POCKET BOOK

OF

Hospital care for children

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GUIDELINES FOR THE MANAGEMENT OF COMMON ILLNESSES WITH LIMITED RESOURCES

World Health Organization

WHO Library Cataloguing-in-Publication Data

Pocket book of hospital care for children: guidelines for the management of common illnesses with limited resources.

1.Pediatrics 2.Child care 3.Hospitals 4.Child, Hospitalized 5.Developing countries 6.Practice guidelines 7.Manuals I.World Health Organization.

ISBN 92 4 154670 0 (NLM classification: WS 29)

Designed by minimum graphics

Printed in China, Hong Kong Special Administrative Region

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Acknowledgements

This pocket book is the result of an international effort coordinated by the World Health Organization's Department of Child and Adolescent Health and Development.

A special debt of gratitude is owed to Dr Harry Campbell, University of Edinburgh, Scotland for the overall coordination of the preparation of the chapters of the document and significant contributions to individual chapters.

WHO would like to thank the following for their preparation of and contributions to the chapters:

Dr Ann Ashworth (UK); Dr. Stephen Bickler (USA); Dr Jacqueline Deen (Philippines), Dr Trevor Duke (PNG/Australia); Dr Greg Hussey (South Africa); Dr Michael English (Kenya); Dr Stephen Graham (Malawi); Dr Elizabeth Molyneux (Malawi); Dr Nathaniel Pierce (USA); Dr Haroon Saloojee (South Africa); Dr Barbara Stoll (USA); Dr Giorgio Tamburlini (Italy); Dr Bridget Wills (Vietnam); and Fabienne Jäger (Switzerland) for assistance in the review and revision process.

WHO is grateful to the following for reviewing the manuscript at different stages:

L. Adonis-Koffy, Côte d'Ivoire; E. Agyei-Yobo, Ghana; M. Agyemang, Ghana; R. Ahmed, Maldives; E. Akrofi-Mantey, Ghana; H., Almaraz Monzon; A. Amanor, Ghana; E. Aranda, Bolivia; W. , Asamoah, Ghana; C. Assamoi Bodjo, Côte d'Ivoire; A. Bartos, Bolivia; Z. Bhutta, Pakistan; U. Bodhankar, India; L. Bramante, Italy; L. Bravo, Philippines; D. Brewster, Vanuatu; J. Bunn, UK; K. Bylsma, Ghana; C. Casanovas, Bolivia; N. Chintu, Zambia; B. Coulter, UK; S. Cywes, South Africa; A. da Cunha, Brazil; S.-C. Daka, Cambodia; A. Deorari, India; G.F. Ding, China; V. Doku, Ghana; P. Enarson, France; J. Erskine, Gambia; F.A. Eshgh, Iran; A. Falade, Nigeria; J. Farrar, Vietnam, C. Frago, Philippines; M. Funk, Ghana; S. C. Galina, Russia; E. Gallardo, Philippines; R. Gie, South Africa; A. Grange, Nigeria; A. Hansmann, Germany; H. Hartmann, Germany; S. Heinrich, Cambodia; E.M. Hubo, Philippines; R. Ismail, Indonesia; P. Jeena, South Africa; A. Jhukral, India; S. Junge, Switzerland; V. Kapoor, India; M. Kazemian, Iran; N. Kesaree, India; E. Keshishian, Russia; H. T. Kim, Vietnam; E. Kissi Owusu, Ghana; A. Klufio, Ghana; J. Kouawo, Côte d'Ivoire; M. Krawinkel, Germany; B. Kretschmer, Germany; C. Krueger, Germany; A. Krug, South Africa; M. Langaroodi; J. Lawn, UK; J. Lim, Philippines; W. Loening, South Africa; M.P. Loscertales, Spain; C. Maclennan, Australia; A. Madkour, Egypt;

I. Mahama, Ghana; D. Malchinkhuu, Mongolia; N. Manjavidze, Georgia; P. Mazmanyan, Armenia; D. Mei, China; A. Mekasha, Ethiopia; C.A. Melean Gumiel, Bolivia; C. Meng, Cambodia; W. Min, China; H. Mozafari, Iran; K. Mulholland, Australia; A. Narang, India; S. Nariman, Iran; K.J. Nathoo, Zimbabwe; K. Nel, South Africa; S. K. Newton, Ghana; K. Olness, USA; K. Pagava, Georgia; V. Paul, India; I. Rahman, Sudan; M. Rakha, Egypt; S.E. Razmikovna, Russia; R. Rios, Chile; H. Rode, South Africa; E. Rodgers, Fiji; I. Ryumina, Russia; I. Sagoe-Moses, Ghana; G. Sall, Senegal; L. C. Sambath, Cambodia; W. Sangu, Tanzania; J. Schmitz, France; F. Shann, Australia; P. Sharma, Nepal; M. Shebbe, Kenya; L. Sher, South Africa; N. Singhal, Canada; D. Southall, UK; J.-W. Sun, China; G. Swingler, South Africa; T.T. Tam, Vietnam; E. Tanoh; M. Taylor, Ghana; E. Teye Adjase, Ghana; I. Thawe, Malawi; M. Timite-Konan, Côte d'Ivoire; P. Torzillo, Australia; R. Turki, Tunisia; F. Uxa, Italy; D.-H. Wang, China; D. Woods, South Africa; B.J. Wudil, Nigeria; A.J. Yao, Côte d'Ivoire.

Valuable inputs were provided by the WHO Clusters of Communicable Diseases and of Non Communicable Diseases, and WHO Departments of Disability/Injury Prevention and Rehabilitation, Essential Drugs and Medicines Policy, Essential Health Technology, HIV/AIDS, Nutrition for Health and Development, Protection of the Human Environment, Reproductive Health and Research, Roll Back Malaria, Stop Tuberculosis, and Vaccines and Biologicals and by WHO Regional Offices.

WHO wishes to thank the following organizations who contributed to the production of the pocket book:

Australian Agency for International Development (AusAID); Institute for Child Health IRCCS "Burlo Garofolo", Trieste, Italy; and the International Paediatric Association.

international pediatric association
association internationale de pédiatrie
asociación internacional de pediatría

Foreword

This pocket book 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 which are based on a review of the available published evidence by subject 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, these guidelines can be used in the larger 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, blood glucose, blood grouping and cross-matching, basic microscopy of CSF and urine, bilirubin determination for neonates, chest radiography and pulse oximetry—and (2) essential drugs available for the care of seriously ill children. Expensive treatment options, such as new antibiotics or mechanical ventilation, are not described.

These guidelines focus on the inpatient management of the major causes of childhood mortality, such as pneumonia, diarrhoea, severe malnutrition, malaria, meningitis, measles, and related conditions. They contain guidance on the management of children with HIV infection, neonates with problems, and of the surgical management of children. Details of the principles underlying the guidelines can be found in technical review papers published by WHO. A companion background book has also been published by WHO which gives details of burden of disease, pathophysiology and technical basis underlying the guidelines for use by medical/nursing students or as part of inservice training of health workers. The evidence-base underlying these recommendations is published on the WHO website as well. (See Further Reading, page 301.)

This pocket book is part of a series of documents and tools that support the Integrated Management of Childhood Illness (IMCI) and is consistent with the IMCI guidelines for outpatient management of sick children. It is presented in a format that could be carried by doctors, nurses and other health workers during their daily work and so be available to help guide the management of sick children. Standard textbooks of paediatrics should be consulted for rarer conditions not covered in the pocketbook. These guidelines are applicable in

most areas of the world and may be adapted by countries to suit their specific circumstances. Blank pages have been left at the end of each chapter to allow individual readers to include their own notes—for example, on locally important conditions not covered in this pocket book.

WHO believes that their widespread adoption would improve the care of children in hospital and lead to lower case fatality rates.

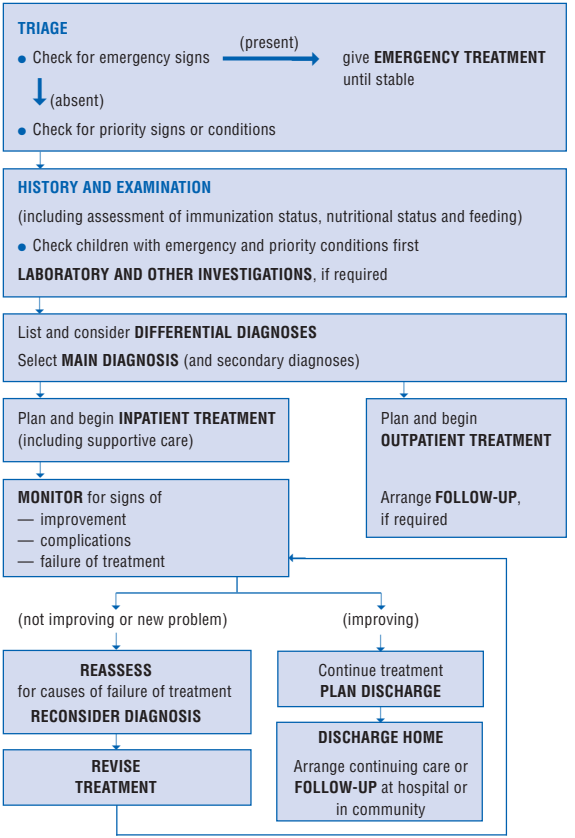
Abbreviations

AIDS	acquired immunodeficiency syndrome
AVPU	simple consciousness scale (**a**lert, responding to **v**oice, responding to **p**ain, **u**nconscious)
BP	blood pressure
CMV	cytomegalovirus
CSF	cerebrospinal fluid
DHF	dengue haemorrhagic fever
DPT	diphtheria, pertussis, tetanus
DSS	dengue shock syndrome
EPI	expanded programme of immunization
FG	French gauge
G6PD	glucose 6-phosphate dehydrogenase
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
NG	nasogastric
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
STI	sexually transmitted infection
TB	tuberculosis
TMP	trimethoprim
TPHA	treponema pallidum haemogglutination
SMX	sulfamethoxazole
UTI	urinary tract infection
VDRL	veneral disease research laboratories
WBC	white blood cell count
WHO	World Health Organization
°C	degrees Celsius
°F	degrees Fahrenheit

■ diagnostic sign or symptom

➤ treatment recommendation

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



CHAPTER 1

Triage and emergency conditions

SUMMARY OF STEPS IN EMERGENCY TRIAGE ASSESSMENT AND TREATMENT

Triage is the process of rapidly screening sick children soon after their arrival in hospital in order to identify:

— 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 (cold hands; capillary refill longer than 3 seconds; weak, fast pulse)
- coma
- convulsions
- signs of severe dehydration in a child with diarrhoea (lethargy, sunken eyes, very slow return after pinching the skin—any two of these).

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

The priority signs (see below, page 5) identify children who are at higher risk of dying. These children should be ***assessed without unnecessary delay***.

1.1 Summary of steps in emergency triage assessment and treatment

The process of emergency triage assessment and treatment is summarized in the Charts on pages 4–16.

*First, check for **emergency signs**.*

Check for emergency signs in two steps:

- **Step 1**. If there is any airway or breathing problem, 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.

If emergency signs are found:

- Call an experienced health professional to help if available, but do not delay starting the treatment. Stay calm and work with other health workers who

may be required to give the treatment, because a very sick child may need several treatments at once. The most experienced health professional should continue assessing the child (see Chapter 2, page 37), 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.

Tables of common differential diagnoses for emergency signs are provided from page 20 onwards.

If no emergency signs are found, check for priority signs:

- **T**iny baby: any sick child aged under 2 months
- **T**emperature: child is very hot
- **T**rauma or other urgent surgical condition
- **P**allor (severe)
- **P**oisoning
- **P**ain (severe)
- **R**espiratory distress
- **R**estless, continuously irritable, or lethargic
- **R**eferral (urgent)
- **M**alnutrition: visible severe wasting
- **O**edema of both feet
- **B**urns (major)

The above can be remembered with the help of "3TPR MOB".

