

# MODULE 3 INITIAL MANAGEMENT



Government of Sudan

**Training Course on  
Inpatient Management of  
Severe Acute Malnutrition**

**Children 6–59 Months with SAM  
and Medical Complications**

June 2011

This modified version of the 2002 World Health Organisation's *Training Course on Inpatient Management of Severe Acute Malnutrition (SAM)* is the practical application of the 2009 Government of Sudan (GOS) Federal Ministry of Health (FMOH) *Interim Manual Community-Based Management of Severe Acute Malnutrition (November 2009)*. The training course is made possible by the generous support of the American people through the support of the Office of U.S. Foreign Disaster Assistance, Bureau for Democracy, Conflict and Humanitarian Assistance, and the Office of Health, Infectious Diseases, and Nutrition, Bureau for Global Health, United States Agency for International Development (USAID), under terms of Cooperative Agreement No. AID-OAA-A-11-00014, through the FANTA-2 Bridge, managed by FHI 360. The contents are the responsibility of FHI 360 and do not necessarily reflect the views of USAID or the United States Government.

Illustrations for modules: Susan Kress

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## Acronyms and Abbreviations

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AIDS	acquired immune deficiency syndrome
ART	antiretroviral therapy
AWG	average daily weight gain
BMI	body mass index
cm	centimetre(s)
CMAM	Community-Based Management of Acute Malnutrition
CMV	combined mineral and vitamin mix
dl	decilitre(s)
ENA	Essential Nutrition Actions
FMOH	Federal Ministry of Health
g	gram(s)
GOS	Government of Sudan
Hb	haemoglobin
HFA	height-for-age
HIV	human immunodeficiency virus
IGF	insulin growth factor
IM	intramuscular
IMNCI	Integrated Management of Neonatal and Childhood Illness
IU	international unit(s)
IV	intravenous
IYCF	infant and young child feeding
kcal	kilocalorie(s)
kg	kilogram(s)
L	litre(s)
LOS	length of stay
M&R	monitoring and reporting
MAM	moderate acute malnutrition
ml	millilitre(s)
mm	millimetre(s)
MUAC	mid-upper arm circumference
µg	microgram(s)
NG	nasogastric
NGT	nasogastric tube
OPD	outpatient department
ORS	oral rehydration solution
PCV	packed cell volume
PLHIV	people living with HIV
PMTCT	prevention of mother-to-child transmission of HIV
QI	quality improvement
ReSoMal	Rehydration Solution for Malnutrition
RUTF	ready-to-use therapeutic food
SAM	severe acute malnutrition
SFP	supplementary feeding programme
TB	tuberculosis
UNSCN	United Nations Standing Committee on Nutrition
WFA	weight-for-age
WFH	weight-for-height
WFP	World Food Programme
WHO	World Health Organisation

## Introduction

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In the process of treating a child with severe acute malnutrition (SAM) who is admitted to Inpatient Care, the focus of initial management is to prevent death while stabilising 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<sup>1</sup>.

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

In an emergency situation, many procedures must be done very quickly, almost simultaneously. Much practice and experience is needed to perform efficiently in an Emergency Room as a team. This course cannot teach the entire process of emergency management, but instead focuses on the steps that must be added or adjusted to treat a child with SAM.

Some of the initial management procedures described in this module may be performed in the Emergency Room, before a child is admitted to Inpatient Care (SAM ward). It is very important that Emergency Room staff know how to treat children with SAM differently. If Emergency Room staff do not know how to treat children with SAM, the children with SAM should be moved to the SAM ward immediately. Emergency Room staff must be taught to recognise children with SAM and to understand that these children might be seriously ill even without showing signs of infection. A child with SAM should be seen as quickly as possible in the Emergency Room. Emergency Room staff must understand that they should **not** start a rapid intravenous (IV) flow, but should rather follow procedures as outlined in the Government of Sudan Interim Manual: Community-Based Management of Severe Acute Malnutrition, Version 1.0 (November 2009) (the CMAM Manual), Chapter 4.

