Module 3

3. Initial management
Module 3

3.

Initial management
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10. Record initial findings and treatments and communicate to staff

Annex. Description of monitoring signs

Web Annexes
   Web Annex A. Critical care pathway (WHO/HEP/NFS/21.6)
   Web Annex B. Antibiotics reference card (WHO/HEP/NFS/21.7)
The World Health Organization (WHO) Training course on the inpatient management of severe acute malnutrition includes training modules, training guides, and supporting materials. The training package is based on the 2002 WHO Training course on the management of severe malnutrition\(^1\), which was updated in 2009\(^2\) to include the WHO Child Growth Standards, the use of mid-upper arm circumference to assess wasting, and the provision of ready-to-use therapeutic foods (RUTF) for the management of severe acute malnutrition, which enabled early transfer of children from inpatient to outpatient care. In 2013, WHO issued the Guideline: updates on the management of severe acute malnutrition in infants and children\(^3\), which provided updated recommendations on the following:

- admission and discharge criteria for children aged 6-59 months with severe acute malnutrition;
- where to manage children with severe acute malnutrition who have bilateral pitting oedema;
- use of antibiotics in the management of children with severe acute malnutrition in outpatient care;
- changes in the provision of vitamin A supplementation in the treatment of children with severe acute malnutrition;
- options for therapeutic feeding approaches in the management of severe acute malnutrition in children aged 6-59 months;
- fluid management of children with severe acute malnutrition and dehydration with and without shock;
- management of HIV-infected children with severe acute malnutrition;
- identifying and managing infants who are less than 6 months old with severe acute malnutrition.

The training course has been updated to incorporate these updates. Table 1 lists the key technical updates made for each module.

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<table>
<thead>
<tr>
<th>Module 2: Principles of care</th>
<th>Procedure</th>
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<tr>
<td></td>
<td>Admission criteria for inpatient care for children aged 6 months or older</td>
<td>Use of visible severe wasting as a sign of severe acute malnutrition</td>
<td>Visible severe wasting is no longer recommended as a sign of severe acute</td>
</tr>
<tr>
<td></td>
<td>Admit all severely malnourished children for inpatient care</td>
<td></td>
<td>malnutrition, due to its subjective nature</td>
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<tr>
<td></td>
<td></td>
<td>• Severely malnourished children with medical complications or failed appetite test should be admitted for inpatient care (or severely malnourished children who have mitigating circumstances such as disability, social issues, or difficulties with access to care)</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>• Severely malnourished children without these signs or mitigating circumstances should be managed in outpatient care</td>
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<tr>
<td></td>
<td></td>
<td>Emphasis on appetite test as an important procedure to decide whether severely malnourished children should be admitted for inpatient or outpatient care</td>
<td></td>
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<tr>
<td></td>
<td>Oedema of both feet</td>
<td>• Children with severe acute malnutrition who have severe bilateral oedema (+++) should be admitted for inpatient care, even when they do not present with medical complications and have appetite</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Children who have only + or ++ bilateral pitting oedema but present with medical complications or have no appetite, or are wasted, should be admitted for inpatient care</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Children aged 6 months or older who have + or ++ bilateral pitting oedema but no medical complications and have appetite should be managed in outpatient care</td>
<td></td>
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<tr>
<td>Module</td>
<td>Procedure</td>
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</tbody>
</table>
| Module 2: Principles of care | Criteria for transfer to outpatient care for children aged 6 months or older | Transfer to outpatient care when:  
- medical complications have been treated, and  
- the child has minimal oedema, and  
- the child is alert, and  
- the child eats 75% of the proposed daily amount of ready-to-use therapeutic food (RUTF);  
The decision should be determined by assessment of clinical condition and not anthropometric outcomes |  |
| | Criteria for discharge from all care for children aged 6 months or older | Discharge from all care when:  
- weight-for-height/length Z-score is ≥ -2, and  
- no oedema for at least 2 weeks, or  
- mid-upper arm circumference is ≥ 125 mm, and  
- no oedema for at least 2 weeks  
The anthropometric indicator used to confirm severe acute malnutrition should also be used to assess whether a child has reached nutritional recovery  
Children admitted with only bilateral pitting oedema +++ should be discharged from treatment based on whichever anthropometric indicator is routinely used in programmes  
Percentage weight gain should not be used as a discharge criterion |  |
<table>
<thead>
<tr>
<th>Module</th>
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<tr>
<td>Module 3: Initial management</td>
<td>Doses of routine antibiotics</td>
<td>• Amoxicillin 25 mg/kg&lt;br&gt;• Gentamicin 5 mg/kg&lt;br&gt;• Ampicillin 50 mg/kg</td>
<td>The doses of routine antibiotics have been adjusted, for example: amoxicillin 25–40 mg/kg, gentamicin 7.5 mg/kg, to reflect the latest recommendations from the 2013 WHO Pocket book of hospital care for children</td>
</tr>
<tr>
<td>Vitamin A</td>
<td></td>
<td>Children with severe acute malnutrition should receive the daily recommended nutrient intake of vitamin A (5000 IU) throughout the treatment period. If the children are receiving F-75, F-100 or RUTF that comply with WHO specifications (and therefore already contain sufficient vitamin A), or vitamin A is part of other daily supplements, the children do not require additional vitamin A. Children with severe acute malnutrition should be given a high dose of vitamin A (50 000 IU, 100 000 IU or 200 000 IU, depending on age) on admission, only if they are given therapeutic foods that are not fortified as recommended in WHO specifications and vitamin A is not part of other daily supplements</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High dose only indicated in corneal ulceration</td>
<td>Give a high dose (50 000 IU, 100 000 IU or 200 000 IU, depending on age) of vitamin A to children with severe acute malnutrition and eye signs of vitamin A deficiency or recent measles in inpatient care on Days 1, 2, and 15 (or at discharge to outpatient care), irrespective of the type of therapeutic food they are receiving</td>
<td></td>
</tr>
<tr>
<td>Atropine</td>
<td>1% 3 times a day</td>
<td>The concentration of atropine has been adjusted to 0.1% 3 times a day following discussion with and guidance from several experts as well as the WHO Model List of Essential Medicines.</td>
<td></td>
</tr>
<tr>
<td>Module</td>
<td>Procedure</td>
<td>2009 version</td>
<td>New version</td>
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</table>
| Module 4: Feeding | Transition to RUTF | Two options for transitioning children from F-75 to RUTF are suggested:  
a. Start feeding by giving RUTF as prescribed for the transition phase. If the child does not take the prescribed amount, then top up the feed with F-75. Increase the amount of RUTF over 2–3 days until the child takes the appropriate amount of RUTF to meet energy needs, or:  
b. Give the child the prescribed amount of RUTF for the transition phase. If the child does not take at least half the prescribed amount in the first 12 hours, then stop giving RUTF and give F-75 again. Retry the same approach after another 1–2 days until the child takes the appropriate amount of RUTF to meet energy needs | |
| | Transition for children with oedema | Children with bilateral pitting oedema should transition to RUTF when appetite returns and oedema is reducing | |
| | Rehabilitation phase for children on F-100 | Children who are taking F-100 and are achieving rapid weight gain during rehabilitation should be changed to RUTF. Ensure that they are finishing up the appropriate amount of RUTF before transferring them for outpatient care | |
| | Admission criteria for infants aged 0–6 months | • Weight-for-height Z-score < –3, and/or  
• Weight-for-length Z-score < –3, or  
• Presence of bilateral pitting oedema, or  
• Recent weight loss  
• Prolonged failure to gain weight  
• Serious breastfeeding difficulties after mother’s counselling | |
| | Feeding for infants aged 0–6 months | • Infants with severe acute malnutrition but no oedema should be given expressed breast milk. Where this is not possible, commercial (generic) infant formula or F-75 or diluted F-100 may be given, either alone or as the supplementary feed together with breast milk  
• Infants with severe acute malnutrition and bilateral pitting oedema should be given F-75 as a supplement to breast milk | |

3. INITIAL MANAGEMENT | TRAINING COURSE ON THE INPATIENT MANAGEMENT OF SEVERE ACUTE MALNUTRITION
<table>
<thead>
<tr>
<th>Module</th>
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<th>2009 version</th>
<th>New version</th>
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</thead>
</table>
| **Module 4: Feeding** | Criteria for transfer to outpatient care for infants aged 0–6 months | Transfer to outpatient care when:  
  • all clinical conditions are resolved, and  
  • the infant has good appetite, is clinically well and alert, and  
  • weight gain is satisfactory, and  
  • the infant has been checked for immunizations, and  
  • the mother or caregiver is linked with community-based follow-up and support |  |
|  | Criteria for discharge from all care for infants aged 0–6 months | Discharge from all care when the infant:  
  • is breastfeeding effectively or feeding well with replacement feeds, and  
  • has adequate weight gain, and  
  • has a weight-for-length Z-score $\geq -2$ |  |
<p>| <strong>Module 5: Daily care</strong> |  | Similar updates as those made to modules 3 and 4, where applicable |  |
| <strong>Module 6: Monitoring and problem solving</strong> |  | No major technical updates. Minor updates, for example where RUTF replaces F-100 |  |
| <strong>Module 7: Involving mothers in care</strong> | Criteria for referral to outpatient care for children aged 6 months or older | Similar updates as in module 2 |  |
|  | Criteria for discharge from all care for children aged 6 months or older | Similar updates as in module 2 |  |</p>
<table>
<thead>
<tr>
<th>Module</th>
<th>Procedure</th>
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<th>New version</th>
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<tbody>
<tr>
<td>Module 8: Outpatient management of severe acute malnutrition</td>
<td></td>
<td>New module</td>
<td></td>
</tr>
<tr>
<td>Supporting materials</td>
<td>Critical care pathways and answers to exercises</td>
<td></td>
<td>All critical care pathways and answers to exercises have been updated to reflect the updates in modules</td>
</tr>
<tr>
<td></td>
<td>Organization of supporting materials</td>
<td></td>
<td>The supporting materials have been incorporated within the modules and guides concerned</td>
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</tbody>
</table>
ACKNOWLEDGEMENTS

This updated version was coordinated by Zita Weise Prinzo, Department of Nutrition for Health and Development, together with Chantal Gegout (formerly in the Department of Nutrition for Health and Development), in collaboration with Wilson Were, Department of Maternal Child and Adolescent Health. Thanks are due to Jaden Bendabenda, Department of Nutrition for Health and Development, for finalizing this version and preparing it for publication. Special thanks are due to Diana Estevez, who helped during the finalization process.