These children need prompt assessment (no waiting in the queue) to determine what further treatment is needed. Move the child with any priority sign to the front of the queue to be assessed next. If a child has trauma or other surgical problems, get surgical help where available.

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)

ASSESS

TREAT
Do not move neck if cervical spine injury possible

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

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 intraosseous or external jugular line
(see pages 310, 312)

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

CHART 2. Triage of all sick children (*continued*)

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

ASSESS

TREAT
Do not move neck if cervical spine injury possible

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 13, page 114)

If severe malnutrition:
- ➤ Do **not** insert IV
- ➤ Proceed immediately to full assessment and treatment (see section 1.3, page 18)

PRIORITY SIGNS
These children need prompt assessment and treatment

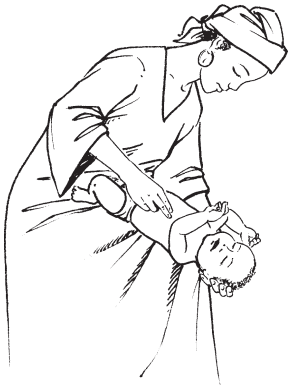
- Tiny baby (<2 months)
- Temperature very high
- Trauma or other urgent surgical condition
- Pallor (severe)
- Poisoning (history of)
- Pain (severe)
- Respiratory distress
- Restless, continuously irritable, or lethargic
- Referral (urgent)
- Malnutrition: visible severe wasting
- Oedema of both feet
- Burns (major)

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

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

CHART 3. How to manage the choking infant

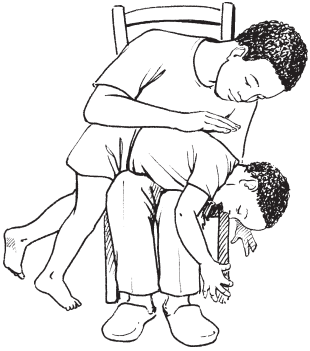
Back slaps



Chest thrusts

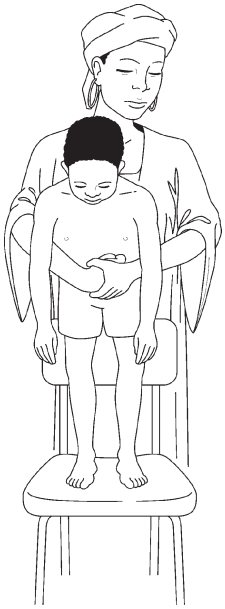
- Lay the infant on your arm or thigh in a head down position
- Give 5 blows to the infant's back with heel of hand
- If obstruction persists, turn infant over and give 5 chest thrusts with 2 fingers, one finger breadth below nipple level in midline (see diagram)
- If obstruction persists, check infant's mouth for any obstruction which can be removed
- If necessary, repeat sequence with back slaps again

CHART 3. How to manage the choking child (over 1 year of age)



Slapping the back to clear airway obstruction in a choking child

- 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
- 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



Heimlich manoeuvre in a choking older child

CHART 4. How to manage the airway in a child with obstructed breathing (or who has just stopped breathing) where no neck trauma is suspected

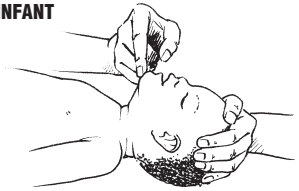
Child conscious

1. Inspect mouth and remove foreign body, if present
2. Clear secretions from throat
3. Let child assume position of maximal comfort

Child unconscious

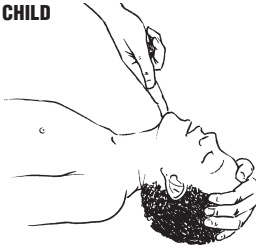
1. Tilt the head as shown
2. Inspect mouth and remove foreign body, if present
3. Clear secretions from throat
4. Check the airway by looking for chest movements, listening for breath sounds and feeling for breath

INFANT

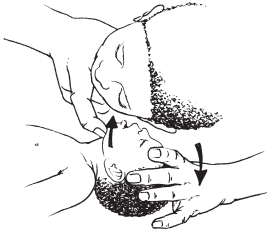


Neutral position to open the airway in an infant

OLDER CHILD



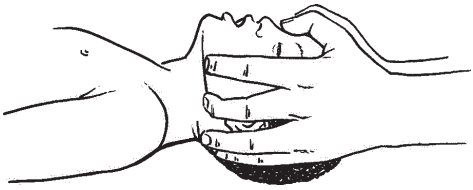
Sniffing position to open the airway in an older child



Look, listen and feel for breathing

CHART 4. How to manage the airway in a child with obstructed breathing (or who has just stopped breathing) where neck trauma or possible cervical spine injury is suspected

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. Place the 4th and 5th finger behind the angle of the jaw and move it upwards so that the bottom of the jaw is thrust forwards, at 90° to the body

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

CHART 5. How to give oxygen

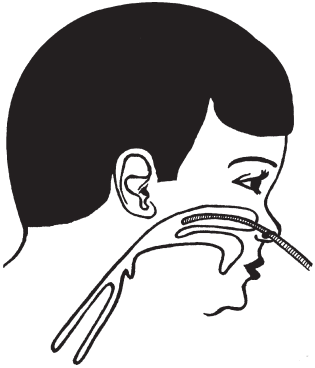
Give oxygen through nasal prongs or a nasal catheter

Nasal Prongs

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

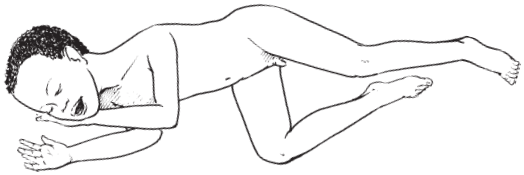
Nasal Catheter

- Use an 8 FG 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 pages 281–284)

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 and chin 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.

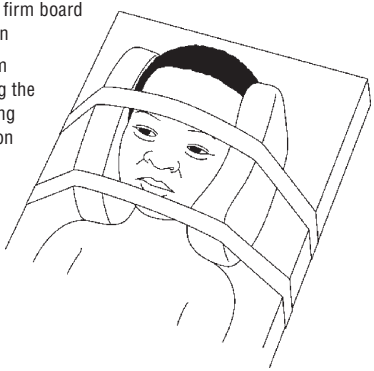


CHART 7. How to give IV fluids rapidly for shock in a child without severe malnutrition

- If the child is severely malnourished the fluid volume and rate are different, so check that the child is not severely malnourished

  Shock in child without severe malnutrition—Chart 7
  Shock in child with severe malnutrition—Chart 8 (and section 1.3, page 18)
- 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 (if shock is not caused by profuse diarrhoea, in this case repeat Ringer's lactate or normal saline).
Reassess after fourth infusion:	If no improvement, see disease-specific treatment guidelines. You should have established a provisional diagnosis by now.

After improvement at any stage (pulse slows, faster capillary refill), go to Chart 11, page 16.

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), according to availability:
  - 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 Give over 1 hour (15 ml/kg)	Weight	Volume IV fluid 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 respiratory rates fall):

  - give repeat IV 15 ml/kg over 1 hour; then
  - switch to oral or nasogastric rehydration with ReSoMal (see page 179), 10 ml/kg/h up to 10 hours;
  - initiate refeeding with starter F-75 (see page 184).

  If the child fails to improve after the first 15ml/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 184);
  - start antibiotic treatment (see page 182).

  If the child deteriorates during the IV rehydration (breathing increases by 5 breaths/min or pulse by 15 beats/min), stop the infusion because IV fluid can worsen the child's condition.

CHART 9. How to give diazepam (or paraldehyde) rectally

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 (1.5 mg)	1.0 ml
2–<4 months (4–<6 kg)	0.5 ml (2.5 mg)	1.6 ml
4–<12 months (6–<10 kg)	1.0 ml (5 mg)	2.4 ml
1–<3 years (10–<14 kg)	1.25 ml (6.25 mg)	4 ml
3–<5 years (14–19 kg)	1.5 ml (7.5 mg)	5 ml

If convulsion continues after 10 minutes, give a second dose of diazepam rectally (or give diazepam intravenously (0.05 ml/kg = 0.25 mg/kg) 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 15 mg/kg).

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 minute
Weight 3 kg—initial dose: 0.3 ml, repeat 0.15 ml after 30 minute
} if convulsions continue

CHART 10. How to give IV glucose

- Insert IV line and draw blood for emergency laboratory investigations
- Check blood glucose. If low (<2.5 mmol/litre (45 mg/dl) in a well nourished or <3 mmol/litre (54 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:

  — 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), or

  — IV fluids containing 5–10% glucose (dextrose) (see App. 4, p. 357)

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 the use of dextrostix, refer to instruction on box. Generally, 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 after initial management of shock

For children with severe dehydration but without shock, refer to diarrhoea treatment plan C, p.114.

If the child is in shock, first follow the instructions in Charts 7 and 8 (pages 12 and 13). 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 2½ 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 2½ 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 (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 of 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 plan (A, B, or C, pages 120, 117, 114) 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.

1.2 Notes for the assessment of emergency and priority signs

■ Assess the airway and breathing (A, B)

Does the child's breathing appear obstructed? Look and listen to determine if there is poor air movement during breathing.

Is there severe respiratory distress? The breathing is very laboured, the child uses auxiliary muscles for breathing (shows head nodding), is breathing very fast, and the child appears to tire easily. Child is not able to feed because of respiratory distress.

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

■ Assess circulation (for shock) (C)

Check if the child's hand is cold? If so

Check if the capillary refill time is longer than 3 seconds. Apply pressure to whiten the nail of the thumb or the big toe for 3 seconds. Determine the time from the moment of release until total recovery of the pink colour.

If capillary refill takes longer than 3 seconds, check the pulse. Is it 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 (C)

Is the child in coma? Check the level of consciousness on the AVPU scale:

- **A** **a**lert,
- **V** responds to **v**oice,
- **P** responds to **p**ain,
- **U** **u**nconscious.

If the child is not awake and alert, try to rouse the child by talking or shaking the arm. If the child is not alert, but responds to voice, he is lethargic. If there is no response, ask the mother if the child has been abnormally sleepy or difficult to wake. Look if the child responds to pain, or if he is unresponsive to a painful stimulus. If this is the case, the child is in coma (unconscious) and needs emergency treatment.

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

■ Assess for severe dehydration if the child has diarrhoea (D)

Does the child have sunken eyes? 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 for 1 second, then release and observe.

■ Assess for priority signs

While assessing for emergency signs, you will have noted several possible priority signs:

Is there any respiratory distress (not severe)?
Is the child lethargic or continuously irritable or restless?

This was noted when you assessed for coma.

Note the other priority signs (see page 5).

1.3 Notes for giving 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.

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 accordingly (see charts on pages 4–16).
- 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 179).
- 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 15), and then IV fluids (see Chart 8, page 13, 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 (page 173) 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.

1.4 Diagnostic considerations of children presenting with emergency conditions

The following text provides guidance for the approach to the diagnosis and the differential diagnosis of presenting conditions for which emergency treatment has been provided. After you have stabilized the child and provided emergency treatment, determine the underlying cause of the problem, to be able to provide specific curative treatment. The following lists and tables provide some guidance which help with the differential diagnosis, and are complemented by the tables in the symptom-specific chapters.