After any necessary emergency treatment has been provided, the child should be moved immediately to the SAM 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. Only later, after these problems are under control and the child is stabilised, is the child expected to gain weight. This module describes the life-saving tasks that are essential to the initial management of a child with SAM.

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<sup>1</sup> Basic emergency treatment is taught in medical schools and will not be taught in this course. For additional information, you may refer to the World Health Organisation (WHO) document entitled *Management of the Child with a Serious Infection or Severe Malnutrition: Guidelines for care at the first-referral level in developing countries (WHO/FCH/CAH/00.1)*.

## Learning Objectives

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This module describes and, to the extent feasible, allows you to observe and/or practise the following skills:

- Identifying and managing a child with SAM with medical complications in Inpatient Care:
  - Hypoglycaemia
  - Hypothermia
  - Shock
  - Very severe anaemia
  - Corneal clouding and corneal ulceration
  - Watery diarrhoea and/or vomiting
  - Hypernatraemia
- Preparing Rehydration Solution for Malnutrition (ReSoMal)
- Selecting appropriate antibiotics and calculating dosages
- Testing and treating for malaria, HIV and tuberculosis (TB)
- Keeping a written record of initial findings and treatments

## 1.0 Identifying and Managing a Child with SAM with Medical Complications in Inpatient Care

### 1.1 Managing Hypoglycaemia

#### What Is Hypoglycaemia?

Hypoglycaemia is a low level of glucose in the blood. In children with SAM,  $< 3$  mmol/L (or  $< 54$  mg/dl) is considered 'low'. The hypoglycaemic child is usually hypothermic (low temperature) as well. Other signs of hypoglycaemia include lethargy, limpness and loss of consciousness. Sweating and pallor may not occur in malnourished children with hypoglycaemia. Often the only sign before death is drowsiness.

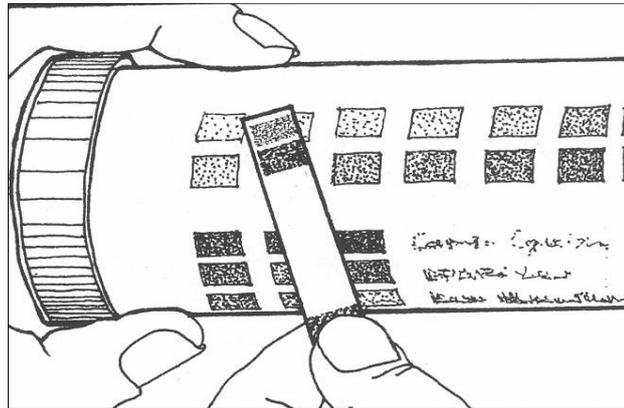
The short-term cause of hypoglycaemia is lack of food. Children with SAM are more at risk of hypoglycaemia than other children and need to be fed more frequently, including during the night. Malnourished children may arrive at the hospital hypoglycaemic if they have been vomiting, if they have been too sick to eat or if they have had a long journey without food. Children may develop hypoglycaemia in the hospital if they are kept waiting for admission or if they are not fed regularly. 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.

#### Testing Blood Glucose Level

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

Blood glucose level can be tested using treated paper strips, such as dextrostix, glucostix or other similar products. When the end is covered with a blood sample, the paper strips change colour to indicate blood glucose level. Regularly check the expiration date on such products as dextrostix or glucostix. If expired, the readings may not be true.



*Testing blood glucose level*

Different test kits may have different instructions. In general, instructions are:

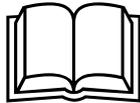
- Touch the treated paper to the blood sample.
- Wait an appropriate number of seconds.
- Wash the blood off the strip with running water.
- Compare the test paper to a colour scale or read the result in a glucometre (a device for reading a precise glucose level).

In many cases, the colour scale for the paper strips may not clearly show the level  $< 3$  mmol/L. For example, it may say that a certain colour corresponds to 2–4 mmol/L. If a range is given, assume that the child's blood glucose is the lower reading (that is, in this example, 2 mmol/L).

