.3	9.2	8.1
8.4	9.6	10.7	11.9	13	**89**	12.7	11.6	10.5	9.3	8.2
8.6	9.8	10.9	12.1	13.3	**90**	12.9	11.8	10.7	9.5	8.4
8.8	9.9	11.1	12..3	13.5	**91**	13.2	12	10.8	9.7	8.5
8.9	10.1	11.3	12.5	13.7	**92**	13.4	12.2	11	9.9	8.7
9.1	10.3	11.5	12.8	14	**93**	13.6	12.4	11.2	10	8.8
9.2	10.5	11.7	13	14.2	**94**	13.9	12.6	11.4	10.2	9
9.4	10.7	11.9	13.2	14.5	**95**	14.1	12.9	11.6	10.4	9.1
9.6	10.9	12.1	13.4	14.7	**96**	14.3	13.1	11.8	10.6	9.3
9.7	11	12.4	13.7	15	**97**	14.6	13.3	12	10.7	9.5
9.9	11.2	12.6	13.9	15.2	**98**	14.9	13.5	12.2	10.9	9.6
10.1	11.4	12.8	14.1	15.5	**99**	15.1	13.8	12.4	11.1	9.8
10.3	11.6	13	14.4	15.7	**100**	15.4	14	12.7	11.3	9.9
10.4	11.8	13.2	14.6	16	**101**	15.6	14.3	12.9	11.5	10.1
10.6	12	13.4	14.9	16.3	**102**	15.9	14.5	13.1	11.7	10.3
10.8	12.2	13.7	15.1	16.6	**103**	16.2	14.7	13.3	11.9	10.5
11	12.4	13.9	15.4	16.9	**104**	16.5	15	13.5	12.1	10.6
11.2	12.7	14.2	15.6	17.1	**105**	16.7	15.3	13.8	12.3	10.8
11.4	12.9	14.4	15.9	17.4	**106**	17	15.5	14	12.5	11
11.6	13.1	14.7	16.2	17.7	**107**	17.3	15.8	14.3	12.7	11.2
11.8	13.4	14.9	16.5	18	**108**	17.6	16.1	14.5	13	11.4
12	13.6	15.2	16.8	18.3	**109**	17.9	16.4	14.8	13.2	11.6
12.2	13.8	15.4	17.1	18.7	**110**	18.2	16.6	15	13.4	11.9

Notes:

1. SD = standard deviation score or Z-score; although the interpretation of a fixed percent-of-median value varies across age and height, and generally the two scales cannot be compared, the approximate percent-of-the median values for –1 and –2SD are 90% and 80% of median, respectively (*Bulletin of the World Health Organization*, 1994, **72**: 273-283).

2. Length is measured below 85 cm; height is measured 85 cm and above. Recumbent length is on average 0.5 cm greater than standing height, although the difference is of no importance to the individual child. A correction may be made by deducting 0.5 cm from all lengths above 84.9 cm if the standing height cannot be measured.

A4.2 Monitoring weight gain

Calculating weight gain

The example below is for weight gain over 3 days, but the same procedure can be applied to any interval.

- Subtract the child's weight (in grams) as it was 3 days earlier from the current weight.
- Divide by 3 to determine the average daily weight gain (g/day)
- Divide by the child's average weight in kg to calculate the weight gain as g/kg/day.

Monitoring charts: explanation of the charts on the following pages

There is a blank weight chart on page 150, which can be used to monitor the weight gain of a severely malnourished child. The horizontal '*x*' axis represents the number of days after admission, while the vertical '*y*' axis represents the weight of the child in kilograms. Notice that the weight in kg has been left blank, and is stepped in 0.5 kg increments. This means the chart can be photocopied and used for any child, irrespective of their starting weight. Fill in the starting weight at the appropriate level (such as 5 kg, 5.5 kg, 6 kg ..... or 7 kg, 7.5 kg, 8 kg etc.). Choosing an appropriate starting weight like this is preferable to using a chart with weights marked from 0, because this more flexible chart gives a larger scale which shows the pattern of change clearly.

An example of a completed weight chart is given on page 151 and shows how the blank weight chart can be filled in and used. It shows the weight gain of a boy weighing 5.8 kg on admission.