1.4.1 Child presenting with an airway or severe breathing problem

History

- Onset of symptoms: slowly developing or sudden onset
- Previous similar episodes
- Upper respiratory tract infection
- Cough
  — duration in days
- History of choking
- Present since birth, or acquired
- Immunization history
  — DTP, measles

(*continued on page 21*)

CHILD PRESENTING WITH AN AIRWAY OR SEVERE BREATHING PROBLEM

Table 1. Differential diagnosis of the child presenting with an airway or severe breathing problem

Diagnosis or underlying cause	In favour
Pneumonia	— Cough with fast breathing and fever — Development over days, getting worse — Crepitations on auscultation
Asthma	— History of recurrent wheezing — Prolonged expiration — Wheezing or reduced air entry — Response to bronchodilators
Foreign body aspiration	— History of sudden choking — Sudden onset of stridor or respiratory distress — Focal reduced air entry or wheeze
Retropharyngeal abscess	— Slow development over days, getting worse — Inability to swallow — High fever
Croup	— Barking cough — Hoarse voice — Associated with upper respiratory tract infection
Diphtheria	— Bull neck appearance of neck due to enlarged lymph nodes — Red throat — Grey pharyngeal membrane — No DTP vaccination

Table 2. Differential diagnosis of the child presenting with shock

Diagnosis or underlying cause	In favour
Bleeding shock	— History of trauma — Bleeding site
Dengue shock syndrome	— Known dengue outbreak or season — History of high fever — Purpura
Cardiac shock	— History of heart disease — Enlarged neck veins and liver
Septic shock	— History of febrile illness — Very ill child — Known outbreak of meningococcal infection
Shock associated with severe dehydration	— History of profuse diarrhoea — Known cholera outbreak

- Known HIV infection
- Family history of asthma

Examination

- Cough
  — quality of cough
- Cyanosis
- Respiratory distress
- Grunting
- Stridor, abnormal breath sounds
- Nasal flaring
- Swelling of the neck
- Crepitations
- Wheezing
  — generalized
  — focal
- Reduced air entry
  — generalized
  — focal

1.4.2 Child presenting with shock

History

- Acute or sudden onset
- Trauma
- Bleeding
- History of congenital or rheumatic heart disease
- History of diarrhoea
- Any febrile illness
- Known dengue outbreak
- Known meningitis outbreak
- Fever
- Able to feed

Examination

- Consciousness
- Any bleeding sites
- Neck veins
- Liver size
- Petechiae
- Purpura

1.4.3 Child presenting with lethargy, unconsciousness or convulsions

History

Determine if there is a history of:

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

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 .

It is important to determine the length of time a child has been unconscious and his/her AVPU score (see page 17). This coma scale score should be

Table 3. Differential diagnosis of the child presenting with lethargy, unconsciousness or convulsions

Diagnosis or underlying cause	In favour
Meningitis [a,b]	— Very irritable — 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 — Anaemia — Convulsions — Hypoglycaemia
Febrile convulsions (not likely to be the cause of unconsciousness)	— Prior episodes of short convulsions when febrile — Associated with fever — 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)	— Poor perfusion — Rapid, weak pulse
Acute glomerulonephritis with encephalopathy	— Raised blood pressure — Peripheral or facial oedema — Blood in urine — Decreased or no 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 not be done if there are signs of raised intracranial pressure (see pages 149, 316). A positive lumbar puncture is one where there is cloudy CSF on direct visual inspection. 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/litre (<54 mg/dl) in a severely malnourished child.

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 Japanese encephalitis, dengue haemorrhagic fever, typhoid, and relapsing fever.

Table 4. 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 — History of difficult delivery
Intracranial haemorrhage	— Onset in first 3 days of life in a low-birth-weight or preterm Infant
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

1.5 Common poisonings

Suspect poisoning in any unexplained illness in a previously healthy child. Consult standard textbook of paediatrics for management of exposure to specific poisons and/or any local sources of expertise in the management of poisoning, for example a poison centre. The principles of the management of ingestion of a few of the more common poisons only is given here. Note that traditional medicines can be a source of poisoning.

Diagnosis

This is made from the history by the child or carer, from clinical examination, and the results of investigations, where appropriate.

- Find out full details of the poisoning agent, the amount ingested and the time of ingestion.

Attempt to identify the exact agent involved requesting to see the container, where relevant. Check that no other children were involved. Symptoms and signs depend on the agent ingested and therefore vary widely—see below.

- Check for signs of burns in or around the mouth or of stridor (laryngeal damage) suggesting ingestion of corrosives.

➤ Admit all children who have ingested iron, pesticides, paracetamol or aspirin, narcotics, antidepressant drugs; children who have ingested deliberately and those who may have been given the drug or poison intentionally by another child or adult.

➤ Children who have ingested corrosives or petroleum products should not be sent home without observation for 6 hours. Corrosives can cause oesophageal burns which may not be immediately apparent and petroleum products, if aspirated, can cause pulmonary oedema which may take some hours to develop.

1.5.1 Principles for ingested poisons

Gastric decontamination (removal of poison from stomach) is most effective within one hour of ingestion, and after this time there is usually little benefit, except with agents that delay gastric emptying or in patients who are deeply unconscious. The decision on whether to attempt this has to consider each case separately and must weigh the likely benefits against the risks with each method. Gastric decontamination will not guarantee that all of the substance has been removed, so the child may still be in danger.

Contraindications to gastric decontamination are:

— an unprotected airway in an unconscious child
— ingestion of corrosives or petroleum products unless there is the risk of serious toxicity.

➤ Check the child for emergency signs (see page 2) and check for hypoglycaemia (page 177).

➤ Identify the specific agent and remove or adsorb it as soon as possible. Treatment is most effective if given as quickly as possible after the poisoning event, ideally within 1 hour.

- If the child has swallowed kerosene, petrol or petrol-based products (note that most pesticides are in petrol-based solvents) or if the child's mouth and throat have been burned (for example with bleach, toilet cleaner or battery acid), then **do not** make the child vomit but give water orally.

➤ **Never** use salt as an emetic as this can be fatal.

➤ If the child has swallowed other poisons

➤ Give activated charcoal, if available, and **do not** induce vomiting; give by mouth or NG tube according to table below. If giving by NG tube, be particularly careful that the tube is in the stomach.

Table 5. Amount of activated charcoal per dose

Children up to one year of age:	1 g/kg
Children 1 to 12 years of age:	25 to 50 g
Adolescents and adults:	25 to 100 g

- Mix the charcoal in 8–10 times the amount of water, e.g. 5 g in 40 ml of water.
- If possible, give the whole amount at once; if the child has difficulty in tolerating it, the charcoal dose can be divided.

➤ If charcoal is not available, then induce vomiting *but only if the child is conscious* by rubbing the back of the child's throat with a spatula or spoon handle; if this does not work, give an emetic such as paediatric ipecacuanha (10 ml for 6 months to 2 year-olds or 15 ml for over 2 years); if this does not work, then try rubbing the back of the child's throat again. *Note:* ipecacuanha can cause repeated vomiting, drowsiness and lethargy which can confuse the diagnosis of poisoning.

Gastric lavage

Only do it in health care facilities if staff has experience in the procedure, and if the ingestion was only a few hours ago and is life threatening, and there has

been no ingestion of corrosives or petroleum derivatives. Make sure a suction apparatus is available in case the child vomits. Place the child in the left lateral/head down position. Measure the length of tube to be inserted. Pass a 24–28 French gauge tube through the mouth into the stomach, as a smaller size nasogastric tube is not sufficient to let particles such as tablets pass. Ensure the tube is in the stomach. Perform lavage with 10 ml/kg body weight of warm normal saline (0.9%). The volume of lavage fluid returned should approximate to the amount of fluid given. Lavage should be continued until the recovered lavage solution is clear of particulate matter.

Note that tracheal intubation may be required to reduce risk of aspiration.

- Give specific antidote if this is indicated
- Give general care.
- Keep the child under observation for 4–24 hours depending on the poison swallowed
- Keep unconscious children in recovery position.
- Consider transferring child to next level referral hospital, where appropriate and where this can be done safely, if the child is unconscious or has deteriorating conscious level, has burns to mouth and throat, is in severe respiratory distress, is cyanosed or is in heart failure.

1.5.2 Principles for poisons in contact with skin or eyes

Skin contamination

- Remove all clothing and personal effects and thoroughly flush all exposed areas with copious amounts of tepid water. Use soap and water for oily substances. Attending staff should take care to protect themselves from secondary contamination by wearing gloves and apron. Removed clothing and personal effects should be stored safely in a see-through plastic bag that can be sealed, for later cleansing or disposal.

Eye contamination

- Rinse the eye for 10–15 minutes with clean running water or saline, taking care that the run-off does not enter the other eye. The use of anaesthetic eye drops will assist irrigation. Evert the eyelids and ensure that all surfaces are rinsed. In the case of an acid or alkali irrigate until the pH of the eye returns to, and remains, normal (re-check pH 15–20 minutes after stopping irrigation). Where possible, the eye should be thoroughly examined under fluorescein staining for signs of corneal damage. If there is significant conjunctival or corneal damage, the child should be seen urgently by an ophthalmologist.

1.5.3 Principles of inhaled poisons

- Remove from the source of exposure.
- Administer supplemental oxygen if required.

Inhalation of irritant gases may cause swelling and upper airway obstruction, bronchospasm and delayed pneumonitis. Intubation, bronchodilators and ventilatory support may be required.

1.5.4 Specific poisons

Corrosive compounds

Examples—sodium hydroxide, potassium hydroxide, acids, bleaches or disinfectants

- **Do not** induce vomiting or use activated charcoal when corrosives have been ingested as this may cause further damage to the mouth, throat, airway, oesophagus and stomach.
- Give milk or water as soon as possible to dilute the corrosive agent.
- Then give the child nothing by mouth and arrange for surgical review to check for oesophageal damage/rupture, if severe.

Petroleum compounds

Examples—kerosene, turpentine substitutes, petrol

- **Do not** induce vomiting or give activated charcoal as inhalation can cause respiratory distress with hypoxaemia due to pulmonary oedema and lipoid pneumonia. Ingestion can cause encephalopathy.
- Specific treatment includes oxygen therapy if respiratory distress (see page 281)

Organo-phosphorus and carbamate compounds

Examples: organophosphorus – malathion, parathion, TEPP, mevinphos (Phosdrin); and carbamates – methiocarb, carbaryl

These can be absorbed through the skin, ingested or inhaled.

The child may complain of vomiting, diarrhoea, blurred vision or weakness. Signs are those of excess parasympathetic activation: salivation, sweating, lacrimation, slow pulse, small pupils, convulsions, muscle weakness/twitching, then paralysis and loss of bladder control, pulmonary oedema, respiratory depression.

Treatment involves:

- Remove poison by irrigating eye or washing skin (if in eye or on skin).
- Give activated charcoal if ingested and within 1 hour of the ingestion.
- **Do not** induce vomiting because most pesticides are in petrol-based solvents.
- In a serious ingestion where activated charcoal cannot be given, consider careful aspiration of stomach contents by NG tube (the airway should be protected).
- If the child has signs of excess parasympathetic activation (see above), then give atropine 15–50 micrograms/kg IM (i.e. 0.015–0.05mg/kg) or by intravenous infusion over 15 minutes. The main aim is to reduce bronchial secretions whilst avoiding atropine toxicity. Auscultate the chest for signs of respiratory secretions and monitor respiratory rate, heart rate and coma score (if appropriate). Repeat atropine dose every 15 minutes until no chest signs of secretions, and pulse and respiratory rate returns to normal.
- Check for hypoxaemia with pulse oximetry, if possible, if giving atropine as it can cause heart irregularities (ventricular arrythmias) in hypoxic children. Give oxygen if oxygen saturation is less that 90%.
- If muscle weakness, give pralidoxime (cholinesterase reactivator) 25–50mg/kg diluted with 15 ml water by IV infusion over 30 minutes repeated once or twice, or followed by an intravenous infusion of 10 to 20 mg/kg/hour, as necessary.

Paracetamol

- If within 1 hour of ingestion give activated charcoal, if available, or induce vomiting UNLESS an oral antidote may be required (see below).
- Decide if antidote is required to prevent liver damage: ingestions of 150 mg/kg or more, or toxic 4 hour paracetamol level where this is available. Antidote is more often required for older children who deliberately ingest paracetamol or when parents overdose children by mistake.
- If within 8 hours of ingestion give oral methionine or IV acetylcysteine. Methionine can be used if the child is conscious and not vomiting (<6 years: 1 gram every 4 hours for 4 doses; 6 years or older: 2.5 grams every 4 hours for 4 doses).
- If more than 8 hours after ingestion, or the child cannot take oral treatment, give IV acetylcysteine. Note that the fluid volumes used in the standard regimen are too large for young children.