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In addition, special thanks are due to Beatrice Amadi, Teaching Hospital, Lusaka, Zambia, for her contribution during the pilot testing and for reviewing the course, and to Professor Michael Golden and Dr Yvonne Grellety for reviewing and providing invaluable technical inputs to the course.

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FINANCIAL SUPPORT

WHO gratefully acknowledges the financial support from the French Muskoka Fund and the Bill and Melinda Gates Foundation for the update of the training materials.
### ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CCP</td>
<td>critical care pathway</td>
</tr>
<tr>
<td>CMV</td>
<td>combined minerals and vitamins</td>
</tr>
<tr>
<td>Hb</td>
<td>haemoglobin</td>
</tr>
<tr>
<td>IM</td>
<td>intramuscular</td>
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<tr>
<td>IU</td>
<td>international unit</td>
</tr>
<tr>
<td>IV</td>
<td>intravenous</td>
</tr>
<tr>
<td>NG</td>
<td>nasogastric</td>
</tr>
<tr>
<td>ORS</td>
<td>oral rehydration solution</td>
</tr>
<tr>
<td>ReSoMal</td>
<td>rehydration solution for malnutrition</td>
</tr>
<tr>
<td>RUTF</td>
<td>ready-to-use therapeutic food</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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</table>
INTRODUCTION

The focus of initial management during inpatient care of a severely malnourished child is to prevent death while stabilizing the child. The first step is to check the child for emergency signs and provide emergency treatment as necessary. Any child presenting to the hospital should be checked for emergency signs as part of standard procedure.4

With an extremely sick child, many procedures must be done quickly, efficiently, and correctly. Much practice and experience is needed to perform efficiently in an emergency room as a team. This course obviously cannot teach the entire process of emergency management, but it will focus on the steps that must be added or adjusted to treat the severely malnourished child.

Some of the initial management procedures described in this module may be performed in the emergency room, before the child is admitted to the severe acute malnutrition ward. It is very important that emergency room staff know to treat the severely malnourished child differently. They must be taught to recognize severely malnourished children and to understand that these children may be seriously ill even without showing signs of infection. A severely malnourished child should be seen as quickly as possible in the emergency room. Staff must understand that they should not put up a rapid intravenous (IV) line. A critically ill child with severe acute malnutrition may present with shock, severe anaemia, hypoglycaemia or hypothermia, which need immediate resuscitation and treatment.

When any necessary emergency treatment has been provided, the child should be moved immediately to the severe acute malnutrition ward. For several days, it is critical to watch for and treat or prevent such life-threatening problems as hypoglycaemia, hypothermia, shock, dehydration and infection. The child should not gain any weight until appetite has returned and the child has been moved to transition phase. This module describes the life-saving tasks that are essential to initial management of the severely malnourished child exhibiting danger signs.

The focus of initial management is to prevent death while stabilizing the child

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4 It is expected that participants already have skills in emergency triage, assessment, and treatment of all sick children - these will not be taught in this course. Only the differences in treatment of emergencies (such as shock or severe dehydration) in a malnourished child are taught in this course.
LEARNING OBJECTIVES

This module will describe and, to the extent feasible, allow you to observe and practise the following skills:

• recognizing the danger signs;
• identifying and managing the severely malnourished child with:
  - shock
  - very severe anaemia
  - hypoglycaemia
  - hypothermia
  - corneal ulceration
  - watery diarrhoea or vomiting;
• preparing rehydration solution for malnutrition (ReSoMal);
• selecting appropriate antibiotics and calculating dosages;
• keeping a written record of initial findings and treatments.
1. **INITIAL ASSESSMENT**

When a child with severe acute malnutrition is seen in the emergency department, assess for general danger signs or emergency signs and take a history concerning:

- recent intake of food and fluids
- usual diet before the current illness
- breastfeeding
- duration and frequency of diarrhoea and vomiting
- type of diarrhoea (watery, bloody)
- loss of appetite
- family circumstances
- cough for more than 2 weeks
- contact with tuberculosis
- recent contact with measles
- known or suspected HIV infection or exposure.

On examination, look for:

- shock: semi-conscious or unconscious, with cold hands, slow capillary refill (over 3 seconds) or weak (low volume), rapid pulse and low blood pressure
- signs of dehydration
- severe palmar pallor
- bilateral pitting oedema
- eye signs of vitamin A deficiency: 5
  - dry conjunctiva or cornea, Bitot’s spots
  - corneal ulceration
  - corneal clouding
- localizing signs of infection, including ear and throat infections, skin infection or pneumonia
- signs of HIV infection
- fever (temperature ≥ 37.5°C) or hypothermia (rectal temperature < 35.5°C)
- mouth ulcers
- skin changes:
  - hypo- or hyperpigmentation
  - desquamation
  - ulceration (spreading over limbs, thighs, genitalia, groin and behind the ears)
  - exudative lesions (resembling severe burns), often with secondary infection (including *Candida*)
- conduct an appetite test:
  - check if the child has appetite by providing ready-to-use therapeutic food (RUTF)
- conduct necessary laboratory investigations.

---

5 Children with vitamin A deficiency are likely to be photophobic and will keep their eyes closed. It is important to examine the eyes very gently to prevent corneal rupture.
2. EMERGENCY TREATMENT FOR SEVERELY MALNOURISHED CHILDREN

Children with severe acute malnutrition should be assessed following the guidelines on emergency triage, assessment, and treatment of sick children outlined in the WHO Updated guideline: paediatric emergency triage, assessment and treatment: care of critically ill children,⁶ and the WHO Pocket book of hospital care for children.⁷

Children with emergency signs for airway and breathing, or coma or convulsions, should receive standard emergency treatment.

However, in severely malnourished children who have shock, WHO recommends a cautious approach to IV fluid resuscitation for the following reasons.

• Individual emergency signs of shock may be present in a malnourished child even when there is no shock.
• Shock from dehydration and sepsis are likely to coexist, and these are difficult to differentiate on clinical grounds alone.
• Children with severe malnutrition are susceptible to fluid changes and, in particular, have reduced tolerance to rapid changes in circulating blood volume. For these reasons, fluid management is complex in all children with severe acute malnutrition.
• It is frequently very difficult to assess and determine the hydration status and circulating volume of severely malnourished children.

Careful history should be taken, with a clinical examination, investigations and treatment, to properly manage shock in severe acute malnutrition. Skilled staff and adequate equipment are essential (see section 5 of this module).

Severely malnourished children with signs of severe dehydration but not in shock should not be rehydrated with IV fluids. Severe dehydration is difficult to diagnose in severe acute malnutrition and is often misdiagnosed. The clinical signs usually relied on to diagnose dehydration are similar to those found in severe wasting without dehydration. Giving IV fluids puts these children at risk of overhydration and death due to heart failure. Severely malnourished children with signs of severe dehydration but not in shock should be rehydrated orally with the special rehydration solution for malnutrition (ReSoMal) (see section 6 of this module).

Additionally, 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 also important to take prompt action to prevent some of these problems, if they were not present at the time of admission to hospital. These conditions are discussed in detail in this module.

3. MANAGE HYPOGLYCAEMIA

3.1 What is hypoglycaemia?

Hypoglycaemia is a low level of glucose in the blood. In severely malnourished children, the level considered low is less than (<) 3 mmol/L (or < 54 mg/dl). The hypoglycaemic child is often hypothermic (low temperature) as well. Other signs of hypoglycaemia include limpness, loss of consciousness and sometimes eyelid retraction (sleeping with eyes open, which may also be due to dehydration). Sweating and pallor are uncommon in malnourished children with hypoglycaemia. Often the only sign before death is drowsiness.

The short-term cause of hypoglycaemia is lack of food. Severely malnourished children are more at risk of hypoglycaemia than other children and need to be fed more frequently, including during the night. Malnourished children may arrive at the hospital hypoglycaemic if they have been vomiting, if they have been too sick to eat, or if they have had a long journey without food. Most hypoglycaemia cases occur in the newly admitted child who has not been fed for 12 hours or more. It is important to:

- take a history from the mother of the last time the child had food;
- give all severely malnourished children a drink of sugar water (10%) on arrival at the health facility;
- teach the mother and staff to look at the eyes of the child – if the child sleeps with the eyes open, wake the child and give sugar water or F-75.

Children may also develop hypoglycaemia in the hospital if they are kept waiting for too long in the admission area, or if they are not fed regularly. Severe hypoglycaemia and hypothermia are also signs that the child has a serious infection.

Hypoglycaemia is extremely dangerous. The child may die if not given glucose (and then food) quickly, or if there is a long time between feeds.

3.2 Test blood glucose level

If blood was not taken during emergency procedures, take a sample on admission to the ward. The same sample can be used to determine blood glucose level, haemoglobin level and blood type, in case a transfusion is needed.

Blood glucose level can be tested using treated paper strips such as dextrostix or glucostix, or using a glucometer as shown in the figure below. Carefully follow the user instructions provided by manufacturers of the test kits.