There might not be enough time to take and test a blood sample right away. There may be no testing strips available or it may not be possible to get enough blood test. In any of these cases, assume that the child has hypoglycaemia and give treatment immediately without blood glucose test confirmation.

### Preventing Hypoglycaemia: Begin F-75

If the child's blood glucose is not low, begin feeding the child F-75 right away. Feed the child every 2–4 hours, even during the night. Appropriate amounts are given in the Stabilisation Phase Look-Up Table for Amounts of F-75 Based on 130 ml/kg/day in the job aids. These frequent, small feeds will prevent hypoglycaemia and provide nutrients for the child during the initial period of stabilisation.



#### Look at the F-75 Look-Up Tables in the Job Aid

Notice that 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, or now if the context is appropriate.

*Note:* The F-75 look-up tables in the job aid show one table with F-75 amounts for children with severe wasting and moderate or mild oedema and another table with F-75 amounts for children with severe (+++) bilateral pitting oedema. Amounts for children with severe oedema are less because the amount is based on a body weight that is corrected for the increased weight from the oedema.



*Feeding with F-75 should begin as soon as possible. Feeding with cup and saucer is discussed in detail in **Module 4, Feeding.***

## Treating 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 (1 teaspoon sugar to 3 tablespoons of water) or by nasogastric tube (NGT). Although 50 ml is a very small amount, it can make a big difference to the child.

Glucose is preferable because the body can use it more easily; sucrose must be broken down by the body before it can be used. However, give whichever is available most quickly. 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 NGT.

**If the child is lethargic, 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 NGT<sup>2</sup>. If the IV dose cannot be given immediately, give the nasogastric (NG) dose first.

Start feeding F-75 half an hour after giving glucose and give it every half-hour during the first 2 hours. For a hypoglycaemic child, the amount to give every half-hour is one-quarter of the 2-hourly amount shown on the F-75 look-up table in your job aid.

Take another blood sample after 2 hours and check the child's blood glucose again. If blood glucose is now 3 mmol/L or higher, change to 2-hourly feeds of F-75. If still low, make sure antibiotics and F-75 have been given. Keep giving F-75 every half-hour.

### *Example*

Ari weighs 7.4 kg. He has hypoglycaemia and is given a 50 ml bolus of 10% glucose orally shortly after arrival at the hospital. One half-hour after taking the glucose, Ari should be given one-quarter of the 2-hourly amount of F-75 for his weight. The 2-hourly amount is 80 ml, so Ari should be given 20 ml every half-hour for 2 hours. If his blood glucose is then 3 mmol/L or higher, he should be given 80 ml of F-75 every 2 hours.

## 1.2 Managing Hypothermia

### What Is Hypothermia?

Hypothermia is low body temperature. A child with SAM is hypothermic if the **axillary temperature is below 35° C or if the rectal temperature is below 35.5° C**.

Children with SAM 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. If the child is hypothermic, he is probably also hypoglycaemic. Both hypothermia and hypoglycaemia are signs that the child has a serious systemic infection.

All hypothermic children should be treated for both hypoglycaemia and infection.

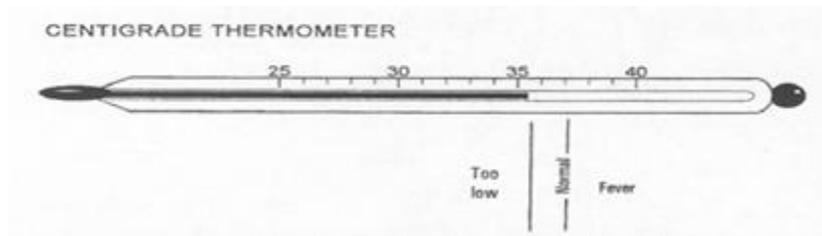
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<sup>2</sup> If the child will be given IV fluids for shock, there is no need to follow the 10% IV glucose with a nasogastric (NG) bolus, as the child will continue to receive glucose in the IV fluids.