For children <20 kg give the loading dose of 150 mg/kg in 3 ml/kg of 5% glucose over 15 minutes, followed by 50 mg/kg in 7 ml/kg of 5% glucose over 4 hours, then 100 mg/kg IV in 14 ml/kg of 5% glucose over 16 hours. The volume of glucose can be scaled up for larger children.

Aspirin and other salicylates

This can be very serious in young children because they rapidly become acidotic and are consequently more likely to suffer the severe CNS effects of toxicity. Salicylate overdose can be complex to manage.

- These cause acidotic-like breathing, vomiting and tinnitus.
- ➤ Give activated charcoal if available. Note that salicylate tablets tend to form a concretion in the stomach leading to delayed absorption, so it is worthwhile giving several doses of charcoal. If charcoal is not available and a severely toxic dose has been given, then perform gastric lavage or induce vomiting, as above.
- ➤ Give IV sodium bicarbonate 1 mmol/kg over 4 hours to correct acidosis and to raise the pH of the urine to above 7.5 so that salicylate excretion is increased. Give supplemental potassium too. Monitor urine pH hourly.
- ➤ Give IV fluids at maintenance requirements unless child shows signs of dehydration in which case give adequate rehydration (see chapter 5).
- ➤ Monitor blood glucose every 6 hours and correct as necessary (see page 321).
- ➤ Give vitamin K 10mg IM or IV.

Iron

- Check for clinical features of iron poisoning: nausea, vomiting, abdominal pain and diarrhoea. The vomit and stools are often grey or black. In severe poisoning there may be gastrointestinal haemorrhage, hypotension, drowsiness, convulsions and metabolic acidosis. Gastrointestinal features usually appear in the first 6 hours and a child who has remained asymptomatic for this time probably does not require antidote treatment.
- ➤ Activated charcoal does not bind to iron salts, therefore consider giving a gastric lavage if potentially toxic amounts of iron were taken.
- ➤ Decide whether to give antidote treatment. Since this can have side-effects it should only be used if there is clinical evidence of poisoning (see above).
- ➤ If you decide to give antidote treatment, give deferoxamine (50 mg/kg IM up to a maximum of 1 g) by deep IM injection repeated every 12 hours; if

very ill, give IV infusion 15 mg/kg/hour to a maximum of 80 mg/kg in 24 hours.

Carbon monoxide poisoning

➤ Give 100% oxygen to accelerate removal of carbon monoxide (note patient can look pink but still be hypoxaemic) until signs of hypoxia disappear.

➤ Monitor with pulse oximeter but be aware that these can give falsely high readings. If in doubt, be guided by presence or absence of clinical signs of hypoxaemia.

Prevention

➤ Teach the parents to keep drugs and poisons in proper containers and out of reach of children

➤ Advise parents on first aid if this happens again in the future

— Do not make child vomit if child has swallowed kerosene, petrol or petrol-based products or if child's mouth and throat have been burned, nor if the child is drowsy.

— Try to make the child vomit if other drugs or poisons have been taken by stimulating the back of the throat.

— Take the child to a health facility as soon as possible, together with information about the substance concerned e.g. the container, label, sample of tablets, berries etc.

1.6 Snake bite

■ Snake bite should be considered in any severe pain or swelling of a limb or in any unexplained illness presenting with bleeding or abnormal neurological signs. Some cobras spit venom into the eyes of victims causing pain and inflammation.

Diagnosis of envenoming

■ General signs include shock, vomiting and headache. Examine bite for signs such as local necrosis, bleeding or tender local lymph node enlargement.

■ Specific signs depend on the venom and its effects. These include:

— Shock

— Local swelling that may gradually extend up the bitten limb

— Bleeding: external from gums, wounds or sores; internal especially intracranial

- — Signs of neurotoxicity: respiratory difficulty or paralysis, ptosis, bulbar palsy (difficulty swallowing and talking), limb weakness
- — Signs of muscle breakdown: muscle pains and black urine

■ Check haemoglobin (where possible, blood clotting should be assessed).

Treatment

First aid

➤ Splint the limb to reduce movement and absorption of venom. If the bite was likely to have come from a snake with a neurotoxic venom, apply a firm bandage to affected limb from fingers or toes to proximal of site of bite.

➤ Clean the wound.

➤ If any of the above signs, transport to hospital which has antivenom as soon as possible. If snake has already been killed, take this with child to hospital.

➤ Avoid cutting the wound or applying tourniquet.

Hospital care

Treatment of shock/respiratory arrest

➤ Treat shock, if present (see pages 3, 15 and 16).

➤ Paralysis of respiratory muscles can last for days and requires intubation and mechanical ventilation or manual ventilation (with a mask or endotracheal tube and bag) by relays of staff and/or relatives until respiratory function returns. Attention to careful securing of endotracheal tube is important. An alternative is to perform an elective tracheostomy.

Antivenom

■ If there are systemic signs or severe local signs (swelling of more than half of the limb or severe necrosis), give antivenom, if available.

➤ Prepare IM epinephrine and IV chlorpheniramine and be ready if allergic reaction occurs (see below).

➤ Give monovalent antivenom if the species of snake is known. Give polyvalent antivenom if the species is not known. Follow the directions given on the antivenom preparation. The dose for children is the same as for adults.

- — Dilute the antivenom in 2–3 volumes of 0.9% saline and give intravenously over 1 hour. Give more slowly initially and monitor closely for anaphylaxis or other serious adverse reactions.

- If itching/urticarial rash, restlessness, fever, cough or difficult breathing develop, then stop antivenom and give epinephrine 0.01 ml/kg of 1/1000 or 0.1 ml/kg of 1/10,000 solution subcutaneously and IM or IV/SC chlorpheniramine 250 micrograms/kg. When the child is stable, re-start antivenom infusion slowly.
- More antivenom should be given after 6 hours if there is recurrence of blood incoagulability, or after 1–2 hr if the patient is continuing to bleed briskly or has deteriorating neurotoxic or cardiovascular signs.

Blood transfusion should not be required if antivenom is given. Clotting function returns to normal only after clotting factors are produced by the liver. Response of abnormal neurological signs to antivenom is more variable and depends on type of venom.

- If there is no reponse to antivenom infusion this should be repeated.
- Anticholinesterases can reverse neurological signs in some species of snake (see standard textbooks of paediatrics for further details).

Other treatment

Surgical opinion

Seek surgical opinion if there is severe swelling in a limb, it is pulseless or painful or there is local necrosis.

Surgical care will include:

- Excision of dead tissue from wound
- Incision of fascial membranes to relieve pressure in limb compartments, if necessary
- Skin grafting, if extensive necrosis
- Tracheostomy (or endotracheal intubation) if paralysis of muscles involved in swallowing occurs

Supportive care

- Give fluids orally or by NG tube according to daily requirements (see page 273). Keep a close record of fluid intake and output.
- Provide adequate pain relief
- Elevate limb if swollen
- Give antitetanus prophylaxis
- Antibiotic treatment is not required unless there is tissue necrosis at wound site

➤ Avoid intramuscular injections

➤ Monitor very closely immediately after admission, then hourly for at least 24 hours as envenoming can develop rapidly.

1.7 Scorpion sting

Scorpion stings can be very painful for days. Systemic effects of venom are much more common in children than adults.

Diagnosis of envenoming

Signs of envenoming can develop within minutes and are due to autonomic nervous system activation. They include:

- shock
- high or low BP
- fast and/or irregular pulse
- nausea, vomiting, abdominal pain
- breathing difficulty (due to heart failure) or respiratory failure
- muscle twitches and spasms.

➤ Check for low BP or raised BP and treat if signs of heart failure (see page 107).

Treatment

First aid

➤ Transport to hospital as soon as possible.

Hospital care

Antivenom

➤ If signs of severe envenoming give scorpion antivenom, if available (as above for snake antivenom infusion).

Other treatment

➤ Treat heart failure, if present (see page 106)

➤ Consider use of prazosin if there is pulmonary oedema (see standard textbooks of paediatrics)

Supportive care

➤ Give oral paracetamol or oral or IM morphine according to severity. If very severe, infiltrate site with 1% lignocaine, without epinephrine.

1.8 Other sources of envenoming

➤ Follow the same principles of treatment, as above. Give antivenom, where available, if severe local or any systemic effects.

In general, venomous spider bites can be painful but rarely result in systemic envenoming. Antivenom is available for some species such as widow and banana spiders. Venomous fish can give very severe local pain but, again, systemic envenoming is rare. Box jellyfish stings are occasionally rapidly life-threatening. Apply vinegar on cotton wool to denature the protein in the skin. Adherent tentacles should be carefully removed. Rubbing the sting may cause further discharge of venom. Antivenom may be available. The dose of antivenom to jellyfish and spiders should be determined by the amount of the venom injected. Higher doses are required for multiple bites, severe symptoms or delayed presentation.

Notes

CHAPTER 2

Diagnostic approach to the sick child

2.1 Relationship to the IMCI approach

The pocket book is symptom-based in its approach, with the symptoms following the sequence of the IMCI guidelines: cough, diarrhoea, fever. The diagnoses also closely match the IMCI classifications, except that the expertise and investigative capabilities that are available 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 (up to 2 months) are considered separately (see Chapter 3), as in the IMCI approach, but the guidelines cover conditions arising at birth such as birth asphyxia. 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.

2.2 Taking the history

Taking the history generally should start with the presenting complaint:

Why did you bring the child?

Then it progresses to the history of the present illness. The symptom-specific chapters give some guidance on specific questions which are important to ask concerning these specific symptoms, and which help in the differential diagnosis of the illness. This includes the personal history, family and social and environmental history. The latter might link to important counselling messages such as sleeping under a bednet for a child with malaria, breastfeeding or sanitary practices in a child with diarrhoea, or reducing exposure to indoor air pollution in a child with pneumonia.

Especially for younger infants, the history of pregnancy and birth is very important. In the infant and younger child, feeding history becomes essential. The older the child, the more important is information of the milestones of development and behaviour of the child. Whereas the history is obtained from a parent or caretaker in the younger child, an older child will contribute important information.

2.3 Approach to the sick child and clinical examination

All children must be examined fully so that no important sign will be missed. However, in contrast to the systematic approach in adults, the examination of the child needs to be organized in a way to upset the child as little as possible.

- Do not upset the child unnecessarily.
- Leave the child in the arms of the mother or carer.
- Observe as many signs as possible before touching the child. These include
  - — Is the child alert, interested and looking about?
  - — Does the child appear drowsy?
  - — Is the child irritable?
  - — Is the child vomiting?
  - — Is the child able to suck or breastfeed?
  - — Is the child cyanosed or pale?
  - — Are there signs of respiratory distress?
    - Does the child use auxiliary muscles?
    - Is there lower chest wall indrawing?
    - Does the child appear to breath fast?
    - Count the respiratory rate.

These and other signs should all be looked for and recorded before the child is disturbed. You might ask the mother or caretaker to cautiously reveal part of the chest to look for lower chest wall indrawing or to count the respiratory rate. If a child is distressed or crying, it might need to be left for a brief time with its mother in order to settle, or the mother could be ask to breastfeed, before key signs such as respiratory rate can be measured.

Then proceed to signs which require touching the child but are little disturbing, such as listening to the chest. You get little useful information if you listen to the chest of a crying child. Therefore, signs that involve interfering with the child, such as recording the temperature or testing for skin turgor, should be done last.

2.4 Laboratory investigations

Laboratory investigations are targeted based on the history and examination, and help narrow the differential diagnosis. The following 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 parasites
- blood glucose
- microscopy of CSF and urine
- blood grouping and cross-matching
- HIV testing.

In the care of sick newborns (under 1 week old), blood bilirubin is also an essential investigation.

Indications for these tests are outlined in the appropriate sections of this pocket book. Other investigations, such as pulse oximetry, chest X-ray, blood cultures and stool microscopy, can help in complicated cases.

2.5 Differential diagnoses

After the assessment has been completed, consider the various conditions that could cause the child's illness and make a list of possible differential diagnoses. 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 might have more than one diagnosis or clinical problem requiring treatment.