---

8 Identification of hypoglycaemia should prompt investigation into the underlying cause, which includes taking a thorough history.
There may not be enough time to take and test a blood sample right away. If hypoglycaemia is suspected, give treatment immediately without laboratory confirmation. It can do no harm, even if the diagnosis is incorrect. All severely malnourished children are at risk of developing hypoglycaemia.

### 3.3 Treat hypoglycaemia

If blood glucose is low or hypoglycaemia is suspected, immediately give the child a 50 ml bolus of 10% glucose or 10% sucrose orally, sublingually, or by nasogastric (NG) tube. Though 50 ml is a very small amount, it can make a big difference to the child.

If only 50% glucose solution is available, dilute one part to four parts sterile or boiled water to make a 10% solution.

If the child can drink, give the 50 ml bolus orally. If the child is alert but not drinking, give the 50 ml by NG tube.

Start feeding with F-75 immediately and follow the feeding schedule (2-hourly feeds). Take another blood sample after 2 hours and check the child’s blood glucose again before giving second feeds. If blood glucose is still low, make sure antibiotics and F-75 have been correctly given.

If the child is stuporous, semi-conscious, unconscious, or convulsing, give 5 ml/kg body weight of sterile 10% glucose by IV, followed by 50 ml of 10% glucose or sucrose by NG tube. If the IV dose cannot be given immediately, give the NG dose first.

**Note:** If the child is being given IV fluids for shock, there is no need to follow the 10% IV glucose with an NG bolus, as the child will continue to receive glucose in the IV fluids. The treatment of significant hypoglycaemia is dramatic; the child usually wakes up in 2 or 3 minutes. If the child does not regain consciousness within this period, look for other causes of unconsciousness.
3.4 Prevent hypoglycaemia: begin F-75

If the child’s blood glucose is not low (above 3 mmol/L), begin feeding the child with F-75 right away. Feed the child every 2 hours, even during the night. Appropriate amounts are given on your F-75 reference card. These frequent, small feeds will prevent hypoglycaemia and provide nutrients for the child during the initial period of stabilization.

Look at the F-75 reference card now

There are two F-75 reference card tables. One shows amounts for children without oedema or with mild (+) or moderate (++) oedema, and the other one (on the reverse side) presents amounts for children with severe oedema (+++). Notice that the amounts for children with severe oedema are smaller.

The first column shows the weight of the child, and the next column shows the amount of F-75 to give every 2 hours. The remaining columns, which show amounts for 3-hourly and 4-hourly feeds, will be used later, as the child progresses.

Feeding with F-75 should begin as soon as possible. Feeding will be discussed in detail in Module 4.

4. MANAGE HYPOTHERMIA

4.1 What is hypothermia?

Hypothermia is low body temperature. A severely malnourished child is hypothermic if the rectal temperature is below 35.5°C or if the axillary temperature is below 35.0°C.

Severely malnourished children are at greater risk of hypothermia than other children and need to be kept warm. The hypothermic child has not had enough calories to warm the body. Both hypothermia and hypoglycaemia are signs that the child is more likely to have a serious systemic infection.

4.2 Take temperature

Rectal temperatures are preferred because they more accurately reflect core body temperature. If axillary temperatures are taken, convert them to rectal by adding...
0.5°C. If axillary temperatures are used for routine monitoring, recheck any patient with an axillary temperature below 35.0°C by taking a rectal temperature.

**Steps for using a rectal thermometer:**

- if you are using a mercury thermometer, shake it down to below 35°C;
- position the child on their side or back with legs lifted;
- insert thermometer in rectum so that the bulb goes in about 1.25 cm;
- keep in place for 1 minute.

**Steps for using an axillary thermometer:**

- if you are using a mercury thermometer, shake it down to below 35.0°C;
- place thermometer under armpit;
- keep in place for 3 minutes;
- if below 35.0°C, take rectal temperature for more accurate reading.

### 4.3 Treat hypothermia

**Warm the child**

Severely malnourished children have difficulty controlling their body temperature and so must be kept warm and fed frequently. Keeping them warm also conserves their energy.

Hypothermia is very dangerous. If the child is hypothermic, rewarming is necessary to raise temperature.

**Actively rewarm the hypothermic child**

In addition to keeping the child covered and keeping the room warm, use one of the following rewarming techniques if the child is hypothermic.

- Have the mother hold the child with the child’s skin next to her skin when possible (kangaroo technique), and cover both of them. Keep the child’s head covered.
• Use a heater or incandescent lamp with caution. Use indirect heat (not too close). Monitor rectal temperature every 30 minutes to make sure the child does not get too hot. Stop rewarming when the child’s temperature becomes normal.
• Do not use hot water bottles to rewarm the child due to danger of burning fragile skin.

4.4 Prevent hypothermia
Maintain temperature

The following measures are important for all severely malnourished children.

• Always use adult beds and encourage the mother and child to sleep together. Baby cots are very dangerous for children with severe acute malnutrition and can cause hypothermia.
• Cover the head and put on a dry blanket (nearly all the heat is lost from the head). Stop draughts in the room; move the child away from windows.
• Maintain a room temperature of 28°C to 32°C if possible.⁹
• Most hypothermia occurs at night; install a minimum–maximum thermometer on the wall of the ward so that the night-time temperature can be read by the staff coming on in the morning.
• Keep the child covered at night.
• Warm your hands before touching the child.
• Avoid leaving the child uncovered while being examined or weighed.
• Promptly change wet clothes or bedding.
• Do not bathe the child early in the morning. Dry the child thoroughly after bathing.
• Do not bathe very ill or moribund children.

If it is not possible to warm the room, let the child sleep snuggled up to the mother, and cover them with a blanket.

---

⁹ A ward that feels too warm for the staff’s comfort is good for the malnourished child. Similarly, if it is comfortable for the staff it is too cold for the child.
Example of critical care pathway

The next page shows the first part of a case record, or critical care pathway (CCP). Information has been entered about a child’s presenting signs and initial management.

So far, the steps in this module have been related to the following CCP sections: signs of severe acute malnutrition, temperature, blood glucose, and feeding. As the module continues, you will learn about the other sections of this page of the CCP.

A complete, blank CCP is provided in Web Annex A. The CCP will be used in this course as both a job aid and a record of care.

Tell a facilitator when you have reached this point in the module. When everyone is ready, your facilitator will present a brief introduction on how to use the CCP. In the meantime, you may study the example on the next page.
INITIAL MANAGEMENT

NAME ___________________ M     F     DATE OF BIRTH___________ AGE ______(months) DATE OF ADMISSION____________

INITIAL MANAGEMENT

Comments on pre-referral and/or emergency treatment already given: __________________________________________

SIGNS OF SAM
Severe wasting? [ ] Yes [ ] No
Bilateral pitting oedema? [ ] Yes [ ] + [ ] ++ [ ] +++ (raw skin, fissures)
Dermatosis? [ ] Yes [ ] + [ ] ++ [ ] +++
Weight (kg): 6.3

TEMPERATURE: _______°C rectal   axillary
If rectal <35.5°C (95.9°F), or axillary<35°C (95°F), actively warm child.

BLOOD GLUCOSE (mmol/L): Check temperature every 30 minutes.

SIGNS OF SHOCK:
Semi-conscious/unconscious     Cold hands   Slow capillary refill (> 3 seconds)      Weak or fast pulse

If semi-conscious or unconscious, cold hands, plus either slow capillary refill or weak or fast pulse, give oxygen. Give IV glucose as described under Blood Glucose (left).

If semi-conscious or unconscious, slow capillary refill weak or fast, give oxygen. Give IV glucose as described under Blood Glucose (left).

SIGNS OF DIARRHOEA:

Watery diarrhoea? [ ] Yes [ ] No

If diarrhea, circle signs present:
Restless/irritable          Lethargic        Thirsty

Recent sunken eyes     Dry mouth/tongue      No tears

If Hb <40 g/l or PCV<12%, transfuse 10 ml/kg whole fresh blood (or 5-7 ml/kg packed cells)

DEHYDRATION:

If diarrhoea, give 50 ml bolus of 10% glucose or sucrose orally or by NGT. If <3 mmol/l and alert, give 50 ml bolus NGT. Then give 10 ml/kg IV for up to 10 hours. If no improvement after 1 hour, treat for septic shock (transfuse whole fresh blood, see ‘Haemoglobin’), give maintenance IV fluids 6 ml/kg/hour while waiting for blood.

MEASLES

Yes [ ] No [ ]

If eye signs, give vitamin A & atropine immediately. Record below and on Daily Care page.

Antibiotics (All receive)

<table>
<thead>
<tr>
<th>Drug/Route</th>
<th>IV</th>
<th>Once daily for 7 days</th>
<th>Time of 1st Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gentamicin</td>
<td></td>
<td></td>
<td>10.30</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>Oral (syrup)</td>
<td>Every 6 hours for 2 days</td>
<td>10.30</td>
</tr>
</tbody>
</table>

Begin feeding with F-75 as soon as possible. (If child is rehydrated, reweigh before determining amount to feed):

New weight: ___ (kg)

Amount for 2-hourly feeding:

F-75 ml

Time first fed: 10.45

FEEDING

Amount for 2-hourly feedings:
F-75 F-75 F-75 F-75 F-75

Oral doses
<6 months 50,000 UI
6 - 12 months 100,000 UI
>12 months 200,000 UI

Oral A:

<6 months 50,000 UI
6 - 12 months 100,000 UI
>12 months 200,000 UI

EYE SIGNS:

None [ ] Left [ ] Right [ ]

If eye signs, give vitamin A & atropine immediately. Record below and on Daily Care page.