## Taking the Temperature

In general, rectal temperatures are preferred because they more accurately reflect core body temperature. One can convert axillary temperatures to rectal temperatures by adding 0.5° C. If axillary temperatures are used for routine monitoring, recheck any patient with an axillary temperature below 35° C by taking a rectal temperature.

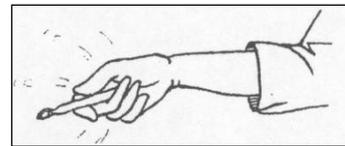
The following illustration shows a low-reading thermometer with too low, normal and high (fever) temperatures indicated.



If possible, use a low-reading thermometer. If no low-reading thermometer is available, use a normal thermometer. With a normal thermometer, assume that the child has hypothermia if the mercury does not move.

### *Steps for Using a Thermometer to Take Axillary Temperatures*

- Shake thermometer down to below 35° C.
- Place thermometer under armpit.
- Keep in place for 3 minutes.
- If below 35° C, take the rectal temperature for a more accurate reading.



### *Steps for Using a Thermometer to Take Rectal Temperatures*

- Shake thermometer down to below 35° C.
- Position the child on his side or back with legs lifted.
- Insert thermometer in rectum so that the bulb goes in about ½ inch.
- Keep in place for 1 minute.



## Warming the Child

Children with SAM have difficulty controlling their body temperature. As a result, it is important to keep them warm and fed frequently. Keeping them warm also conserves their energy.

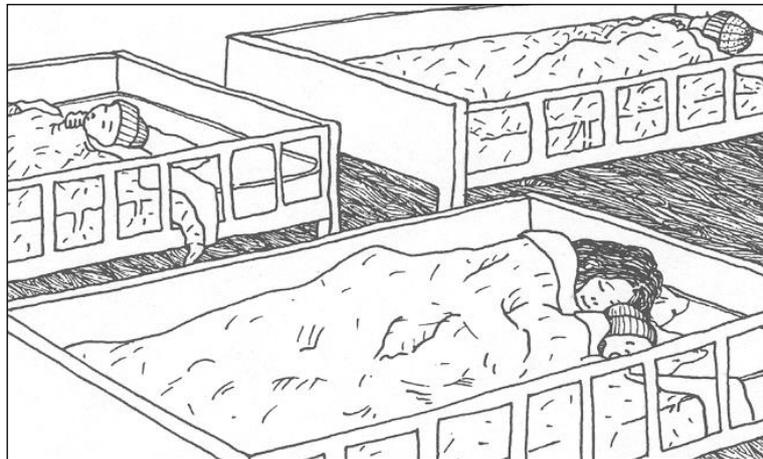
Hypothermia is very dangerous. If the child is hypothermic, re-warming is necessary to raise temperature.

### *Maintaining Temperature (Preventing Hypothermia)*

The following measures are important for all children with SAM:

- Give 2–3 hourly feeds (if possible); start feeds immediately on admission.
- Always give feeds throughout the day and night.
- Keep the child covered, including the head.
- Stop draughts in the room. Move the child away from windows.

- Maintain room temperature of 25° C–30° C if possible.
- Keep the child covered at night.
- Warm your hands before touching the child.
- Avoid leaving the child uncovered while being examined, weighed, etc.
- Promptly change wet clothes or bedding.
- Dry the child thoroughly after bathing.
- If it is not possible to warm the room to the temperature recommended above, let the child sleep with mother<sup>3</sup> in an adult bed, covered with a blanket, as shown below.



*Keep children warmly covered, especially at night.*

### ***Actively Re-Warm the Hypothermic Child***

In addition to keeping the child covered and keeping the room warm, use one of the following re-warming techniques if the child is hypothermic:

- Have the mother hold the child with her/his skin next to the mother's skin when possible (kangaroo technique, as shown), 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 re-warming when the child's temperature becomes normal.