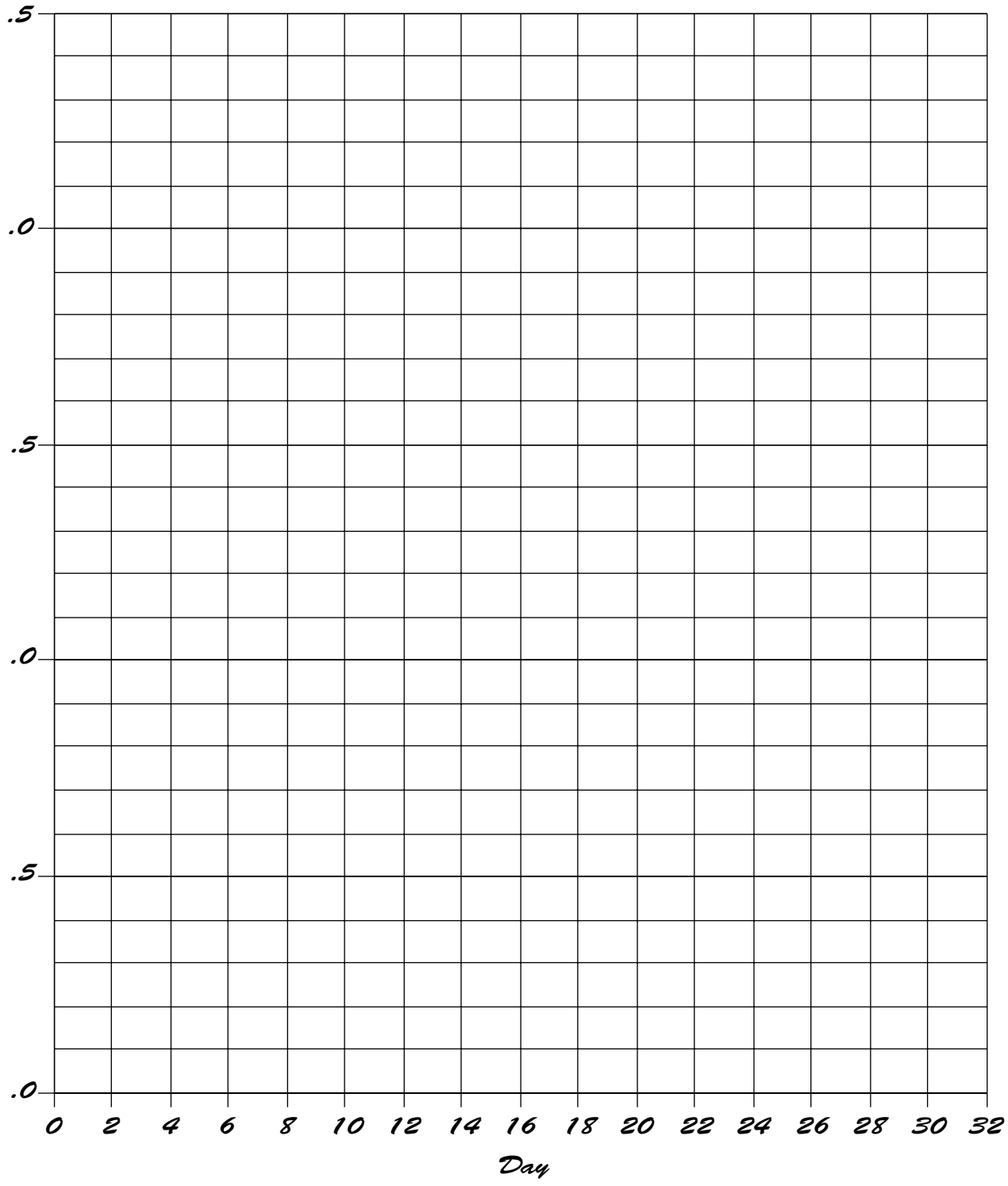
A blank intake and output chart for recording the food given to an individual patient, the amount consumed, and any losses through vomiting or diarrhoea is given on page 152.

An example of a daily ward feed chart, which enables the ward supervisor to decide how much feed to prepare for the whole ward and what to give to individual patients is given on page 153. A similar chart (blank) is shown on page 154.