Start: ____________  Time: ____________

Ended: ____________

Plan feed:

Amount: 5 ml x ____ kg (child’s weight) = _____ ml ReSoMal every 2 hours

Amount for 2-hourly feedings:
F-75 F-75 F-75 F-75 F-75

Start: ____________  Time: ____________

Ended: ____________

Amount: 5-10 ml x ____ kg (child’s weight) = _____ ml ReSoMal every 2 hours

Stop: ____________  Time: ____________

3. INITIAL MANAGEMENT | TRAINING COURSE ON THE INPATIENT MANAGEMENT OF SEVERE ACUTE MALNUTRITION
5. MANAGE A SEVERELY MALNOURISHED CHILD WHO IS IN SHOCK

5.1 What is shock?

Shock is a dangerous condition resulting from diarrhoea with severe dehydration, haemorrhage, burns, or sepsis. In non-malnourished children, signs of shock include cold extremities, slow capillary refill (longer than 3 seconds), fast, weak pulse, and lethargy or unconsciousness. However, in severely malnourished children these signs may be present even in the absence of shock, making the diagnosis of shock difficult. Thus, in severe acute malnutrition, IV fluids should only be given if the child meets the following criteria.

<table>
<thead>
<tr>
<th>Criteria for diagnosis of shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>The severely malnourished child is considered to have shock if he or she:</td>
</tr>
<tr>
<td>• is stuporous, semi-conscious or unconscious, and</td>
</tr>
<tr>
<td>• has cold hands.</td>
</tr>
<tr>
<td>plus, either:</td>
</tr>
<tr>
<td>• slow capillary refill(a) (longer than 3 seconds), or</td>
</tr>
<tr>
<td>• weak or fast pulse,(b)</td>
</tr>
</tbody>
</table>

a. To check capillary refill:
• press the nail of the thumb or big toe for 2 seconds to produce blanching of the nail bed;
• count the seconds from release until return of the pink colour. If it takes longer than 3 seconds, capillary refill is slow.

b. Normal pulse rate in children:

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Pulse rate (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1</td>
<td>100–160</td>
</tr>
<tr>
<td>1 to 3</td>
<td>90–150</td>
</tr>
<tr>
<td>3 to 6</td>
<td>80–140</td>
</tr>
</tbody>
</table>

5.2 Give IV glucose, IV fluids and oxygen

If the child is in shock (meets criteria in box above):

• give sterile 10% glucose 5 ml/kg by IV (as described in section 3.3 above)
• give oxygen (see below)
• give IV fluids (see below)
• keep the child warm.

Giving oxygen

If available, provide oxygen flow at 1–2 L per minute (0.5 L per minute for young infants) to aim for an oxygen saturation > 90%. Care should be taken to keep the nostrils clear of mucus, which could block the flow of oxygen.
Giving IV fluids

Shock from dehydration and sepsis are likely to coexist in severely malnourished children. They are difficult to differentiate on clinical signs alone. Children with dehydration will respond to resuscitation using IV fluids. Those with septic shock and no dehydration will not respond to IV fluids. The amount of IV fluids given must be guided by the child’s response. Overhydration can cause heart failure and death.

To give IV fluids:

• Insert an IV line (and draw blood for emergency laboratory investigations).
• Check the starting weight, respiratory and pulse rates and record them on the CCP. Also record the starting time.
• Infuse IV fluid at 15 ml/kg over 1 hour (see table below). Use one of the following solutions, listed in order of preference:
  1. half-strength Darrow’s solution with 5% dextrose
  2. Ringer’s lactate solution with 5% glucose
  3. 0.45% (half-normal) saline with 5% glucose.

<table>
<thead>
<tr>
<th>Child weight</th>
<th>Volume of IV fluid: give for 1 hour (15 ml/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 kg</td>
<td>60 ml</td>
</tr>
<tr>
<td>6 kg</td>
<td>90 ml</td>
</tr>
<tr>
<td>8 kg</td>
<td>120 ml</td>
</tr>
<tr>
<td>10 kg</td>
<td>150 ml</td>
</tr>
<tr>
<td>12 kg</td>
<td>180 ml</td>
</tr>
<tr>
<td>14 kg</td>
<td>210 ml</td>
</tr>
<tr>
<td>16 kg</td>
<td>240 ml</td>
</tr>
<tr>
<td>18 kg</td>
<td>270 ml</td>
</tr>
</tbody>
</table>

• Observe the child and check respiratory and pulse rates every 5–10 minutes.
• If there are signs of improvement (pulse rate and respiratory rate are slower) and no evidence of pulmonary oedema:
  - repeat IV infusion at 15 ml/kg over 1 hour; then
  - switch to oral or NG rehydration with ReSoMal at 5–10 ml/kg in alternate hours with F-75 for up to 10 hours;
  - initiate re-feeding with F-75;
  - leave the IV line in place in case it is needed again;
  - continue to check respiratory and pulse rates every 5–10 minutes;
  - continue to monitor weight changes.
• If the child fails to improve after 1 hour on IV fluids, then treat for septic shock:
  - give maintenance IV fluid (4 ml/kg per hour) while waiting for blood;
  - when blood is available, transfuse fresh whole blood at 10 ml/kg slowly over 3 hours (use packed cells if the child is in cardiac failure); then
  - initiate re-feeding with F-75;
  - provide IV or intramuscular (IM) antibiotics (see section 9).

10 Half-strength Darrow’s solution with 5% dextrose is preferred because it has a lower sodium and higher potassium content than the other two fluids. However, in non-malnourished children, half-strength Darrow’s solution is not recommended for resuscitation because of the risk of hyponatraemia.
Note: Children in shock who respond partially or not at all to fluid resuscitation require a differentiated response, depending on the cause. A careful history should be taken, with a clinical examination, investigations and treatment. In addition to septic shock, other causes of shock, such as toxic shock or cardiogenic shock, should be considered.\(^{11}\)

- If the child deteriorates during IV rehydration (shows signs of overhydration and signs of congestive heart failure):
  - if the respiratory rate increases by 5 breaths per minute or pulse rate increases by 15 beats per minute, liver enlarges, fine crackles occur throughout lung fields, jugular venous pressure increases, or galloping heart rhythm develops – stop the infusion, because IV fluid can worsen the child's condition by inducing pulmonary oedema.

Notice that the steps for checking for shock and giving IV fluids are all written on the CCP as a reminder (see extract below).

<table>
<thead>
<tr>
<th>SIGNS OF SHOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
<tr>
<td>Slow capillary refill (&gt; 3 seconds)</td>
</tr>
</tbody>
</table>

*If semi-conscious or unconscious, cold hands, plus either slow capillary refill or weak or fast pulse, give oxygen. Give IV glucose as described under “blood glucose” (left).

Then give IV fluids: amounts IV fluids per hour: \(15 \text{ ml} \times \frac{\text{kg (child's wt.)}}{\text{kg}}\) = \(\text{ml}\)

<table>
<thead>
<tr>
<th><strong>Time</strong></th>
<th><strong>Start (1st hr)</strong></th>
<th><strong>Monitor every 10 minutes</strong></th>
<th><strong>2nd hr</strong></th>
<th><strong>Monitor every 10 minutes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**If improvements after 1 hour (respiratory and pulse rates are slower), repeat same amount of IV fluids for second hour; then alternate ReSoMol and F-75 for up to 10 hours. If no improvement after 1 hour, treat for septic shock (transfuse whole fresh blood, see “haemoglobin”), give maintenance IV fluids (4 ml/kg/hour) while waiting for blood.

6. MANAGE DEHYDRATION

Dehydration, usually resulting from diarrhoea, is often difficult to diagnose in malnourished children because the clinical signs relied on to diagnose dehydration, such as lethargy, skin pinch and sunken eyes, are similar to those found in severe wasting without dehydration. Using these signs in a severely malnourished child can lead to overdiagnosis of dehydration and inappropriate fluid administration, increasing the risk of death due to overhydration.

In children with severe acute malnutrition, dehydration should be suspected if there is a recent history of watery stools (frequent with a sudden onset within the past few hours or days), frequent vomiting, or recent change in the face noted by the mother.

Children with severe acute malnutrition who present with some dehydration or severe dehydration but who are not shocked should be rehydrated slowly, either orally or by NG tube, using ReSoMal. Do not give IV fluids.

6.1 ReSoMal: preparing and calculating the correct amounts

What is ReSoMal?

ReSoMal is rehydration solution for malnutrition. It is a modification of the standard oral rehydration solution (ORS) recommended by WHO. ReSoMal contains less sodium, more sugar, and more potassium than the standard ORS.

Prepare ReSoMal

WHO recommends use of commercial (pre-packaged) ReSoMal, which is readily available in many countries. Simply follow the dilution instructions on the package.

In case of stock-out, ReSoMal can be prepared from standard WHO low-osmolarity ORS with the additional ingredients shown below.

<table>
<thead>
<tr>
<th>Contents of ReSoMal prepared from standard WHO low-osmolarity ORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
</tr>
<tr>
<td>Standard low-osmolarity ORS</td>
</tr>
<tr>
<td>Sugar</td>
</tr>
<tr>
<td>Combined minerals and vitamins (CMV)*</td>
</tr>
</tbody>
</table>

*a Composition of combined minerals and vitamins (CMV) is presented in Annex 3 of Module 2, on principles of care.

Dissolve one sachet of the standard WHO low-osmolarity ORS in 2 L water (instead of 1 L). Add 1 level scoop of commercially available combined minerals and vitamins mix or 40 ml of mineral mix solution and add and dissolve 50 g of sugar.
In some countries, sachets are available that are designed to make 500 ml of standard WHO low-osmolarity ORS. In this situation, dilution can be revised to add 1 L.

**Calculate amount of ReSoMal to give**

Children with severe acute malnutrition and who have some or severe dehydration but no shock should receive 5 ml/kg ReSoMal every 30 minutes for the first 2 hours. Then, if the child is still dehydrated, 5–10 ml/kg/hour ReSoMal should be given in alternate hours with F-75, up to a maximum of 10 hours.