- ⊗ **Do not use hot water bottles (or fluorescent lamps) to re-warm the child due to the danger of burning fragile skin.**

<sup>3</sup> The term 'mother' is used throughout this module. However, it is understood that the person who is responsible for the care of the child might not always be that child's mother, but rather some other caregiver. However, for the sake of readability, 'mother' means 'mother/caregiver' throughout this module, 'she' means 'she or he' and 'her' means 'her or his'.

***Example of Inpatient Management Record***

The next page shows the first part of a case record called an Inpatient Management Record. 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 sections of the Inpatient Management Record titled *Signs of SAM*, *Temperature*, *Blood Glucose*, and *Feeding*. As the module continues, you will learn about the other sections of this part of the Inpatient Management Record.

A complete, blank Inpatient Management Record can be found in the Inpatient Management Record Job Aid. The Inpatient Management Record 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 Inpatient Management Record. In the meantime, you may study the example on the next page.**

Name: CARA Sex: M  F Age: 18 mths Date of admission: 10 December Time: 10:00 AM Hospital ID number: 464 Page 1 of 6

**INITIAL MANAGEMENT** Comments on pre-referral and/or emergency treatment already given: REFERRED BY HEALTH CENTRE

<b>SIGNS OF SAM</b> Severe wasting? <input checked="" type="radio"/> Yes <input type="radio"/> No Bilateral Pitting Oedema? <input checked="" type="radio"/> 0 <input type="radio"/> + <input type="radio"/> ++ <input type="radio"/> +++ Dermatosis? <input checked="" type="radio"/> 0 <input type="radio"/> + <input type="radio"/> ++ <input type="radio"/> +++ (raw skin, fissures) Weight (kg): <u>6.3</u> Height / length (cm): <u>72</u> WFH z-score: <u>-3</u> MUAC (mm): <u>103</u>		<b>SIGNS OF SHOCK</b> <input checked="" type="radio"/> None <input type="radio"/> Lethargic/unconscious <input type="radio"/> Cold hands <input type="radio"/> Slow capillary refill (> 3 seconds) <input type="radio"/> Weak or fast pulse If lethargic or unconscious*, plus 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: Amount IV fluids per hour: 15 ml x ___ kg (child's wt) = ___ ml																																																																																																																																																																									
<b>TEMPERATURE:</b> <u>36</u> °C axillary / <u>rectal</u> If axillary < 35° C or rectal < 35.5° C, actively warm child. Check temperature every 30 minutes.		<table border="1"> <tr> <th></th> <th>Start:</th> <th>Monitor every 10 minutes</th> <th>**2<sup>nd</sup> hr</th> <th>Monitor every 10 minutes</th> </tr> <tr> <td>Time</td> <td></td> <td></td> <td>**</td> <td></td> </tr> <tr> <td>Resp. 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> </table>			Start:	Monitor every 10 minutes	**2 <sup>nd</sup> hr	Monitor every 10 minutes	Time			**		Resp. rate			**		Pulse rate			**																																																																																																																																																					
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<b>BLOOD GLUCOSE</b> (mmol/L): <u>4</u> If no test available, treat for hypoglycaemia. If < 3 mmol/L and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG): Yes No If < 3 mmol/L and lethargic, unconscious or convulsing, give sterile 10% glucose IV: 5 ml x ___ kg (child's weight) = ___ ml. Then give 50 ml bolus NG. Time glucose given: <u>10:15</u> <input checked="" type="radio"/> Oral <input type="radio"/> NG <input type="radio"/> IV		* In case of suspected hypernatraemic dehydration, see Operational Guide or CMAM Manual Appendix, page 183. ** If respiratory and pulse rates are slower after 1 hour, repeat same amount IV fluids for second hour; then alternate ReSoMal and F-75 for up to 10 hours as in right section of chart below. If no improvement on IV fluids, transfuse whole fresh blood. (See 'Haemoglobin' section at left.) Give maintenance IV fluids (4 ml/kg/hour) while waiting for blood.																																																																																																																																																																									