Section 1.4 and Tables 1–4 (pages 19–24) present the differential diagnoses for emergency conditions encountered during triage. Further tables of symptom-specific differential diagnoses for common problems are found at the beginning of each chapter 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.

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 is 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. The diagnosis might be revised at this stage, or additional diagnoses included in the considerations.

Notes

CHAPTER 3

Problems of the neonate and young infant

This chapter provides guidance for the management of problems in neonates and young infants from birth to 2 months of age. This includes neonatal resuscitation, the recognition and management of neonatal sepsis and other bacterial infections, and the management of low and very low birth weight (VLBW) infants. Drug tables for commonly used drugs in neonates and young infants are included at the end of this chapter, also providing dosages for low birth weight and premature babies.

3.1 Routine care of the newborn at delivery

Most babies require only simple supportive care at and after delivery.

- ➤ Dry the baby with a clean towel.
- ➤ Observe baby (see chart 12) while drying.
- ➤ Give the baby to the mother as soon as possible, place on chest/abdomen.
- ➤ Cover the baby to prevent heat loss.
- ➤ Encourage initiation of breastfeeding within the first hour.

Skin-to-skin contact and early breastfeeding are the best ways to keep a baby warm and prevent hypoglycaemia.

3.2 Neonatal resuscitation

For some babies the need for resuscitation may be anticipated: those born to mothers with chronic illness, where the mother had a previous fetal or neonatal death, a mother with pre-eclampsia, in multiple pregnancies, in preterm delivery, in abnormal presentation of the fetus, with a prolapsed cord, or where there is prolonged labour or rupture of membranes, or meconium-stained liquor.

However, for many babies the need for resuscitation cannot be anticipated before delivery. Therefore,

- be prepared for resuscitation at every delivery,
- follow the assessment steps of chart 12.

CHART 12. Neonatal resuscitation

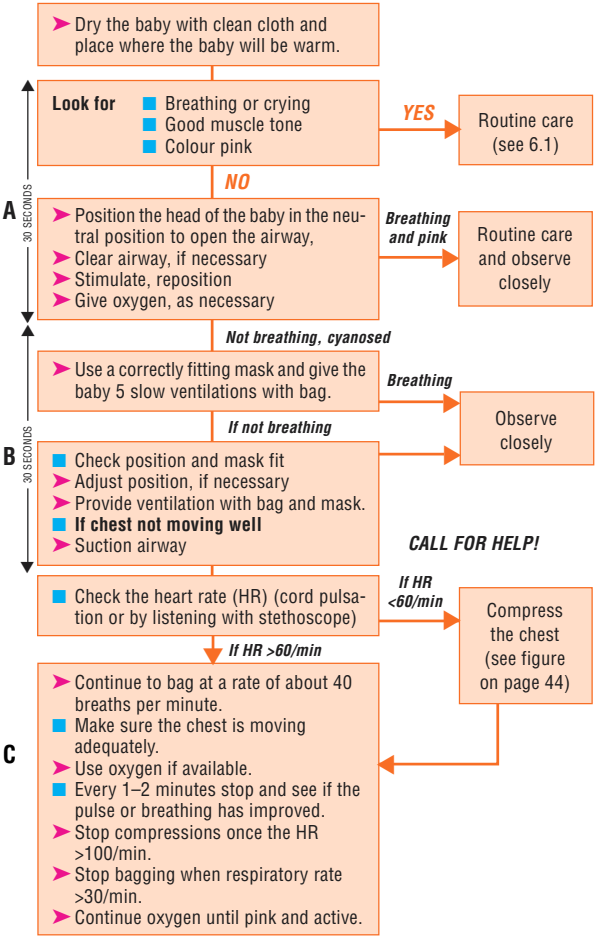


CHART 12. Neonatal resuscitation

There is no need to slap the baby, drying is enough for stimulation.

A. Airway

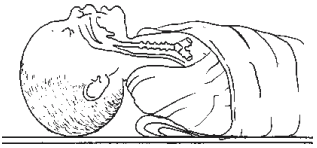
- Suction airway—if there is meconium stained fluid AND baby is NOT crying and moving limbs:
  - Suck the mouth, nose and oropharynx, do not suck right down the throat as this can cause apneoa/bradycardia.

B. Breathing

- Choosing mask size: Size 1 for normal weight baby, size 0 for small (less than 2.5 kg) baby
- Ventilation with bag and mask at 40–60 breaths/minute
- Make sure the chest moves up with each press on the bag and in a very small baby make sure the chest does not move too much.

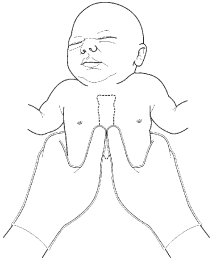
C. Circulation

- 90 compressions coordinated with 30 breaths/min (3 compressions: 1 breath every 2 seconds).
- Place thumbs just below the line connecting the nipples on the sternum (see below).
- Compress 1/3 the A-P diameter of the chest.



Correct head position to open up airways and for bag ventilation.

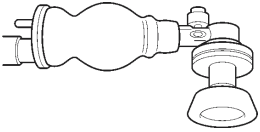
Do not hyperextend the neck



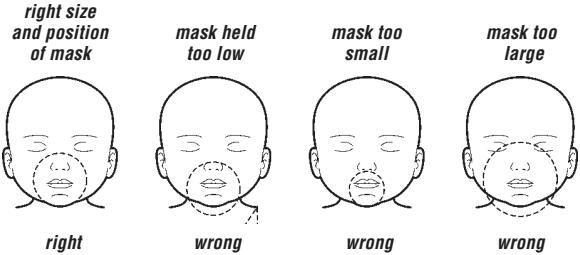
Correct position of hands for cardiac massage in a neonate. The thumbs are used for compression over the sternum

CHART 12. Neonatal resuscitation

Neonatal self-inflating resuscitation bag with round mask



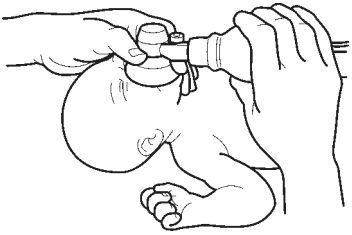
Fitting mask over face:



Ventilating a neonate with bag and mask

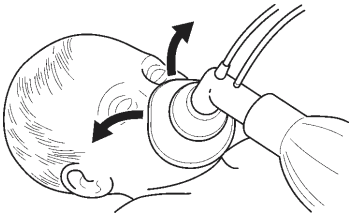
Pull the jaw forward towards the mask with the third finger of the hand holding the mask

Do not hyperextend the neck



Inadequate seal

If you hear air escaping from the mask, form a better seal. The most common leak is between the nose and the cheeks.



3.2.1 Cessation of resuscitation

If after 20 minutes of resuscitation the baby is:

- Not breathing and pulse is absent: cease efforts.
- Explain to the mother that the baby has died, and give it to her to hold if she wishes.

3.3 Routine care for all newborn babies after delivery (and for neonates born outside and brought to the hospital)

- Keep dry in a warm room away from drafts, well covered
- Keep the baby with the mother, rooming in
- Initiate breastfeeding within the first hour
- Let the baby breastfeed on demand if able to suck
- Give vitamin K (phytomenadione), according to national guidelines
  1 ampoule (1 mg/0.5ml or 1 mg/ml) IM once
  (Do NOT use 10 mg/ml ampoule)
- Keep umbilical cord clean and dry
- Apply antiseptic ointment or antibiotic eye drops/ointment (e.g. tetracycline eye ointment) to both eyes once, according to national guidelines
- Give oral polio, hepatitis B and BCG vaccines, depending on national guidelines

3.4 Prevention of neonatal infections

Many early neonatal infections can be prevented by:

- Good basic hygiene and cleanliness during delivery of the baby
- Special attention to cord care
- Eye care

Many late neonatal infections are acquired in hospitals. These can be prevented by:

- Exclusive breastfeeding
- Strict procedures for hand washing for all staff and for families before and after handling babies
- Not using water for humidification in incubators (where *Pseudomonas* will easily colonize) or by avoiding incubators (using kangaroo mother care instead).

- Strict sterility for all procedures
- Clean injection practices
- Removing intravenous drips when they are no longer necessary
- Avoiding unnecessary blood transfusion

3.5 Management of the child with perinatal asphyxia

May be the result of a lack of oxygen supply to organs before, during or immediately after birth. Initial treatment is effective resuscitation (see above).

Problems in the days after birth:

- *Convulsions*: treat with phenobarbital (see page 49), check glucose.
- *Apnoea*: common after severe birth asphyxia. Sometimes associated with convulsions. Manage with oxygen by nasal catheter and resuscitation with bag and mask.
- *Inability to suck*: feed with milk via a nasogastric tube. Beware of delayed emptying of the stomach which may lead to regurgitation of feeds.
- *Poor motor tone*. May be floppy or have limb stiffening (spasticity).

Prognosis: can be predicted by recovery of motor function and sucking ability. A baby who is normally active will usually do well. A baby who, a week after birth, is still floppy or spastic, unresponsive and cannot suck has a severe brain injury and will do poorly. The prognosis is less grim for babies who have recovered some motor function and are beginning to suck. The situation should be sensitively discussed with parents throughout the time the baby is in hospital.

3.6 Danger signs in newborns and young infants

Neonates and young infants often present with non-specific symptoms and signs which indicate severe illness. These signs might be present at or after delivery, or in a newborn presenting to hospital, or develop during hospital admission. Initial management of the neonate presenting with these signs is aimed at stabilizing the child and preventing deterioration. Signs include:

- Unable to breastfeed
- Convulsions
- Drowsy or unconscious
- Respiratory rate less than 20/min or apnoea (cessation of breathing for >15 secs)
- Respiratory rate greater than 60/min

- Grunting
- Severe chest indrawing
- Central cyanosis

EMERGENCY MANAGEMENT of danger signs:

➤ Give oxygen by nasal prongs or nasal catheter if the young infant is cyanosed or in severe respiratory distress.

➤ Give bag and mask ventilation (page 45), with oxygen (or room air if oxygen is not available) if respiratory rate too slow (<20).

➤ Give ampicillin (or penicillin) and gentamicin (see below).

➤ If drowsy, unconscious or convulsing, check blood glucose.

If glucose <1.1 mmol/l (<20 mg/100 ml), give glucose IV.

If glucose 1.1–2.2 mmol/l (20–40 mg/100 ml), feed immediately and increase feeding frequency.

If you cannot check blood glucose quickly, assume hypoglycaemia and give glucose IV. If you cannot insert an IV drip, give expressed breast milk or glucose through a nasogastric tube.

➤ Give phenobarbital if convulsing (see page 49).

➤ Admit, or refer urgently if treatment is not available at your hospital

➤ Give vitamin K (if not given before).

➤ Monitor the baby frequently (see below).

3.7 Serious bacterial infection

Risk factors for serious bacterial infections are:

- Maternal fever (temperature >37.9 °C before delivery or during labour)
- Membranes ruptured more than 24 hours before delivery
- Foul smelling amniotic fluid

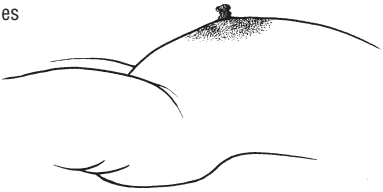
All of the DANGER SIGNS are signs of serious bacterial infection, but there are others:

- Deep jaundice
- Severe abdominal distension

Localizing signs of infection are:

- 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 umbilicus draining pus.
- Bulging fontanelle (see below)



Peri-umbilical flare in umbilical sepsis. The inflammation extends beyond the umbilicus to the abdominal wall.