<table>
<thead>
<tr>
<th>How often to give ReSoMal</th>
<th>Amount to give</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every 30 minutes for first 2 hours</td>
<td>5 ml/kg body weight</td>
</tr>
<tr>
<td>Alternate hours for up to 10 hours</td>
<td>5–10 ml/kg</td>
</tr>
</tbody>
</table>

If the child has already received IV fluids for shock and is switching to ReSoMal, omit the first 2-hour treatment and start with the amount for the next period of up to 10 hours.

### 6.2 Giving ReSoMal

**Determine the child’s target weight**

Weight change is critical to monitoring hydration status and must be done using a scale that measures to a precision of a 10–20 g.

For children with severe wasting and dehydration:

- if pre-diarrhoeal weight is known, use it to monitor weight gain during hydration;
- if pre-diarrhoeal weight is not known, presume a 5% loss of body weight and determine the target weight before giving the ReSoMal.

For severely malnourished children with oedema and dehydration, rehydration must be done more cautiously.

**Give ReSoMal slowly**

It is essential to give ReSoMal slowly, much more slowly than you would give ORS to a well nourished child. Too much fluid, too quickly, can cause heart failure.

The best way to give ReSoMal is by cup, even with a very sick child. The child may need to be coaxed, or you may need to use a spoon or syringe.

If the mother is able to give the ReSoMal, she should be taught to give it slowly. Use of an NG tube for giving ReSoMal should be discouraged. Since the degree of dehydration cannot be determined by clinical signs, and too much fluid could cause heart failure, it is very important that fluids are not forced on the child. When fluids are given orally, the child’s thirst helps to regulate the amount given.

It is essential to stop giving ReSoMal when the child reaches the target weight.
Encourage and support the mother to continue breastfeeding the child during rehydration.

6.3 Monitoring the child who is taking ReSoMal

Monitoring progress

Monitor the child’s progress every half hour for the first 2 hours. It is important to make a major reassessment of the child’s condition after the first 2 hours.

Then monitor hourly, i.e. every time the child takes F-75 or ReSoMal. Continue monitoring even after improved hydration status and discontinuation of ReSoMal.

Signs to check

Check the following signs:

- attainment of target weight: stop giving ReSoMal when the child has reached the target weight
- clinical signs of improvement
- clinical signs of overhydration
- respiratory rate: count for a full minute
- pulse rate: count for 30 seconds and multiply by 2
- urine frequency: has the child urinated since last checked?
- stool or vomit frequency: has the child had a stool or vomited since last checked?
- respiratory and pulse rates in normal ranges
- passing urine.

Record the above information on the CCP. Notice any changes when you check the signs above.

If a child has reached the target weight, stop giving ReSoMal. Continue monitoring even after improved hydration status and ReSoMal stopped.

At the same time as the child gains weight during rehydration, there must be an improvement in clinical signs. If that is not the case, the initial diagnosis of dehydration was wrong and ReSoMal must be stopped.

Signs of overhydration

Stop ReSoMal immediately if any of the following signs appear:

- child’s weight exceeds the target weight
- increased respiratory rate or pulse rate
- jugular veins engorged (pulse wave can be seen in the neck)
- increasing oedema (e.g. puffy eyelids).
### 6.4 Managing diarrhoea

**Children with profuse (acute) watery diarrhoea**

In cases of profuse (acute) watery diarrhoea (e.g. cases of cholera), ReSoMal should not be given. This is because ReSoMal is not adapted to provide the amount of sodium needed to correct losses in cholera. Such children should be managed with standard WHO low-osmolarity ORS that is normally made, without further dilution.

**Children with osmotic diarrhoea**

Osmotic diarrhoea is common in malnourished children when they start taking therapeutic feeds, due to carbohydrate intolerance. It is generally due to villous atrophy and challenge to the gut from the sugars in diets and rehydration fluids, resulting in increased fluid losses from the gut.

Osmotic diarrhoea does not require ReSoMal unless there is significant weight loss (indicating dehydration). Continue giving the feeds and closely monitor weight changes.

**Children with persistent diarrhoea**

Persistent diarrhoea is defined as three or more loose or watery stools in a day for more than 14 days. Persistent diarrhoea may be due to carbohydrate intolerance or small bowel bacterial overgrowth, though it may also be associated with enteric infections such as cryptosporidiosis, or *Giardia, Shigella* or *Salmonella* infection. Children infected with HIV also commonly develop persistent diarrhoea, sometimes due to cryptosporidiosis or severe carbohydrate intolerance.

Management of persistent diarrhoea in such situations generally involves nutritional interventions (including diets that are rich in essential nutrients, particularly zinc), restricting disaccharides (for example, by giving low-lactose feeds), treating bacterial overgrowth, and, when appropriate, excluding enteric or other systemic infections.

Do not give ReSoMal in children with persistent diarrhoea unless there are signs of dehydration.
7. MANAGE VERY SEVERE ANAEMIA

7.1 What is very severe anaemia?
Anaemia is a low concentration of haemoglobin (Hb) in the blood. Very severe anaemia is a Hb concentration of < 40 g/L (or packed cell volume < 12%). As malnutrition is usually not the cause of very severe anaemia, it is important to investigate other possible causes such as severe malaria.

Mild or moderate anaemia is very common in severely malnourished children and should not be treated with iron.

7.2 Blood transfusion for very severe anaemia
Children with severe acute malnutrition should be given blood if they present with very severe anaemia (Hb < 40 g/L) or if Hb < 60 g/L with signs of respiratory distress. Care should be taken because respiratory distress can also be a sign of cardiac failure, and inappropriate blood transfusion can exacerbate heart failure, resulting in death.

Children with severe acute malnutrition should only receive blood if the diagnosis of very severe anaemia is made within the first 24 hours of admission. Do not give a transfusion when the child has been admitted to inpatient care and receiving feeds for more than 24 hours.

Blood for transfusion should be screened for HIV, hepatitis B and C, and other bloodborne pathogens.\(^\text{12}\)

The transfusion must be slower and of smaller volume than for a well nourished child (see step 3).

1. Stop all oral intake and IV fluids during the transfusion.
2. Look for signs of congestive heart failure, such as fast breathing, respiratory distress, rapid pulse, engorgement of the jugular vein, cold hands and feet, and cyanosis of the fingertips and under the tongue.
3. Get blood ready. If there are no signs of congestive heart failure, transfuse whole fresh blood at 10 ml/kg slowly over 3 hours. If there are signs of heart failure, give 5–7 ml/kg packed cells over 3 hours instead of whole blood.
4. Give a diuretic\(^\text{13}\) at the start of the transfusion to make room for the blood. Furosemide (1 mg/kg, given by IV) is the most appropriate choice.

7.3 Monitoring during transfusion
Monitor the respiratory and pulse rates, listen to the lung fields, examine the abdomen for liver size and check the jugular venous pressure every 15 minutes.

\(^\text{12}\) Where testing for HIV and viral hepatitis B is not possible, or where HIV is very common, give transfusion only when haemoglobin falls below 30 g/L (or packed cell volume < 10%), or when there are signs of life-threatening heart failure.
\(^\text{13}\) Diuretics should never be used to reduce oedema in children with severe acute malnutrition. The purpose of giving a diuretic before blood transfusion is to prevent congestive heart failure due to overloading the circulation with the transfusion.
during the transfusion. If either respiratory or pulse rate increases (breathing by 5 breaths per minute or pulse by 25 beats per minute), transfuse more slowly. If there are basal lung crepitations or an enlarging liver, stop the transfusion and give furosemide at 1 mg/kg IV.
In this exercise you will be given some information and partially completed CCPs for several children. You will then answer questions about treatment needed. Use your reference cards as needed.

**Case 1: Tina**

Tina is an 18-month-old girl who was referred from a health centre. Her arms and shoulders appear very thin. She has moderate oedema (both feet and lower legs). She does not have diarrhoea or vomiting, and her eyes are clear. She is referred for inpatient care after a failed appetite test. Additional information is provided in the CCP sections below.

<table>
<thead>
<tr>
<th>Signs of severe acute malnutrition: Severe wasting?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral pitting oedema?</td>
<td>O</td>
<td>++</td>
</tr>
<tr>
<td>Dermatosis?</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Weight (kg):</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>Height/length (cm):</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>WFH Z-score:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MUAC (mm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEMPERATURE:</td>
<td>35.5 °C</td>
<td></td>
</tr>
<tr>
<td>if axillary &lt; 35° C or rectal &lt; 35.5° C, actively warm child. Check temperature every 30 minutes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLOOD GLUCOSE (mmol/L):</td>
<td>3.5 mmol/L</td>
<td></td>
</tr>
<tr>
<td>if &lt; 3 mmol/L and alert, give 50 ml bolus of 10% glucose or sucrose orally or by NG tube.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>if &lt; 3 mmol/L and semi-conscious, unconscious, or convulsing, give sterile 10% glucose 5ml/kg IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total amount = 5 ml x ___ kg (child’s wt) = ___ml Then give 50 ml bolus by NG tube.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time glucose given:</td>
<td>Oral</td>
<td>NG tube</td>
</tr>
<tr>
<td>HAEMOGLOBIN (Hb):</td>
<td>70 g/L</td>
<td>or PCV: ____%</td>
</tr>
<tr>
<td>Blood type: B+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>if Hb &lt; 40 g/L or PCV &lt; 12%, transfuse 10 ml/kg whole fresh blood (or 5–7 ml/kg packed cells) slowly over 3 hours.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time started:</td>
<td></td>
<td>End:</td>
</tr>
</tbody>
</table>
1a. What is Tina’s weight-for-length Z-score?

1b. Should Tina be admitted to the severe acute malnutrition ward? Why or why not?

1c. Is Tina hypothermic?