<b>HAEMOGLOBIN</b> (Hb) (g/dl): <u>9</u> or Packed Cell Vol (PCV): ___ Blood type: ___ If Hb < 4 g/dl (or Hb 4–6 g/dl AND respiratory distress), transfuse 10 ml/kg whole fresh blood (or 5–7 ml/kg packed cells) slowly over 3 hours. Amount: ___ Time started: ___ Ended: ___		<b>DIARRHOEA</b> Watery diarrhoea? Yes <input checked="" type="radio"/> No <input type="radio"/> Blood in stool? Yes <input checked="" type="radio"/> No <input type="radio"/> Vomiting? Yes <input checked="" type="radio"/> No <input type="radio"/> Number of days with diarrhoea: ___ If diarrhoea, circle signs present: Skin pinch goes back slowly <input type="checkbox"/> Lethargic <input type="checkbox"/> Thirsty <input type="checkbox"/> Restless/irritable <input type="checkbox"/> Dry mouth/tongue <input type="checkbox"/> No tears <input type="checkbox"/> Sunken eyes <input type="checkbox"/>																																																																																																																																																																									
<b>EYE SIGNS</b> None <input checked="" type="radio"/> Left <input type="radio"/> Right Bitot's spots <input checked="" type="radio"/> Pus or inflammation <input type="radio"/> Corneal clouding <input type="radio"/> Corneal ulceration If ulceration, give vitamin A and atropine immediately. Record on Daily Care page. If no ulceration, give vitamin A preventive dose on week 4 or upon discharge.		If diarrhoea and/or vomiting, give ReSoMal orally*. Every 30 minutes for first 2 hours, monitor and give:* 5 ml x ___ kg (child's wt) = ___ ml ReSoMal For up to 10 hours, give ReSoMal and F-75 orally* in alternate hours. Monitor every hour. Amount of ReSoMal to offer**: 5 to 10 ml x ___ kg (child's wt) = ___ to ___ ml ReSoMal																																																																																																																																																																									
<b>ORAL DOSES VITAMIN A</b> < 6 months* 50,000 IU *Treatment dose on days 1, 2, 15 6–12 months* ** 100,000 IU **Preventive dose on week 4 or upon discharge > 12 months* ** 200,000 IU		<table border="1"> <tr> <th>Time</th> <th>Start</th> <th></th> </tr> <tr> <td>Resp. rate</td> <td></td> </tr> <tr> <td>Pulse rate</td> <td></td> </tr> <tr> <td>Passed urine? Y N</td> <td></td> </tr> <tr> <td>Number stools</td> <td></td> </tr> <tr> <td>Number vomits</td> <td></td> </tr> <tr> <td>Hydration signs</td> <td></td> </tr> <tr> <td>Amount taken (ml)</td> <td></td> </tr> </table>		Time	Start																				Resp. rate																					Pulse rate																					Passed urine? Y N																					Number stools																					Number vomits																					Hydration signs																					Amount taken (ml)																				
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<b>MEASLES</b> Yes <input checked="" type="radio"/> No <input type="radio"/> Vaccination upon admission: Yes <input type="radio"/> No <input type="radio"/> (Record on Outcome page)		* Give ReSoMal orally (or, if child is unconscious or too ill to take the ReSoMal orally, give by NGT). ** Stop ReSoMal if signs of hydration: Passing urine, moist tongue, making saliva, not thirsty. Stop ReSoMal if any sign of over-hydration: Increasing pulse and resp. rates, engorging jugular veins, increasing oedema, puffing of eyelids.																																																																																																																																																																									
<b>FEEDING</b> 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 feedings: <u>70</u> ml F-75* Time first fed: <u>10:45</u> * If hypoglycaemic, feed 1/3 of this amount every half hour for first 2 hours; continue until blood glucose reaches 3 mmol/L. Record all feeds on 24-Hour Food Intake Chart page.		<table border="1"> <tr> <th>Antibiotics (Drug/Route)</th> <th>Dose/Frequency/Duration</th> <th>Time of 1<sup>st</sup> Dose</th> </tr> <tr> <td><u>Amoxicillin 300 mg/day 3 times ORAL</u></td> <td><u>100 mg x 3</u></td> <td><u>10:30</u></td> </tr> </table>		Antibiotics (Drug/Route)	Dose/Frequency/Duration	Time of 1 <sup>st</sup> Dose	<u>Amoxicillin 300 mg/day 3 times ORAL</u>	<u>100 mg x 3</u>	<u>10:30</u>																																																																																																																																																																		
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<b>MALARIA TEST</b> (Type/Date/Outcome): <b>HIV TEST</b> (Type/Date/Outcome):		<table border="1"> <tr> <th>Antimalarial:</th> <th>Dose/Frequency/Duration</th> <th>Time of 1<sup>st</sup> Dose</th> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>		Antimalarial:	Dose/Frequency/Duration	Time of 1 <sup>st</sup> Dose																																																																																																																																																																					
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## 1.3 Managing a Child with SAM with Shock