Blank Weight Chart

Weight on admission

Weight on discharge

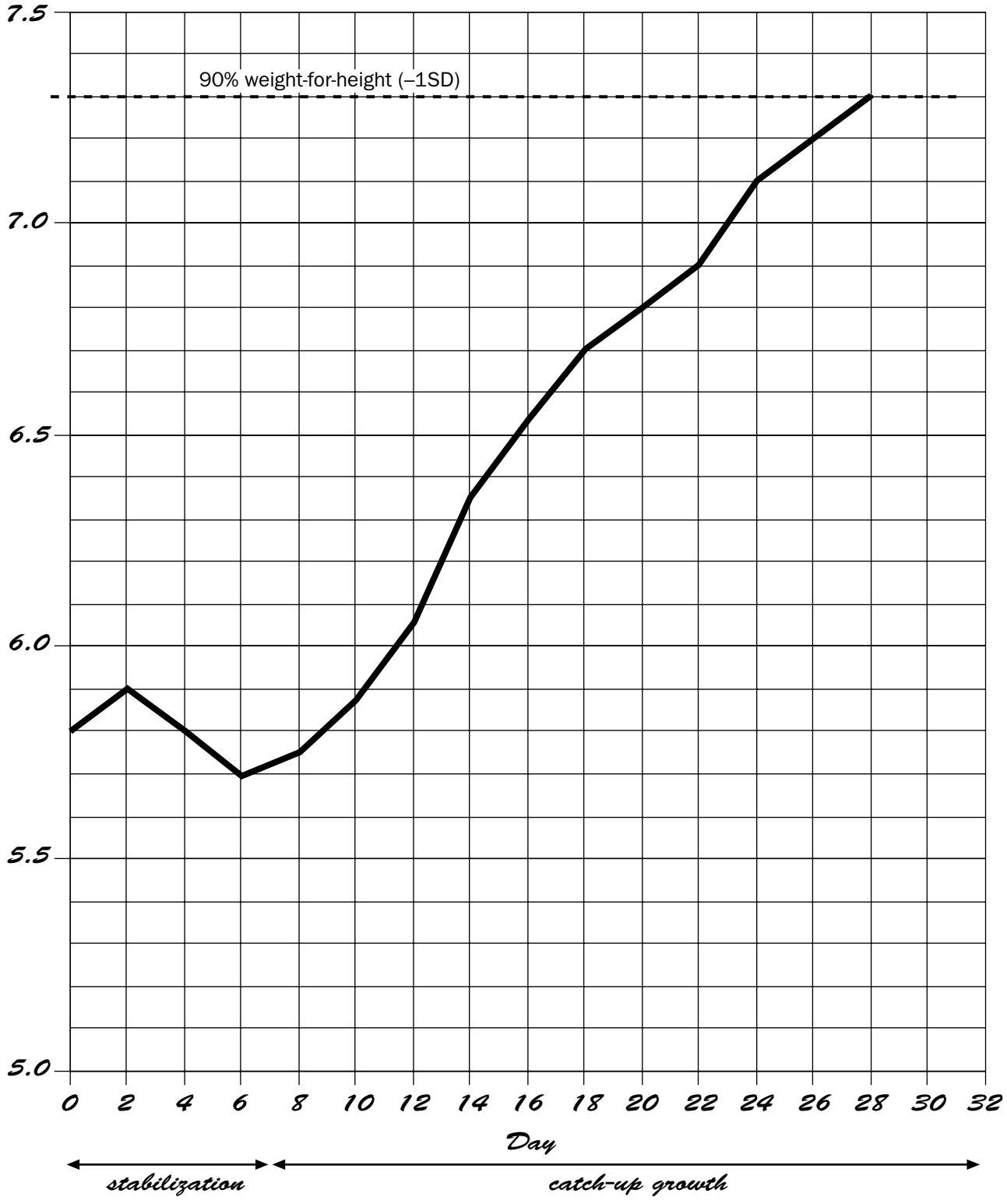


Weight chart: example (boy weighing 5.8 kg on admission)

Boy: Height 68 cm

Weight on admission *5.8 kg*

Weight on discharge *7.3 kg*



24-Hour Food Intake Chart

Ward _____

Name _____ Hospital number _____

Age _____ Weight _____ Date of Admission _____

Date ..... Feed: ..... feeds of ..... ml each = ... ml per day

Time	Type of feed	Volume offered (ml)	Volume left in cup (ml)	Amount taken by child (ml)	Vomit estimate (ml)	Watery diarrhoea (Yes/No)
Totals:				Sub-total		Total taken in 24 hrs