1d. Is Tina hypoglycaemic?

1e. Does Tina have very severe anaemia?

1f. Tina is alert and does not have cold hands. Her capillary refill is 2 seconds. Her pulse does not seem weak. According to the definition given in this module, is Tina in shock?

1g. What two things should be done for Tina immediately based on the above findings?

When you have finished this case, discuss your answers with a facilitator.
Case 2: Kalpana

Kalpana is a 3-year-old girl. She was very pale when she was brought to the hospital, but she is alert and can drink. She has no signs of shock, no diarrhoea, no vomiting, and no eye problems. Additional findings are described in the CCP sections below.

<table>
<thead>
<tr>
<th>Signs of severe acute malnutrition: Severe wasting?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral pitting oedema?</td>
<td>O</td>
<td>+</td>
</tr>
<tr>
<td>Dermatosis?</td>
<td>0</td>
<td>++</td>
</tr>
<tr>
<td>Weight (kg):</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>WFH Z-score:</td>
<td>&lt; -3</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>36.0 °C</td>
<td></td>
</tr>
<tr>
<td>BLOOD GLUCOSE (mmol/L):</td>
<td>&lt;3 mmol/L</td>
<td></td>
</tr>
<tr>
<td>HAEMOGLOBIN (Hb):</td>
<td>39 g/L</td>
<td></td>
</tr>
</tbody>
</table>
| If axillary < 35°C or rectal < 35.5°C, actively warm child. Check temperature every 30 minutes.

2a. What should Kalpana be given immediately to treat her hypoglycaemia? How should it be given?

2b. When should Kalpana begin taking F-75? How often and how much should she be fed?

2c. Does Kalpana have very severe anaemia? If yes, what should be done? Kalpana has no signs of congestive heart failure.

Case 3: John

John is a 15-month-old boy who has been unwell since the rains fell 5 weeks ago. For the last 3 days he has had no food but has been given home fluids for diarrhoea. John was lethargic and limp on arrival at the hospital, and the doctor
assumed his blood glucose was low without taking time for a blood sample and dextrostix test. John’s temperature does not record on a standard thermometer. His gums, lips, and inner eyelids appear normal in colour (not pale). Additional information is given below.

<table>
<thead>
<tr>
<th>Signs of severe acute malnutrition: Severe wasting?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral pitting oedema?</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Dermatosis?</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Weight (kg):</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>Height/length (cm):</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>WFH Z-score:</td>
<td>(&lt; -3)</td>
<td></td>
</tr>
<tr>
<td>MUAC (mm):</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TEMPERATURE:**  
*Assumed* <35.5 °C

If axillary < 35°C or rectal < 35.5°C, actively warm child. Check temperature every 30 minutes.

**BLOOD GLUCOSE** (mmol/L): *assumed* <3 mmol/L

If < 3 mmol/L and alert, give 50 ml bolus of 10% glucose or sucrose orally or by NG tube.  
If < 3 mmol/L and lethargic, unconscious, or convulsing, give sterile 10% glucose 5 ml/kg IV.  
Total amount = 5 ml x ____ kg (child’s wt) = ____ml Then give 50 ml bolus by NG tube.  

Time glucose given:  
Oral | NG tube | IV

**HAEMOGLOBIN** (Hb):  
g/L or PCV: ______ %  
Blood type:  
If Hb < 40 g/L or PCV < 12%, transfuse 10 ml/kg whole fresh blood slowly over 3 hours (or 7 ml/kg packed cells in case of suspected heart failure)  
Amount:  
Time started:  
Ended:

**SIGNS OF SHOCK**

- None
- Semi-conscious/unconscious*
- Cold hands

<table>
<thead>
<tr>
<th>Slow capillary refill (&gt; 3 seconds)</th>
<th>Weak or fast pulse</th>
</tr>
</thead>
</table>

*If semi-conscious or unconscious, cold hands, plus either slow capillary refill or weak or fast pulse:

Give oxygen 1–2 L per minute. Give sterile 10% glucose 5 ml/kg IV over 10 minutes.  
Amount 5 ml x ____ kg (child’s weight) = ____________ml  
Give IV fluids half-strength Darrow’s with 5% glucose or Ringer’s lactate with 5% glucose solution and added sterile potassium chloride 20 mmol/L 15 ml/kg over 1 hour.  
Amount 15 ml x ____ kg (child’s weight) = ____________ml

<table>
<thead>
<tr>
<th>Start: (1st hr)</th>
<th>Monitor every 10 minutes</th>
<th>2nd hr:**</th>
<th>Monitor every 10 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Resp. rate</td>
<td>Pulse rate</td>
<td>Weight</td>
</tr>
</tbody>
</table>

**If respiratory and pulse rates are slower after 1 hour, repeat same amount IV fluids for 2nd hour; then alternate ReSoMoL and F-75 for up to 10 hours as in right part of chart below. If no improvement after 1st hour on IV fluids, treat for septic shock (transfuse whole fresh blood) (see left, under “haemoglobin”).
3a. What are four interventions that John needs immediately?

3b. What amount of glucose does John need?

3c. What amount of IV fluids should be given over the first hour?

John is given IV fluids starting at 09:45. His respiratory rate at that time is 60 breaths per minute, and his pulse rate is 130. John is monitored every 10 minutes over the next hour, and both his respiratory and pulse rates slow down during this time. At 10:45 his respiratory rate is 40 and his pulse rate is 105.

3d. What should be done for the next hour?

After 2 hours of IV fluids, John is alert enough to drink, although he still appears unwell. His blood glucose has been tested and is now up to 5 mmol/L. His haemoglobin is 82 g/L. He is weighed again, and his new weight is 6.0 kg.

3e. What should John be given in alternate hours over the next period of up to 10 hours?

3f. How much F-75 should be given at each feed? (Remember to use John’s new weight to determine amount.)

When you have finished this exercise, discuss your answers with a facilitator.
In this exercise the group will prepare and taste ReSoMal and will measure appropriate amounts to give to severely malnourished children.

A facilitator will lead this exercise. When the group has prepared and tasted the ReSoMal, each person should answer the following questions individually. Then a facilitator will ask each person to measure the amount of ReSoMal given in one of the answers.

1. Ramesh has severe dehydration and is just starting ReSoMal. He weighs 7.3 kg.
   a. How much ReSoMal should Ramesh be given every 30 minutes for the next 2 hours?
   b. After 2 hours, what is the least amount of ReSoMal that Ramesh should be offered in alternate hours?
   c. What is the greatest amount of ReSoMal that Ramesh should be offered in alternate hours?

2. Sula has severe dehydration. She weighs 11.6 kg.
   a. How much ReSoMal should Sula be given every 30 minutes for the next 2 hours?
   b. After 2 hours, what is the least amount of ReSoMal that Sula should be offered in alternate hours?
   c. What is the greatest amount of ReSoMal that Sula should be offered in alternate hours?
8. GIVE EMERGENCY EYE CARE

8.1 Examine the eyes

Wash your hands. Touch the eyes extremely gently and as little as possible. The child’s eyes may be sensitive to light, resulting in the child experiencing pain when the eyes are exposed to light (photophobia). The eyes therefore remain closed, which makes eye examination very difficult and the eye vulnerable to examination trauma. Great caution should be taken when examining the eye.

If any of the following eye signs are present in one or both eyes, emergency eye care is needed:

- dry conjunctiva or cornea
- Bitot’s spots
- corneal clouding
- corneal ulceration.

These signs were defined in Module 2.

8.2 Give vitamin A and atropine eye drops for children with eye signs

Oral treatment with an oil-based vitamin A formulation should be given immediately if the child has any of the eye signs. The following treatment dose should be given on Day 1, Day 2, and Day 15.

<table>
<thead>
<tr>
<th>Age</th>
<th>Vitamin A dose (international units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 6 months</td>
<td>50 000 IU</td>
</tr>
<tr>
<td>6–12 months</td>
<td>100 000 IU</td>
</tr>
<tr>
<td>&gt; 12 months</td>
<td>200 000 IU</td>
</tr>
</tbody>
</table>

Instil one drop atropine (0.1%) into the affected eye(s) to relax the eye and prevent the lens from pushing out. Tetracycline or chloramphenicol eye drops and bandaging are needed. Continuing treatment of corneal ulceration is described in Module 5, on daily care.
Exercise C

In this exercise you will be given information and a partially completed CCP or a blank CCP for several children. You will then answer questions about treatment needed or complete the CCP.

If the child has measles now or has had measles in the past 3 months, this affects the number of doses of vitamin A given (to be discussed in Module 5, on daily care).

Case 1: Marwan

Marwan is an 11-month-old boy. Additional information is given on the CCP sections below. Marwan is awake, has no signs of shock, and has no diarrhoea or vomiting. His dextrostix shows blood sugar in the range 2–4 mmol/L.

<table>
<thead>
<tr>
<th>Signs of severe acute malnutrition: Severe wasting?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral pitting Oedema?</td>
<td>O</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Dermatosis?</td>
<td>O</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>++</td>
<td>+++ (raw skin, fissures)</td>
</tr>
<tr>
<td>Weight (kg):</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>Height/length (cm):</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>WFH Z-score:</td>
<td>&lt; -3</td>
<td></td>
</tr>
<tr>
<td>MUAC (mm):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEMPERATURE:</td>
<td>35 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>axillary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(rectal)</td>
<td></td>
</tr>
</tbody>
</table>

If axillary < 35°C or rectal < 35.5°C, actively warm child. Check temperature every 30 minutes.

**BLOOD GLUCOSE** (mmol/L): 2 – 4 mmol/L

*If < 3 mmol/L and alert, give 50 ml bolus of 10% glucose or sucrose orally or by NG tube.*
*If < 3 mmol/L and lethargic, unconscious, or convulsing, give sterile 10% glucose 5 ml/kg IV*

Total amount = 5 ml x ___ kg (child’s wt) = ____ ml Then give 50 ml bolus NGT.