### What Is Shock?

Shock is a dangerous condition with severe weakness, lethargy or unconsciousness; cold extremities; and fast, weak pulse. It is caused by diarrhoea with severe dehydration, haemorrhage, burns or sepsis. In children with SAM, some of the signs of shock may appear all the time, so it is difficult to diagnose. Thus, IV fluids are given in SAM only if the child meets the following criteria.

A child with SAM is considered to have shock if he/she:

✓ is **lethargic or unconscious** *AND* has **cold hands**

**PLUS either:**

○ **slow capillary refill** (longer than 3 seconds)

**OR**

○ **weak or fast pulse**

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.

For a child 2 months up to 12 months of age, a fast pulse is 160 beats or more per minute. For a child 12 months to 5 years of age, a fast pulse is 140 beats or more per minute.

### Give Oxygen, IV Glucose and IV Fluids for Shock

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

- Give oxygen.
- Give sterile 10% glucose 5 ml/kg by IV (as described in Section 1.1 under ‘Treating Hypoglycaemia’, [page 4](#)).
- Give IV fluids as described below.
- Keep the child warm.

### *Giving IV Fluids*

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

To give IV fluids:

- Check the starting respiratory and pulse rates and record them on the Inpatient Care Inpatient Management Record. Also record the starting time.
- Infuse IV fluid at 15 [or 10] ml/kg over 1 hour. Use one of the following solutions, listed in order of preference:
  - Half-strength Darrow’s solution with 5% glucose
  - Ringer’s lactate solution with 5% glucose\*
  - Half-normal (0.45%) saline solution with 5% glucose\*
- \* If either of these is used, add sterile potassium chloride (20 mmol/L) if possible.
- Observe the child and check respiratory and pulse rates every 10 minutes.
- If the respiratory rate increases by 5 breaths/minute and the pulse rate increases by 25 beats/minute, stop the IV.
- If respiratory rate and pulse rate are slower after 1 hour, the child is improving. Repeat the same amount of IV fluids for another hour. Continue to check respiratory and pulse rates every 10 minutes.
- After 2 hours of IV fluids, switch to oral or NG rehydration with ReSoMal. Give 5–10 ml/kg ReSoMal in alternate hours with F-75 for up to 10 hours. Leave the IV line in place in case it is needed again.

You will learn more about giving ReSoMal later in this module.

Notice that the steps for checking for shock and giving IV fluids are all written on the Inpatient Management Record (excerpted below) as a reminder.

*Important note:* The Inpatient Management Record is not a flow chart; thus it does not indicate steps of priority.

<b>SIGNS OF SHOCK</b> None Lethargic/unconscious Cold hands Slow capillary refill (> 3 seconds) Weak or fast pulse												
<i>If lethargic or unconscious*, plus 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: Amount IV fluids per hour: 15 ml x ____ kg (child’s wt) = _____ml</i>												
	Start:	Monitor every 10 minutes					**2 hr:	Monitor every 10 minutes				
Time						**						
Resp. rate						**						
Pulse rate						**						
* In case of suspected hypernatraemic dehydration, see Operational Guide or CMAM Manual Appendix, page 183. **If respiratory and pulse rates are slower after 1 hour, repeat same amount IV fluids for second hour; then alternate ReSoMal and F-75 for up to 10 hours as in right section of chart below. If no improvement on IV fluids, transfuse whole fresh blood. (See ‘Haemoglobin’ section at left.) Give maintenance IV fluids (4 ml/kg/hour) while waiting for blood.												