Daily Ward Feed Chart—example

Date *24/12/97* Ward *Johnson*

	F-75			F-100		
Name	Freq/day	Amount/ feed	Total	Freq/day	Amount/ feed	Total
John Smith	*6 x*	*135*	*810*			
Ann Jones	*12 x*	*40*	*480*			
Jo Bloggs	*8 x*	*60*	*480*			
Jim Brown				*6 x*	*150*	*900*
Janet White	*6 x*	*100*	*600*			
Paul Red	*8 x*	*35*	*280*			
Billy Blue				*6 x*	*170*	*1020*
TOTAL amount needed	F-75 *2650*			F-100 *1920*		

Daily Ward Feed Chart—blank

Date _____ Ward _____

	F-75			F-100		
Name	Freq/day	Amount/ feed	Total	Freq/day	Amount/ feed	Total
TOTAL amount needed	F-75			F-100		

APPENDIX 5

Toys and play therapy

A5.1 Sample curriculum for play therapy

Each play session should include language and motor activities, and activities with toys. Teach the games or skills listed below when the child is ready for them. Encourage the child to use appropriate words to describe what he or she is doing.

Language activities (from 12 months)

At every play session, teach the child local songs, and games using the fingers and toes. Encourage the child to laugh, vocalise and describe what he or she is doing. Teach the child to use words such as bang when beating the drum, bye when waving goodbye, and thank you when given something.

Motor activities (from 6 months)

Always encourage the child to perform the next appropriate motor activity. For example, bounce the child up and down and hold the child under the arms so the child's feet support his or her weight. Help the child to sit up by propping him or her up with cushions or any other appropriate materials. Roll toys out of reach to encourage the child to crawl after them. Hold the child's hands and help him or her to walk. As soon as the child has started to walk unaided, give the child a push-along toy and later a pull-along toy (see below).

Activities with toys (see figures on page 157)

Ring on a string (from 6 months)

1. Swing a ring on a string within reach of the child and encourage him or her to reach for it.
2. Suspend the ring over the crib and encourage the child to knock it and make it swing.
3. Let the child examine the ring. Then place the ring a short distance from the child, leaving the string within reach of the child. Teach the child to get the ring by pulling on the string.
4. Sit the child on your lap. Then, holding the string, lower the ring towards the floor. Teach the child to get the ring by pulling on the string. Also teach the child to dangle the ring.

Rattle and drum (from 12 months)

1. Let the child examine the rattle. Teach the child to use the word shake when shaking the rattle.
2. Encourage the child to beat the drum with the rattle. Teach the child to use the word bang when beating the drum.
3. Roll the drum out of the child's reach and encourage him or her to crawl after it.

In-and-out toy with blocks (from 9 months)

1. Let the child examine the container and blocks. Put the blocks into the container and shake it. Then teach the child to take them out, one at a time. Teach the child the meaning of the words *out* and *give*.
2. Teach the child to take out the blocks by turning the container upside-down.
3. Teach the child to hold a block in each hand and to bang the blocks together.
4. Teach the child to put the blocks in the container and to take them out again. Teach the child to use the words *in* and *out*.
5. Cover the blocks with the container and let the child find them. Then hide them under two or three covers or pieces of cloth and repeat the game. Teach the child to use the word *under*.
6. Turn the container upside-down and teach the child to put blocks on top of it.
7. Teach the child to stack the blocks, first two, then gradually more. Teach the child to use the words *up* when stacking the blocks and *down* when knocking them down.
8. Line up the blocks horizontally, first two, then more. Teach the child to push them along, making train or car noises. For children aged 18 months or more, teach the meaning of the words *stop*, *go*, *fast*, *slow* and *next to*. Then teach the child to sort the blocks by colours, first two colours, then more. Teach the meaning of the words *high* and *low*. Make up games.

Posting bottle (from 12 months)

Put some objects into a bottle. Shake it. Teach the child to turn the bottle upside-down and empty out the objects. Then teach the child to put the objects into the bottle and to take them out again. Try the same game again with different objects.

Stacking bottle tops (from 12 months)

Let the child play with two bottle tops. Then teach the child to stack them. Later increase the number of bottle tops. Teach children over 18 months to sort the bottle tops by colour and to use the words high and low when describing the stacks.

Doll (from 12 months)

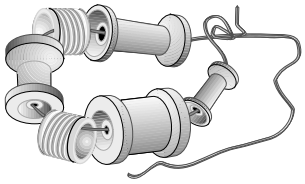
Encourage the child to hold the doll. Teach the child to identify his or her own body parts and those of the doll when you name them. Teach children over 2 years to name their own body parts. Put the doll in a box for a bed and teach the child the words bed and sleep.