Time glucose given: Oral NGT IV

**HAEMOGLOBIN** (Hb): 80 g/L or PCV: ______ % Blood type: B+

If Hb < 40 g/L or PCV < 12%, transfuse 10 ml/kg whole fresh blood slowly over 3 hours (or 7 ml/kg packed cells in case of suspected heart failure)

Amount: Time started: Ended:
MEASLES | Yes | No
---|---|---
EYE SIGNS: | None | Left | Right
Bitot’s spots | | | |
Pus/inflammation | | | |
Corneal clouding | | Yes | |
Corneal ulceration | | Yes | |
If eye signs, give vitamin A immediately. Add atropine if corneal ulceration. Record below and on daily care page.

| Oral doses vitamin A: | < 6 months | 50 000 IU |
| | 6–12 months | 100 000 IU |
| | > 12 months | 200 000 IU |

What are four things that should be done immediately for Marwan?

**Case 2: Ram**

(For this case use the first page of a blank CCP, available in your classroom.)

Ram is a 9-month-old boy. He has not been feeding well in the last 3 weeks. He has had loose stools and vomiting in the last 3 days, and some dehydration. There has been no blood in the stool.

Ram is severely wasted and has some mild dermatosis. He has no oedema. His weight is 4.4 kg and length is 64 cm.

Ram’s rectal temperature is 38°C, and his blood glucose is 5 mmol/L. His haemoglobin is 120 g/L. His eyes appear clear, and he has not had measles. He has no signs of shock.

Ram’s pre-diarrhoeal weight is not known. It is presumed he has a 5% weight deficit.

2a. Using the above information about Ram, complete as many parts of the CCP as you can. Calculate the target weight.

**Note:** You will not complete the section of the CCP for antibiotics in this exercise. Although it is important to give antibiotics quickly, you will learn about these later. In the diarrhoea section, complete only the top part now and the amount of ReSoMal to give. Do not complete the feeding section yet.

Since Ram has had recent diarrhoea and some dehydration but no signs of shock, he needs ReSoMal. Ram is first given ReSoMal at 09:00. His respiratory rate is 28 and his pulse rate is 105. He eagerly takes the full amount. At 09:30 his respiratory rate is still 28 and his pulse rate is 105. Ram has not passed urine. He has had one loose stool but no vomiting. There has been no change in hydration signs. Again, Ram takes the full amount of ReSoMal.
2b. In the diarrhoea section of Ram’s CCP, complete the “start” (09:00) column and the column for 09:30. (You will need to abbreviate or write briefly in the row for hydration signs. Since Ram has had no change in hydration signs, write “same”.)

The columns below show Ram’s progress during the next hour. He continues to take the full amount of ReSoMal. You may transfer this information to Ram’s CCP if you want to.

<table>
<thead>
<tr>
<th>Time</th>
<th>10:00</th>
<th>10:30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate</td>
<td>28</td>
<td>25</td>
</tr>
<tr>
<td>Pulse rate</td>
<td>105</td>
<td>100</td>
</tr>
<tr>
<td>Passed urine? Y/N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Number stools</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Number vomits</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Hydration signs</td>
<td>Same</td>
<td>Moist mouth</td>
</tr>
</tbody>
</table>

2c. At 11:00 Ram is ready to begin the next period of treatment, during which ReSoMal and F-75 are given in alternate hours. How much ReSoMal should Ram be given in alternate hours? Enter this information on the CCP.

2d. What signs of overhydration should be watched for during this period?

At 11:00 Ram’s respiratory rate remains at 25 and his pulse rate at 100. He has passed no urine, but he has had one loose stool in the past hour. He has not vomited. Ram takes the maximum amount of ReSoMal in his range, but he no longer seems thirsty and eager to drink.

2e. Complete the column in the diarrhoea section of Ram’s CCP for 11:00.

At 12:00 Ram’s respiratory rate remains at 25 and his pulse rate at 100. He has passed no urine or stools in the past hour, and he has not vomited. Ram is weighed again. He now weighs 4.62 kg. Ram continues to be willing to drink within the recommended range, although he does not drink eagerly.

2f. What signs of improving hydration does Ram show? Has he attained the target weight?
2g. Should ReSoMal be continued routinely in alternate hours? Why or why not?

Case 3: Irena

(For this case use the first page of a blank CCP, available in your classroom. This case will be done as a group.)

Irena is a 25-month-old girl. She arrives at the hospital at 10:00 on 3 March. She has had diarrhoea and vomiting for 10 days. She is severely wasted. She has no oedema and no dermatosis. She weighs 6.1 kg and is 74 cm in length.

Irena has a rectal temperature of 36°C and a blood glucose level of 4 mmol/L. Her haemoglobin has not been tested. Her left eye appears normal, but her right eye has some pus draining from it. She has not had measles.

Irena has cold hands and is semi-conscious. When the doctor presses her thumbnail, it takes longer than 3 seconds for the pink colour to return to the nail bed. Her pulse is fast (140 per minute).

3a. Using the information about Irena, complete as many parts of the CCP as you can.

Note: You will not complete the section for antibiotics in this exercise. Although it is important to give antibiotics quickly, you will learn about these later. In the diarrhoea section, complete only the top part at this point (through dehydration signs). Do not complete the feeding section yet.

3b. Is Irena hypoglycaemic? Is she hypothermic?

3c. Does Irena need vitamin A? Does she need it immediately?

3d. What signs of shock does Irena have?
3e. What amount of sterile 10% glucose should she be given by IV? Enter the amount on the CCP in the blood glucose section.

3f. What amount of IV fluids should Irena be given in the first hour? Enter the amount on the CCP in the shock section.

Irena’s IV is started at 10:30. Her respiratory rate is 40 breaths per minute and her pulse rate is 140 per minute. The nurses monitor Irena every 10 minutes. The results of monitoring are as follows.

<table>
<thead>
<tr>
<th>Time</th>
<th>Respiratory rate</th>
<th>Pulse rate</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:40</td>
<td>38</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>10:50</td>
<td>36</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>11:00</td>
<td>35</td>
<td>100</td>
<td>Irena sits up, seems alert</td>
</tr>
<tr>
<td>11:10</td>
<td>33</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>11:20</td>
<td>32</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>11:30</td>
<td>30</td>
<td>80</td>
<td></td>
</tr>
</tbody>
</table>

3g. Enter Irena’s starting time and rates on her CCP. Then enter the information from monitoring. What should be done next for Irena?

Irena is given IV fluids for another hour. During the second hour her respiratory rate remains steady at 30 and her pulse rate at 80. After receiving IV fluids, Irena weighs 6.2 kg.

3h. Complete the IV section of Irena’s CCP.

3i. What should be given to Irena at 12:30? How much should be given? Enter the range of amounts on the CCP in the second (right-hand) part of the diarrhoea section.

At 12:30, Irena’s respiratory rate is still 30 and her pulse rate is still 80. She has not passed urine. She has had one loose stool but no vomiting.
3j. Complete the column for 12:30 in the right-hand part of the diarrhoea section of the CCP. The nurse offers Irena the maximum amount of ReSoMal in her range, and Irena eagerly takes it all. Write this amount in the space for “amount taken” at the bottom of the 12:30 column.

At 13:30 Irena’s respiratory rate is still 30 and her pulse rate is still 80. She has had one loose stool, no vomiting, and no urine.

3k. Complete the 13:30 column of the diarrhoea section of the CCP.

3l. Using Irena’s new weight of 6.2 kg, look on your F-75 reference card to find the amount of F-75 to give at 13:30. Record this amount in the feeding section of the CCP.

3m. At 14:30 what should Irena be given?

Twelve hours after her arrival at the hospital, Irena is much better. Since she responded so well to IV fluids and ReSoMal (attained target weight of 6.5 kg), it is clear that she was dehydrated. She needs to continue 2-hourly feeds of F-75, but she no longer needs ReSoMal. She needs antibiotics, which you will learn about in the next section of the module.
9. **GIVE ANTIBIOTICS**

Give all severely malnourished children antibiotics for presumed infection. Give the first dose of antibiotics while other initial treatments are going on, as soon as possible.

### 9.1 Select antibiotics

Selection of antibiotics depends on the severity of complications and prevailing resistance patterns.

As shown on the summary chart below:

- start on IV gentamicin, plus IV ampicillin followed by oral amoxicillin;
- if severe complications (e.g. shock, sepsis, severe infections), or the context indicates a resistance to the first-line antibiotics, consider other antibiotics (refer to the WHO *Pocket book of hospital care for children*, Annex 2: Drug dosages and regimens).

In the case of sepsis or septic shock:

- IV or intramuscular (IM) cefotaxime 50 mg/kg every 8 to 12 hours + oral ciprofloxacin 10–20 mg/kg, 2 times per day for 5 days).

If suspected staphylococcal infections:

- add IV cloxacillin (25 to 50 mg/kg/dose: 4 times a day, depending on the severity of the infection).

If specific infections are identified that require a specific antibiotic not already being given, give an additional antibiotic to address that infection. For example, dysentery and pneumonia may require additional antibiotics. Certain skin infections such as candidiasis require specific antibiotics. Antibiotics required for specific infections are described in the WHO *Pocket book of hospital care for children*, Annex 2: Drug dosages and regimens.