Treatment

Antibiotic therapy

➤ Admit to hospital

➤ Where blood cultures are available, obtain blood cultures before starting antibiotics

➤ For any of these signs, give ampicillin (or penicillin) and gentamicin (for dosages see pages 62–66)

➤ Give cloxacillin (if available) instead of penicillin if extensive skin pustules or abscesses as these might be signs of Staphylococcus infecton

➤ Most serious bacterial infections in neonates should be treated with antibiotics for at least 10 days

➤ If not improving in 2–3 days the antibiotic treatment may need to be changed, or the baby referred

Other treatment

➤ Give all sick infants aged <2 weeks 1 mg of vitamin K (IM)

➤ Treat *convulsions* with IM phenobarbital (1 dose of 15 mg/kg). If needed, continue with phenobarbital 5 mg/kg once daily

➤ For management of pus draining from eyes, see page 59

➤ If child is from malarious area and has fever, take blood film to check for malaria also. Neonatal malaria is very rare. If confirmed, treat with quinine (see page 140)

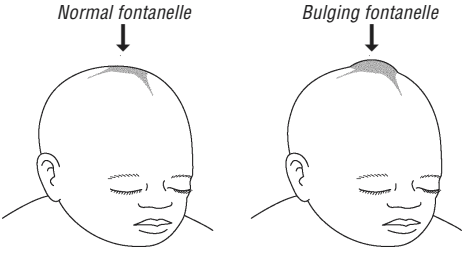
➤ For supportive care, see page 51

3.8 Meningitis

Clinical signs

Suspect if signs of serious bacterial infection are present, or any one of the following signs of meningitis.

MENINGITIS



Bulging fontanelle – sign of meningitis in young infants with an open fontanelle

General signs

- Drowsy, lethargic or unconscious
- Reduced feeding
- Irritable
- High pitched cry
- Apnoeic episodes

More specific signs

- Convulsion
- Bulging fontanelle

Do a lumbar puncture (LP) if you suspect meningitis, unless the baby is having apnoea or there is no motor response to stimuli.

Treatment

Antibiotics

- Give ampicillin and gentamicin or a third generation cephalosporin, such as ceftriaxone (50 mg/kg every 12 hours (might cause biliary sludge leading to jaundice)) or cefotaxime (50 mg/kg every 6 hours) for 3 weeks.
- Alternative antibiotics are penicillin and gentamicin (see pages 65–66). Chloramphenicol is an alternative but should not be used in premature/low weight neonates (see page 64).
- If there are signs of hypoxaemia, give oxygen (see page 52).

Convulsions/fits

- Treat convulsions with phenobarbital (loading dose of 15 mg/kg). If convulsion persists, give further doses of 10 mg/kg phenobarbital up to a

maximum of 40 mg/kg (see page 49). Watch for apnoea. If needed, continue with phenobarbital at a maintenance dose of 5 mg/kg/day. Check for hypoglycaemia.

3.9 Supportive care for the sick neonate

3.9.1 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). 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.
- 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.

3.9.2 Fluid management

Encourage the mother to breastfeed frequently to prevent hypoglycaemia. If unable to feed, give expressed breast milk by nasogastric tube.

- Withhold oral feeding if there is bowel obstruction, necrotizing enterocolitis or the feeds are not tolerated, e.g. indicated by increasing abdominal distension or vomiting everything.
- Withhold oral feeding in the acute phase in babies who are lethargic or unconscious, or having frequent convulsions.

If IV fluids are given, reduce the IV fluid rates as the volume of milk feeds increases.

Babies who are suckling well but need an IV drip for antibiotics should be on minimal IV fluids to avoid fluid overload, or flush cannula with 0.5 ml NaCl 0.9% and cap.

Increase the amount of fluid given over the first 3–5 days (total amount, oral and IV).

Day 1	60 ml/kg/day
Day 2	90 ml/kg/day
Day 3	120 ml/kg/day
Then increase to	150 ml/kg/day

When babies are tolerating oral feeds well, this might be increased to 180 ml/kg/day after some days. But be careful with parenteral fluids, which can quickly

overhydrate a child. When giving IV fluids, do not exceed this volume unless the baby is dehydrated or under phototherapy or a radiant heater. This amount is the TOTAL fluid intake a baby needs and oral intake must be taken into account when calculating IV rates.

- Give more fluid if under radiant heater (x 1.2–1.5)

Do NOT use IV glucose and water (without sodium) AFTER the first 3 days of life. Babies over 3 days of age need some sodium (for example, 0.18% saline/ 5% glucose).

Monitor the IV infusion very carefully.

- Use a monitoring sheet.
- Calculate drip rate
- Check drip rate and volume infused every hour
- Weigh baby daily
- Watch for facial swelling: if this occurs, reduce the IV fluid to minimal levels or take out the IV. Introduce milk feeding by nasogastric tube or breastfeeding as soon as it is safe to do so.

3.9.3 Oxygen therapy

➤ 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)

Where a pulse oximeter is available, this should be used to guide oxygen therapy. Oxygen should be given if the oxygen saturation is below 90%, and the oxygen flow should be regulated to have a saturation between 92% and 95%. Oxygen can be discontinued once the child can maintain a saturation above 90% in room air.

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.

3.9.4 High fever

Do *not* use antipyretic agents such as paracetamol for controlling fever in young infants. Control the environment. If necessary, undress the child.

3.10 Babies with low birth weight

3.10.1 Babies with birth weight between 2.25 and 2.5 kg

These babies are normally strong enough to start feeding themselves after delivery. They need to be kept warm and attention for infection control, but otherwise no special care.

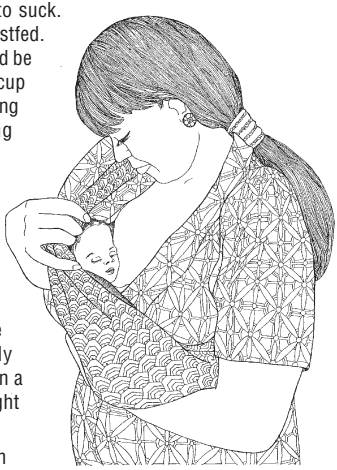
3.10.2 Babies with birth weight between 1.75 and 2.25 kg

Sometimes these babies need extra care, but can normally stay with their mothers to provide feeding and warmth, especially if skin-to skin contact can be maintained.

Feeding. Start feeds within 1 hour of delivery. Many of these babies will be able to suck. Babies who can suck should be breastfed. Those who cannot breastfeed should be given expressed breast milk with a cup and spoon. When the baby is sucking well from the breast and gaining weight, reduce the cup and spoon feeds.

See the babies at least twice a day to assess feeding ability, fluid intake, or presence of any DANGER SIGNS (page 47) or signs of serious bacterial infection (page 48). If any of these signs are present, they should be closely monitored in the neonatal nursery in a similar way to very low birth weight babies (see below).

The risk of keeping the child in hospital (e.g. acquiring nosocomial infections), should be balanced with the potential benefit of obtaining better care.



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.

3.10.3 Babies with birth weight below 1.75 kg

These babies are at risk of hypothermia, apnoea, hypoxaemia, sepsis, feed intolerance and necrotizing enterocolitis. The risks increase the smaller the baby is. All low birth weight babies should be admitted to the Special Care or Neonatal Unit.

Treatment

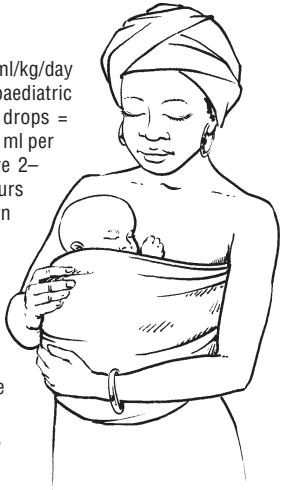
➤ Give oxygen by nasal catheter or nasal prongs if any signs of hypoxaemia

Temperature

- Nurse skin-to-skin between the mother's breasts, or clothed in a warm room, or in a humidicrib if the staff have experience in using them. A hot water bottle wrapped in a towel can be useful for keeping the baby warm if no power for heating is available. Aim for a core body temperature of 36–37 °C with the feet warm and pink.

Fluids and feeds

- If possible give intravenous fluids at 60 ml/kg/day for the first day of life. Best to use a paediatric (100 ml) intravenous burette where 60 drops = 1 ml and therefore 1 drop per minute = 1 ml per hour. If the baby is well and active, give 2–4 ml of expressed breast milk every 2 hours through a nasogastric tube, depending on the weight of the baby (see page 51).
- If very small babies are under a radiant heater or phototherapy they need more fluid than the "usual maintenance" volumes (see page 51), but great care must be taken to accurately run the intravenous fluid as overhydration may be fatal.
- If possible, check blood sugar every 6 hours until enteral feeds established, especially if baby is having apnoea, lethargy or convulsions. VLBW babies may need a 10% glucose solution. Add 10 ml of 50% glucose to every 90 ml of 4.3% glucose + 1/5 normal saline or use a 10% glucose in water solution.



Position for kangaroo mother care of young infant. Note: after wrapping the child, the head needs to be covered with a cap or bonnet to prevent heat loss.

- Start feeding when the condition of the baby is stable (usually on the second day, might be possible in more mature babies on day 1). Start feeds if there is no abdominal distension or tenderness, bowel sounds are present, meconium passed and no apnoea.
- Use a prescription chart.
- Calculate exact amounts for feeding and the timing of feeds.
- Increase on a daily basis if well tolerated.
- When commencing milk feeds, start with 2–4 ml every 1–2 hours by nasogastric tube. Some active VLBW babies can be fed with a cup and spoon or an eyedropper, which must be sterilized before each feed. Use only expressed breast milk if possible. If 2–4 ml volume is tolerated with no vomiting, abdominal distension, or gastric aspirates of more than half the feed, the volume can be increased by 1–2 ml per feed each day. Reduce or withhold feeds if signs of poor tolerance occur. Aim to have feeding established in the first 5–7 days so that the IV drip can be removed, to avoid infection.
- The feeds may be increased over the first 2 weeks of life to 150–180 ml/kg/day (three-hourly feeds of 19–23 ml for a 1kg baby and 28–34 ml for a 1.5 kg baby). As the baby grows, recalculate the feed volume based on the higher weight.

Antibiotics and sepsis

Risk factors for sepsis are: babies born outside hospital or born to unwell mothers, rupture of membranes >24 hours, smaller babies (closer to 1 kg).

Presence of any DANGER SIGNS (page 47) or other signs of serious bacterial infection (page 48).

➤ Initiate antibiotic treatment.

Apnoea

- Caffeine citrate and aminophylline prevent apnoea in premature babies. Caffeine is preferred if it is available. The loading dose of caffeine citrate is 20 mg/kg orally or IV (given slowly over 30 minutes). A maintenance dose should be prescribed (see page 63).

  If caffeine is not available give a loading dose of aminophylline of 10 mg/kg orally or by intravenous injection over 15–30 minutes (see page 63). A maintenance dose should be prescribed.
- If an apnoea monitor is available this should be used.

Discharge and follow-up of low birth weight babies

Low birth weight babies can be discharged when:

- they have no DANGER signs or signs of serious infection
- they are gaining weight on breastfeeding alone
- they can maintain their temperature in the normal range (36–37 °C) in an open cot
- the mother is confident and able to take care.

Low birth weight babies should be given all scheduled vaccines at the time of birth, and any second doses that are due by the time of discharge.

Counselling on discharge

Counsel parents before discharge on

- exclusive breastfeeding
- keeping the baby warm
- danger signs for seeking care

Low birth weight babies should be followed up weekly for weighing, assessment of feeding, and general health until they have reached 2.5 kg.

3.11 Necrotizing enterocolitis

Necrotizing enterocolitis (NEC, a bowel infection) may occur in low birth weight babies, especially after enteral feeds are started. It is more common in low birth weight babies fed artificial formulae, but may occur in breastfed babies.

Common signs of NEC are:

- Abdominal distension or tenderness
- Intolerance of feeding
- Bile-stained vomit or bile-stained fluid up the nasogastric tube
- Blood in the stools

General signs of systemic upset include

- Apnoeas
- Drowsy or unconscious
- Fever or hypothermia

Treatment

- ➤ Stop enteral feeds.
- ➤ Pass a nasogastric tube and leave it on free drainage.
- ➤ Start an IV infusion of glucose/saline (see page 51 for rate of infusion).
- ➤ Start antibiotics: give ampicillin (or penicillin) plus gentamicin plus metronidazole (if available) for 10 days.