Books (from 18 months)

Sit the child on your lap. Teach the child to turn the pages of the book and to point to the pictures. Then teach the child to point to the pictures that you name. Talk about the pictures. Show the child the pictures of simple familiar objects and of people and animals. Teach children over 2 years to name the pictures and to talk about them.

A5.2 **Toys for severely malnourished children**

Ring on a string (from 6 months)
Thread cotton reels and other small objects (e.g. cut from the neck of plastic bottles) on to a string. Tie the string in a ring, leaving a long piece of string hanging.

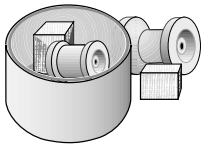


Rattle (from 12 months)
Cut long strips of plastic from coloured plastic bottles. Place them in a small transparent plastic bottle and glue the top on firmly.

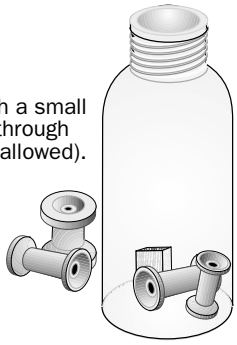
Drum (from 12 months)
Any tin with a tightly fitting lid.

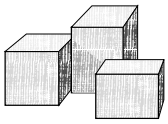
Mirror (from 18 months)
A tin lid with no sharp edges.

In-and-out toy (from 9 months)
Any plastic or cardboard container and small objects (not small enough to be swallowed).



Posting bottle (from 12 months)
A large transparent plastic bottle with a small neck and small long objects that fit through the neck (not small enough to be swallowed).

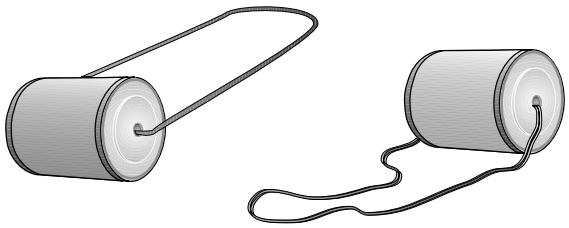




Blocks (from 9 months)
Small blocks of wood. Smooth the surfaces with sandpaper and paint in bright colours, if possible.

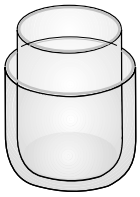
Push-along toy (from 12 months)
Make a hole in the centre of the base and lid of a cylindrical-shaped tin. Thread a piece of wire (about 60 cm long) through each hole and tie the ends inside the tin. Put some metal bottle tops inside the tin and close the lid.

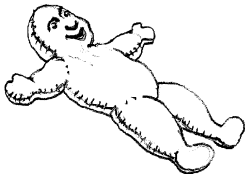
Stacking bottle tops (from 12 months)
Cut at least three identical round plastic bottles in half and stack them.



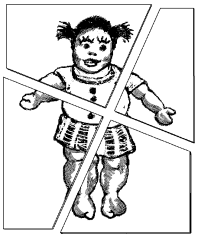
Pull-along toy (from 12 months)
As above, except that string is used instead of wire.

Nesting toys (from 9 months)
Cut off the bottom of two bottles of identical shape, but different size. The smaller bottle should be placed inside the larger bottle.



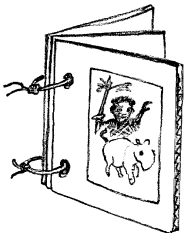


Puzzle (from 18 months)
Draw a figure (e.g. a doll) using a crayon on a square- or rectangular-shaped piece of cardboard. Cut the figure in half or quarters.



Doll (from 12 months)
Cut out two doll shapes from a piece of cloth and sew the edges together, leaving a small opening. Turn the doll inside-out and stuff with scraps of materials. Stitch up the opening and sew or draw a face on the doll.

Book (from 18 months)
Cut out three rectangular-shaped pieces of the same size from a cardboard box. Glue or draw a picture on both sides of each piece. Make two holes down one side of each piece and thread string through to make a book.



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Index

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Fabrice Prati: pp. 6, 9 top, 29, 34, 36 right, 38, 39, 43, 44, 45, 46, 56, 57, 61 left, 62 bottom, 65, 69, 70, 71, 72, 75, 76,77, 78, 80, 81, 82, 89, 90, 109, 110 left, 124 left, 125, 126 right, 127, 128, 130, 132, 133, 134.

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