---

Summary: antibiotics for severely malnourished children

<table>
<thead>
<tr>
<th>In the event of:</th>
<th>Give:</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-line antibiotics</td>
<td>Gentamicin&lt;sup&gt;a&lt;/sup&gt; IV or IM (7.5 mg/kg), once daily for 7 days, plus:</td>
</tr>
<tr>
<td></td>
<td>Ampicillin IV or IM (50 mg/kg), every 6 hours for 2 days</td>
</tr>
<tr>
<td>If severe complications (e.g. shock, sepsis, severe infections) are present, and the context indicates a resistance to amoxicillin and ampicillin:</td>
<td>Followed by amoxicillin&lt;sup&gt;c&lt;/sup&gt; oral: 25–40 mg/kg, every 12 hours for 5 days</td>
</tr>
<tr>
<td>In the case of sepsis or septic shock: IV or IM cefotaxime 50 mg/kg every 8 to 12 hours + oral ciprofloxacin (10–20 mg/kg, 2 times per day for 5 days)</td>
<td></td>
</tr>
<tr>
<td>If suspected staphylococcal infections: add IV cloxacillin (25–50 mg/kg/dose 4 times a day, depending on the severity of the infection)</td>
<td></td>
</tr>
<tr>
<td>If a specific infection requires an additional antibiotic, also give:</td>
<td>Specific antibiotics as directed in the WHO Pocket book of hospital care for children, Annex 2: Drug dosages and regimens.</td>
</tr>
</tbody>
</table>

<sup>a</sup> Note: The antibiotic regimens should be adapted to local resistance patterns.
<sup>b</sup> If the child is not passing urine, gentamicin may accumulate in the body and cause deafness. Do not give the second dose until the child is passing urine.
<sup>c</sup> If amoxicillin is not available, give ampicillin, 50 mg/kg orally every 6 hours for 5 days.

Different formulations of drugs are available (e.g. tablets or syrups of varying strengths). The formulation of the drug will affect the amount to measure for a dose. Some common formulations are given in the dosage tables on the antibiotics reference card (Web Annex B). Refer to the antibiotics reference card as you read the following steps and example.

**Steps to determine the dose**

The following steps should be taken to determine the dose.

1. Refer to the summary table to determine what drug is needed and by what route it should be given.
2. Determine the child’s weight.
3. Determine what formulation of the drug is available (e.g. tablet or syrup, and strength).
4. Look up the formulation on the dosage tables and find the amount to give for the child’s weight. For most drugs, the dosages are given for weight ranges. For gentamicin, doses are given for specific weights.

**Note:** Do not use the child’s age to determine the dose.

9.2 Choose and use the best route of administration

Sometimes there is a choice of whether to give a drug intravenously (IV) or by intramuscular (IM) injection. IM injections are very painful for a severely malnourished child. If an IV line is in place and is being used for giving fluid, use it for the antibiotic as well.¹⁵

If there is no IV line in place, and only one IM injection is needed, give the IM injection, but take special care to avoid bruising tender skin. The child will not have much muscle, so look for the sites with the most muscle and rotate sites (e.g. buttocks, thighs). If more than 2 ml is to be injected, divide the dose between two sites.

If frequent injections would be needed, it is preferable to use a 21- or 23-gauge butterfly needle to keep a vein open for injecting antibiotics. Use the IV dose. This option allows the staff to conveniently give the antibiotic intravenously without leaving an IV bag up, and it is less painful for the child.

A heparinized cannula can also be used to keep a vein open for giving antibiotics.

¹⁵ Note: Gentamicin interacts with penicillins and cephalosporins: they must not be given in the same drip at the same time.
In this exercise you will select antibiotics and determine dosages for several children. Refer to the antibiotics reference card (Web Annex B) as needed.

When there are different drug formulations listed, choose the drug formulation that is most likely to be available in your hospital.

Case 1: Ana

Ana weighs 6.0 kg. She is severely malnourished and has hypoglycaemia, hypothermia and mild dermatosis. She does not have shock and will not be given IV fluids.

1a. What two antibiotics should Ana be given now?

1b. By what possible routes may these antibiotics be given?

1c. Assuming that all of the necessary supplies are available, what route should be chosen?

1d. For each drug, list the formulation to be used (if there is a choice, choose the formulation most likely to be available in your hospital).

1e. Given Ana’s body weight, determine the dose of each antibiotic.

1f. For each antibiotic to be given to Ana, summarize the prescription below.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Route</th>
<th>Dose</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ana improves within 48 hours. Her temperature rises and stays above 35.5°C, and her blood glucose level rises above 3 mmol/L. She has not gained weight, but she is alert and is taking F-75 well.

1g. After two days, how should Ana’s drug regimen change?

1h. What formulation of the new drug is most likely to be available in your hospital?

1i. Given the formulation listed above, what is the appropriate dose for Ana?

1j. Summarize the prescription for the new drug below.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Route</th>
<th>Dose</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
</table>

Case 2: Dipti

Dipti is 82 cm long and weighs 7.9 kg. She is aged 2 years. She appears sickly and has fast breathing (55 breaths per minute) and chest indrawing.

2a. Dipti has signs of a specific infection (pneumonia) requiring a specific antibiotic. Look in the WHO *Pocket book of hospital care for children*, Annex 2: Drug dosages and regimens to see what antibiotic is required first and record it below.

2b. Dipti will be given IM injections. What is the dose?

2c. Summarize the prescription for Dipti in the table below.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Route</th>
<th>Dose</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
</table>
After 5 days Dipti’s breathing is normal and there is no chest indrawing. She is taking F-75 well. She still weighs 7.9 kg.


2e. Choose one of the above antibiotics. What formulation of this drug is most likely to be available in your hospital?

2f. Given the formulation listed in above, what is the appropriate dose for Dipti?

2g. Summarize Dipti’s new prescription in the table below.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Route</th>
<th>Dose</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
</table>

When you have finished this exercise, discuss your answers with a facilitator.

When everyone is ready, the group will view a video segment about emergency treatment. This video will show many of the steps described so far in this module.
10. RECORD INITIAL FINDINGS AND TREATMENTS AND COMMUNICATE TO STAFF

In all cases, but especially if a child is being transferred from an emergency room, it is important to communicate in writing and orally to key staff:

- the child’s symptoms;
- treatments already given;
- what needs to be done to continue care and feeding;
- whether or not the child has complications that require being near the nurses’ station for careful, constant observation. See Annex for monitoring signs.

The CCP (Web Annex A) is an example of a tool to help communicate what has been done and what needs to be done for the child. You may use different forms or case records in your hospital, but some type of written record is essential.
In this exercise there will be a role play in which the admitting doctor briefs the head nurse on a child’s conditions and needs. Use the first page of a blank CCP, available in your classroom. Use your reference cards as needed.

1. Use the information below to complete the first page of a CCP for a child named Rayna. Be sure to record any treatments that should be given, including the specific antibiotic needed (when determining the dose, use a formulation available in your hospital).

**Rayna**

Rayna is a 13-month-old girl. She is admitted on 3 October at 09:00. She is severely wasted and has no appetite. She has no oedema and no dermatosis. She is 72 cm long and weighs 6.3 kg.

Rayna’s rectal temperature is 36.8°C. Her blood glucose level is between 3 and 4 mmol/L. Her haemoglobin is 95 g/L. She has no signs of eye problems. She has not had measles.

Rayna has no signs of shock, no diarrhoea, no blood in the stool, and no vomiting. The admitting doctor is ready to give the head nurse instructions for Rayna’s care, including her first feed and first dose of antibiotic. It is 09:15.

2. When you have finished with the CCP, briefly show it to a facilitator to ensure that it is correct. Then list below the key points that you would discuss with the head nurse if you were the admitting doctor.

3. List some questions that you might ask if you were the head nurse.

Tell a facilitator when you are ready for the role play.
**ANNEX. DESCRIPTION OF MONITORING SIGNS**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Danger sign</th>
<th>Suggests</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pulse and respiration</strong></td>
<td>Confirmed increase in pulse rate of 25 or more beats per minute, along with confirmed increase in respiratory rate of 5 or more breaths per minute</td>
<td>Infection or heart failure (possibly from overhydration due to feeding or rehydrating too fast. Monitor weight gain as well)</td>
</tr>
<tr>
<td><strong>Respiration only</strong></td>
<td>Fast breathing ≥ 50 breaths/min (age 2 to 11 months) ≥ 40 breaths/min (age 12 months up to 5 years)</td>
<td>Pneumonia or cardiac decompensation (occurs during stabilization. Monitor weight gain as well)</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>Any sudden increase or decrease Rectal temperature below 35.5°C</td>
<td>Infection or hypothermia (possibly due to infection, a missed feed or child being uncovered)</td>
</tr>
</tbody>
</table>

**Normal pulse rate in children**

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Normal pulse rate (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 1</td>
<td>100–160</td>
</tr>
<tr>
<td>1 to 3</td>
<td>90–150</td>
</tr>
<tr>
<td>3 to 6</td>
<td>80–140</td>
</tr>
</tbody>
</table>


**Normal respiration rate in children**

<table>
<thead>
<tr>
<th>Age</th>
<th>Normal respiration rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 2 months</td>
<td>&lt; 60 breaths/min</td>
</tr>
<tr>
<td>2 to 11 months</td>
<td>&lt; 50 breaths/min</td>
</tr>
<tr>
<td>1 to 5 years</td>
<td>&lt; 40 breaths/min</td>
</tr>
</tbody>
</table>

In addition to watching for these monitoring signs, also watch for danger signs such as:

- anorexia (loss of appetite)
- change in mental state (e.g. becomes semi-conscious)
- jaundice (yellowish skin or eyes)
- cyanosis (tongue/lips turning blue from lack of oxygen)
- difficulty breathing
- difficulty feeding or waking (drowsy)
- abdominal distension
- new oedema
- large weight changes
- increased vomiting
- petechiae (bruising)
For more information, please contact:
Department of Nutrition and Food Safety
World Health Organization
Avenue Appia 20
CH-1211 Geneva 27
Switzerland
Email: nutrition@who.int
Website: https://www.who.int/health-topics/nutrition