If the baby has apnoea or other danger signs, give oxygen by nasal catheter. If apnoea continues give aminophylline or caffeine IV (see page 51).

If the baby is pale, check the haemoglobin and transfuse if Hb<10 g/dL.

Take a supine and lateral decubitus abdominal X-ray. If there is gas in the abdominal cavity outside the bowel there may be a bowel perforation. Ask a surgeon to see the baby urgently.

Examine the baby carefully each day. Reintroduce expressed breast milk feeds by nasogastric tube when the abdomen is soft and not tender, the baby is passing normal stools with no blood and is not having bilious vomiting. Start feeds slowly and increase slowly by 1–2 ml per feed each day.

3.12 Other common neonatal problems

3.12.1 Jaundice

More than 50% of normal newborns, and 80% of preterm infants, have some jaundice. Jaundice can be divided into abnormal or normal:

Abnormal (non physiological)

- Jaundice started on the first day of life
- Jaundice lasting longer than 14 days in term, 21 days in preterm infants
- Jaundice with fever
- Deep jaundice: palms and soles of the baby deep yellow

Normal (physiological)

- Skin and eyes yellow but none of the above

Abnormal jaundice may be due to

- Serious bacterial infection
- Haemolytic disease due to blood group incompatibility or G6PD deficiency
- Congenital syphilis (page 60) or other intrauterine infection

- Liver disease such as hepatitis or biliary atresia
- Hypothyroidism

Investigations for abnormal jaundice

The clinical impression of jaundice should be confirmed by a bilirubin measurement, where possible. The investigations depend on the likely diagnosis and what tests are available, but may include:

- Haemoglobin or PCV
- Full blood count to look for signs of serious bacterial infection (high or low neutrophil count with >20% band forms), and to look for signs of haemolysis
- Blood type of baby and mother, and Coombs test
- Syphilis serology such as VDRL tests
- G6PD screen, thyroid function tests, liver ultrasound

Treatment

➤ Phototherapy if

- Jaundice on day 1
- Deep jaundice involving palms and soles of the feet
- Prematurity and jaundice
- Jaundice due to haemolysis

Treatment of jaundice based on serum bilirubin level

	Phototherapy				Exchange transfusion[a]			
	Healthy term baby		Preterm or any risk factors[b]		Healthy term baby		Preterm or any risk factors	
	mg/dl	µmol/l	mg/dl	µmol/l	mg/dl	µmol/l	mg/dl	µmol/l
Day1	Any visible jaundice[c]				15	260	13	220
Day 2	15	260	13	220	25	425	15	260
Day 3	18	310	16	270	30	510	20	340
Day 4 and thereafter	20	340	17	290	30	510	20	340

[a] Exchange transfusion is not described in this pocket book. These serum bilirubin levels are included in case exchange transfusion is possible or in case the baby can be transferred quickly and safely to another facility where exchange transfusion can be performed.

[b] Risk factors include small size (less than 2.5 kg at birth or born before 37 weeks gestation), haemolysis, and sepsis.

[c] Visible jaundice anywhere on the body on day 1.

Continue phototherapy until serum bilirubin level is lower than threshold range or until baby is well and there is no jaundice of palms and soles.

If the bilirubin level is very elevated (see table) and you can safely do exchange transfusion, consider doing so.

Antibiotics

➤ If suspected infection or syphilis (page 60), treat for serious bacterial infection (page 61)

Antimalarials

➤ If fever is present and the baby is from a malarious area, check blood films for malaria parasites and give antimalarials, if positive

Encourage breastfeeding

3.12.2 Conjunctivitis

Sticky eyes and mild conjunctivitis

➤ Treat as outpatient

➤ Show the mother how to wash the eyes with water or breast milk and how to put eye ointment in the eyes. The mother must wash her hands before and after.

➤ Tell the mother to wash the eyes and put in eye ointment 4 times a day for 5 days

Give the mother a tube of

- Tetracycline eye ointment OR
- Chloramphenicol eye ointment

To treat the child. Review 48 hours after starting treatment, if not improving.

Severe conjunctivitis (a lot of pus and/or swelling of the eyelids) is often due to gonococcal infection. Treat as inpatient as there is a risk of blindness and it needs twice-daily review.

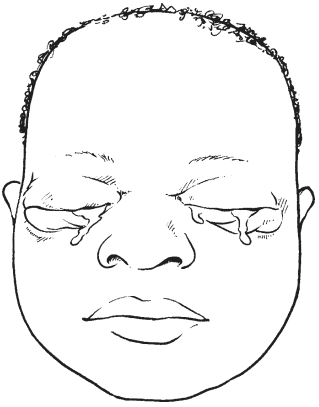
➤ Wash the eyes to clear as much pus as possible.

➤ Ceftriaxone (50 mg/kg up to total of 150 mg IM ONCE) *OR* Kanamycin (25 mg/kg up to total of 75 mg IM ONCE) according to national guidelines.

ALSO use as described above:

- Tetracycline eye ointment *OR*
- Chloramphenicol eye ointment

Also treat the mother and her partner for STDs: amoxicillin, spectinomycin or ciprofloxacin (for gonorrhoea) and tetracycline (for Chlamydia) depending on the resistance pattern in the country. Refer to the STD control guidelines.



Ophthalmia neonatorum. Swollen, red eyelids with pus

3.12.3 Congenital malformations

See Chapter 9 (page 227) for:

- Cleft lip and palate
- Bowel obstruction
- Abdominal wall defects
- Meningomyelocele
- Congenital dislocation of the hip
- Talipes equinovarus (club foot)

3.13 Babies of mothers with infections

3.13.1 Congenital syphilis

Clinical signs

- Often low birth weight
- Palms and soles: red rash, grey patches, blisters or skin peeling
- 'Snuffles': rhinitis with nasal obstruction which is highly infectious
- Abdominal distension due to big liver and spleen
- Jaundice
- Anaemia
- Some VLBW babies with syphilis have signs of severe sepsis with lethargy, respiratory distress, skin petechiae or other bleeding

If you suspect syphilis, do VDRL test if possible

Treatment

➤ Asymptomatic neonates born to VDRL or RPR-positive women should receive 50 000 units/kg of benzathine benzyl penicillin in a single intramuscular dose.

➤ Symptomatic infants require treatment with:

— procaine benzyl penicillin 50 000 units/kg as a single dose daily for 10 days

or

— benzyl penicillin 50 000 units/kg every 12 hours IM or IV for the first 7 days of life and then every 8 hours for a further 3 days.

➤ Treat the mother and partner for syphilis and check for other sexually transmitted infections.

3.13.2 Baby of a mother with tuberculosis

If the **mother has active lung tuberculosis and was treated for less than two months before birth or was diagnosed with tuberculosis after birth**:

- Reassure the mother that it is safe for her to breastfeed her baby;
- Do not give the tuberculosis vaccine (BCG) at birth;
  Give prophylactic isoniazid 5 mg/kg body weight by mouth once daily;
- At the age of six weeks, re-evaluate the baby, noting weight gain and taking an X-ray of the chest, if possible;
- If there are **any findings suggestive of active disease**, start full anti-tuberculosis treatment according to national guidelines;
- If the **baby is doing well and tests are negative**, continue prophylactic isoniazid to complete six months of treatment;
- Delay BCG vaccine until two weeks after treatment is completed. If **BCG was already given**, repeat BCG two weeks after the end of the isoniazid treatment.

3.13.3 Baby of a mother with HIV

See Chapter 8 (page 199) for guidance.

Drug doses of common drugs for neonates and low birth weight babies

Drug	Dosage	Form	Weight of baby in kg						
			1–<1.5kg	1.5–<2kg	2–<2.5kg	2.5–<3kg	3–<3.5kg	3.5–<4kg	4–<4.5kg
Aminophylline *for apnoea prevention*	*Calculate the EXACT oral maintenance dose*								
	Loading dose: Oral or IV over 30 minutes 10mg/kg, then	250 mg/10 ml vial Dilute loading dose to 5 ml with sterile water, give slowly over 15–30 min	0.4–0.6 ml	0.6–0.8 ml	0.8–1.0 ml	AMINOPHYLLINE IS NOT USUALLY USED FOR TERM BABIES WITH APNOEA			
	Maintenance dose: First week of life: Oral: 2.5mg/kg/dose 12 hourly		0.1–0.15 ml	0.15–0.2 ml	0.2–0.25 ml				
	Weeks 2–4 of life Oral: 4mg/kg/dose 12 hourly		0.15–0.25 ml	0.25–0.3 ml	0.3–0.4 ml				
Ampicillin	IM/IV: 50 mg/kg every 12 hours (1st week of life)	Vial of 250 mg mixed with 1.3 ml sterile water to give 250 mg/1.5 ml	0.3–0.6 ml	0.6–0.9 ml	0.9–1.2 ml	1.2–1.5 ml	1.5–2.0 ml	2.0–2.5 ml	2.5–3.0 ml
	Every 8 hours (weeks 2–4 of life)								

Drug	Dosage	Form	Weight of baby in kg						
			1–<1.5kg	1.5–<2kg	2–<2.5kg	2.5–<3kg	3–<3.5kg	3.5–<4kg	4–<4.5kg
Caffeine citrate	*Calculate the EXACT oral maintenance dose*								
	Loading dose: Oral: 20 mg/kg (or IV over 30 minutes)		20–30 mg	30–40 mg	40–50 mg	50–60mg	60–70 mg	70–80 mg	80–90 mg
	Maintenance dose: 5 mg/kg daily oral (or IV over 30 minutes)		5–7.5 mg	7.5–10 mg	10–12.5 mg	12.5–15 mg	15–17.5 mg	17.5–20 mg	20–22.5 mg
Cefotaxime	IV: 50 mg/kg Premature babies: every 12 hours 1st week of life every 8 hours Weeks 2–4 of life every 6 hours	Vial of 500 mg mixed with 2 ml sterile water to give 250 mg/1 ml	0.3 ml	0.4 ml	0.5 ml	0.6 ml	0.7 ml	0.8 ml	0.9 ml

Drug	Dosage	Form	Weight of baby in kg						
			1–<1.5kg	1.5–<2kg	2–<2.5kg	2.5–<3kg	3–<3.5kg	3.5–<4kg	4–<4.5kg
Ceftriaxone									
For meningitis	IV: 50mg/kg every 12 hours	1g vial mix with 9.6 ml sterile water to give 1g/10 ml	0.5–0.75 ml	0.75–1 ml	1–1.25 ml	1.25–1.5 ml	1.5–1.75 ml	1.75–2 ml	2–2.5 ml
	IM/IV: 100mg/kg once daily		1–1.5 ml	1.5–2 ml	2–2.5 ml	2.5–3 ml	3–3.5 ml	3.5–4 ml	4–4.5 ml
For pus draining from eye	50mg/kg once IM (max 125mg)								
Chloramphenicol	*Preferably calculate EXACT dose based on the infant's weight*								
	IV: 25 mg/kg/dose twice daily	Vial 1g mixed with 9.2 ml sterile saline to give 1g/10 ml	DO NOT USE IN PREMATURE BABIES			0.6–0.75 ml	0.75–0.9 ml	0.9–1.0 ml	1.0–1.1 ml
Cloxacillin	25–50mg/kg/dose 12 hourly (1st week of life)	250mg vial mixed with 1.3 ml sterile water to give 250 mg/1.5 ml	**25mg/kg:** 0.15–0.3 ml	0.3–0.5 ml	0.5–0.6 ml	0.6–0.75 ml	0.75–1.0 ml	1.0–1.25 ml	1.25–1.5 ml
	8 hourly (weeks 2–4 of life)		**50mg/kg:** 0.3–0.6 ml	0.6–0.9 ml	0.9–1.2 ml	1.2–1.5 ml	1.5–2.0 ml	2–2.5 ml	2.5–3.0 ml

Drug	Dosage	Form	Weight of baby in kg 1–<1.5kg	1.5–<2kg	2–<2.5kg	2.5–<3kg	3–<3.5kg	3.5–<4kg	4–<4.5kg
Gentamicin	*Preferably calculate EXACT dose based on the infant's weight*								
	1st week of life: Low birth weight babies: IM/IV: 3mg/kg/dose once daily	Vial 20 mg/2 ml Vial 80 mg/2 ml dilute to 8 ml with sterile water to give 10 mg/ml	0.3–0.5 ml	0.5–0.6 ml	0.6–0.75 ml				
	Normal birth weight: IM/IV: 5mg/kg/dose once daily					1.25–1.5 ml	1.5–1.75 ml	1.75–2 ml	2–2.25 ml
	Weeks 2–4 of life: IM/IV: 7.5 mg/kg/dose once daily		0.75–1.1 ml	1.1–1.5 ml	1.5–1.8 ml	1.8–2.2 ml	2.2–2.6 ml	2.6–3.0 ml	3.0–3.3 ml
Note: To use vial 80mg/2ml, dilute to 8ml with sterile water to give 10mg/ml, then use exactly the same dose as in the table above.									
Kanamycin	IM/IV: 20 mg/kg (one dose for pus draining from eyes)	2ml vial to make 125 mg/ml	0.2–0.3 ml	0.3–0.4 ml	0.4–0.5 ml	0.5–0.6 ml	0.6–0.7 ml	0.7–0.8 ml	0.8–1.0 ml
Naloxone	0.1 mg/kg	Vial 0.4 mg/ml	1/4 ml	1/4 ml	1/2 ml	1/2 ml	3/4 ml	3/4 ml	1 ml

Drug	Dosage	Form	Weight of baby in kg						
			1–<1.5kg	1.5–<2kg	2–<2.5kg	2.5–<3kg	3–<3.5kg	3.5–<4kg	4–<4.5kg
PENICILLIN **Benzylpenicillin**	50,000 units/kg/dose 1st week of life 12 hourly Weeks 2–4 and older: 6 hourly	Vial of 600 mg (1 000 000 units) dilute with 1.6 ml sterile water to give 500 000 units/ml	0.2 ml	0.2 ml	0.3 ml	0.5 ml	0.5 ml	0.6 ml	0.7 ml
Benzathine benzylpenicillin	50 000 units/kg once a day	IM: vial of 1.2 million units mixed with 4 ml sterile water	0.2 ml	0.3 ml	0.4 ml	0.5 ml	0.6 ml	0.7 ml	0.8 ml
Procaine benzylpenicillin	IM: 50 000 units/kg once a day	3 g vial (3 000 000 units) mixed with 4 ml sterile water	0.1 ml	0.15 ml	0.2 ml	0.25 ml	0.3 ml	0.3 ml	0.35 ml
Phenobarbital	**Loading dose:** IM/IV or oral: 15 mg/kg.	Vial 200 mg/ml diluted with 4 ml sterile water	*Calculate the EXACT dose*						
		30 mg tabs	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
	Maintenance dose: Oral: 5 mg/kg/day	30 mg tabs	1/4	1/4	1/2	1/2	1/2	3/4	3/4

Notes

Notes

CHAPTER 4

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 3, and in severely malnourished children in Chapter 7.

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 (Table 6, page 71).

4.1 Child presenting with 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
- history of choking or sudden onset of symptoms
- known HIV infection
- immunization history: BCG, DPT, measles, Hib
- personal or family history of asthma.

Examination

General

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

Chest

- respiratory rate (make a count during 1 minute when the child is calm)
  fast breathing: <2 months old: ≥60 breaths
  aged 2–11 months: ≥50 breaths
  aged 1–5 years: ≥40 breaths
- lower chest wall indrawing
- apex beat displaced / trachea shifted from midline
- auscultation—coarse crackles or bronchial breath sounds.
- gallop rhythm of heart on auscultation
- percussion signs of pleural effusion (stony dullness) or pneumothorax (hyper-resonance)

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

- abdominal masses (e.g. lymphadenopathy)
- enlarged liver and spleen.

Investigations

Pulse oximetry – to guide when to start and stop oxygen therapy

Chest X-ray – in children with very severe pneumonia, or severe pneumonia not responding to treatment or with complications, or associated with HIV

Table 6. 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	— Raised jugular venous pressure — Apex beat displaced to the left — Gallop rhythm — Heart murmur — Basal fine crackles — Enlarged palpable liver
Congenital heart disease	— Cyanosis — Difficulty in feeding or breastfeeding — Enlarged liver — Heart murmur
Tuberculosis	— Chronic cough (more than 30 days) — Poor growth / wasting or weight loss — positive Mantoux test — Positive contact history with tuberculosis patient — Diagnostic chest X-ray may show primary complex or miliary tuberculosis — Sputum positive in older child
Pertussis	— Paroxysms of cough followed by whoop, vomiting, cyanosis or apnoea — Well between bouts of cough — 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
Effusion/ empyema	— Stony dullness to percussion — Air entry absent

Table 6. Continued

Diagnosis	In favour
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 — HIV test positive in mother or child

4.2 Pneumonia

Pneumonia 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 appearance. 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.

Table 7. 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 recommended antibiotic — Give oxygen — Manage the airway — Treat high fever if present
■ Chest indrawing	**Severe pneumonia**	— Admit to hospital — Give recommended antibiotic — 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 2–11 months; ≥40 breaths/minute in a child aged 1–5 years	**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

Table 7. Continued

Sign or symptom	Classification	Treatment
■ Definite crackles on auscultation		
■ 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 96)

4.2.1 Very severe pneumonia

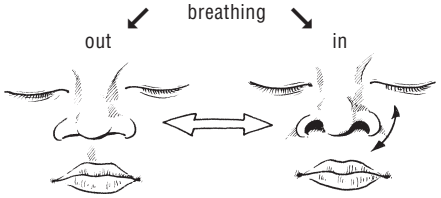
Diagnosis

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

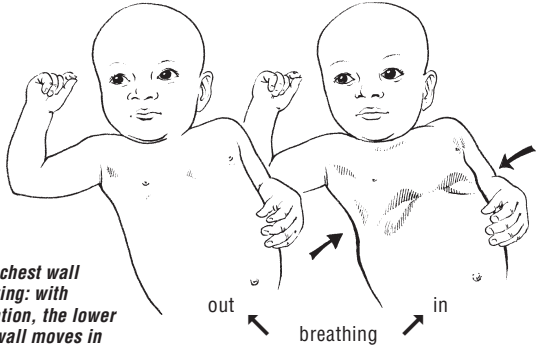
- central cyanosis
- inability to breastfeed or drink, or vomiting everything
- convulsions, lethargy or unconsciousness
- severe respiratory distress.

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

- fast breathing: age <2 months: ≥60/minute
  age 2–11 months: ≥50/minute
  age 1–5 years: ≥40/minute
- nasal flaring
- grunting (in young infants)
- 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)
- 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.



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



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

- If pulse oximetry is available, obtain an oxygen saturation measurement in all children suspected to have severe or very severe pneumonia
- If possible, obtain a chest X-ray to identify pleural effusion, empyema, pneumothorax, pneumatocoele, interstitial pneumonia and pericardial effusion.

Treatment

- Admit the child to hospital.

Antibiotic therapy

- Give ampicillin (50 mg/kg IM every 6 hours) and gentamicin (7.5 mg/kg IM once a day) for 5 days; then, if child responds well, complete treatment at home or in hospital with oral amoxicillin (15 mg/kg three times a day) plus IM gentamicin once daily for a further 5 days.

- Alternatively, give *chloramphenicol* (25 mg/kg IM or IV every 8 hours) until the child has improved. Then continue orally 4 times a day for a total course of 10 days. Or use ceftriaxone (80 mg/kg IM or IV once daily).
- 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
- Where pulse oximetry is available, use this to guide oxygen therapy (give to children with oxygen saturation less than 90%, where there is sufficient oxygen available)
- Use 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 10.7, page 281.
- Continue with oxygen until the signs of hypoxia (such as severe lower chest wall indrawing or breathing rate of ≥70/minute) are no longer present.
- Where pulse oximetry is available, carry out a trial period without oxygen each day in stable children. Discontinue oxygen if the saturation remains stable above 90%. 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 or ≥102.2 °F) which appears to be causing distress, give paracetamol.
- If wheeze is present, give a rapid-acting bronchodilator (see page 88).
- 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 10.2, page 273), 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 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.

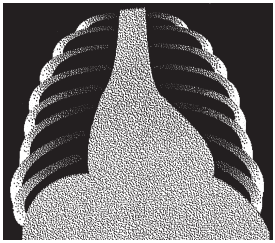
Staphylococcal pneumonia. This is suggested if there is rapid clinical deterioration despite treatment, by a pneumatocoele or pneumothorax with effusion on chest X-ray, numerous Gram-positive cocci in a smear of sputum, or heavy growth of *S. aureus* in cultured sputum or empyema fluid. The presence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

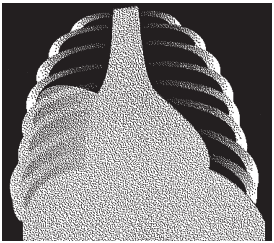
Empyema. This is suggested by persistent fever, and physical and chest X-ray signs of pleural effusion.

➤ Diagnosis and management are described in section 4.1.4, page 81.

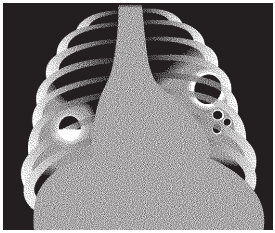
Tuberculosis. A child with persistent fever for more than 2 weeks and signs of pneumonia should be evaluated for tuberculosis. If another cause of the fever cannot be found, tuberculosis should be considered and treatment for tuberculosis, following national guidelines, may be initiated and response to anti-Tb treatment evaluated (see section 4.8, page 101).



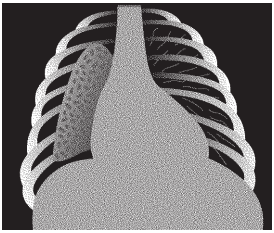
Normal chest X-ray



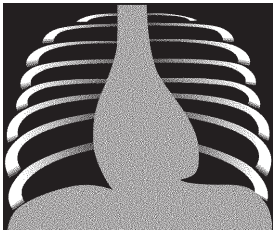
Lobar pneumonia of the right lower zone indicated by a consolidation (X-ray)



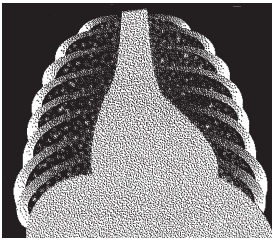
Staphylococcal pneumonia. *Typical features include pneumatocoeles on the right side of the illustration, and an abscess with an air-fluid level on the left side of the illustration (X-ray).*



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).*

Children who are HIV positive or in whom HIV is suspected. Some aspects of antibiotic treatment are different in children who are HIV positive or in whom HIV is suspected. Although the pneumonia in many of these children has the same aetiology as in children without HIV, PCP, often at the age of 4–6 months (see page 217) is an important additional cause which must be treated when present.

- Give ampicillin plus gentamicin for 10 days, as above
- If the child does not improve within 48 hours, a switch to ceftriaxone (80 mg/kg IV once daily over 30 minutes) if available. If it is not available, give gentamicin plus cloxacillin, as above.
- Also give high-dose 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.

For the further management of the child, including PCP prophylaxis (see HIV Chapter, page 199).

4.2.2 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 2–11 months: ≥50/minute
  - age 1–5 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 (25 mg/kg 2 times a day). The total course of treatment is 5 days.

➤ If the child does not improve within 48 hours, or deteriorates, look for complications and treat accordingly (see above, as described for very severe pneumonia, page 58, and below for suspected HIV). If there are no apparent complications, 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 10.7 (page 281).

Supportive care

See above (page 75), 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

Children who are HIV positive or in whom HIV is suspected

➤ Give ampicillin plus gentamicin for 10 days, as for very severe pneumonia

➤ If the child does not improve within 48 hours, switch to ceftriaxone (80 mg/kg IV once daily over 30 minutes) if available. If it is not available give gentamicin plus cloxacillin, as for very severe pneumonia.