### If No Improvement with IV Fluids, Give Blood Transfusion

If the child fails to improve after the first hour of IV fluids, then assume that the child has septic shock. Give maintenance IV fluids (4 ml/kg/hour) while waiting for blood. When blood is available, stop all oral intake and IV fluids, give a diuretic to make room for the blood and then transfuse whole fresh blood at 10 ml/kg slowly over 3 hours. If there are signs of heart failure, give packed cells instead of whole blood as these have a smaller volume. (See steps below under ‘If Haemoglobin < 4 g/dl, Give Blood Transfusion’ for more details.)

## 1.4 Managing Very Severe Anaemia

### What Is Very Severe Anaemia?

Anaemia is a low concentration of Hb in the blood. Very severe anaemia is a Hb concentration of < 4 g/dl (or packed cell volume < 12%) or Hb concentration of < 6 g/dl **and** respiratory distress. Very severe anaemia can cause heart failure (because there is 'high output' failure with an overactive circulation) and must be treated with a blood transfusion. As malnutrition is usually not the cause of very severe anaemia, it is important to investigate other possible causes, such as malaria and intestinal parasites (for example, hookworm).

Mild or moderate anaemia is very common in children with SAM and should be treated later with iron, after the child has stabilised. (Do NOT give iron now as it can damage cell membranes and make infections worse.)

If it is not possible to test Hb, rely on clinical judgement. For example, judge based on paleness of gums, lips and inner eyelids.

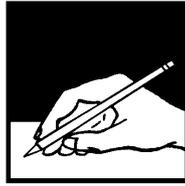
If Hb is < 4 g/dl (or Hb is 4–6 g/dl **and** there are signs of respiratory distress), give a blood transfusion<sup>4</sup>.

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, be prepared to give 10 ml/kg whole fresh blood over 3 hours. If there are signs of congestive heart failure, be ready to give packed cells (5–7 ml/kg) over 3 hours instead of whole blood.
4. Give a diuretic<sup>5</sup> to make room for the blood. Furosemide (1 mg/kg, given by IV) is the most appropriate choice.

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<sup>4</sup> Where testing for HIV and viral hepatitis B is not possible, or where HIV is very common, give transfusion only when Hb falls below 3 g/dl (or packed cell volume < 10%), or when there are signs of life-threatening heart failure.

<sup>5</sup> Diuretics should never be used to reduce oedema in children with severe malnutrition. The purpose of giving a diuretic before a blood transfusion is to prevent congestive heart failure from overloading the circulation with the transfusion.



## Exercise A

In this exercise, you will be given some information and partially completed Inpatient Management Records for several children. You will then answer questions about treatment needed. Use the CMAM Manual or job aids 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. Additional information is provided in the Inpatient Management Record sections below.

<b>SIGNS OF SAM:</b> Severe wasting?	<u>Yes</u>	No
Bilateral Pitting Oedema?	0	+ <u>++</u> +++
Dermatosis?	<u>0</u>	+ ++ +++ (raw skin, fissures)
Weight (kg):	6.2	Height/length (cm): 70
WFH z-score:	< -3	MUAC (mm): 107

<b>TEMPERATURE:</b> 35.5° C	axillary	<u>rectal</u>
If axillary < 35° C or rectal < 35.5° C, actively warm child. Check temperature every 30 minutes.		

<b>BLOOD GLUCOSE</b> (mmol/L) <i>If no test, treat for hypoglycaemia.</i>	3.5
<i>If &lt; 3 mmol/L and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG). Yes No</i>	
<i>If &lt; 3 mmol/L and lethargic, unconscious or convulsing, give sterile 10% glucose IV:</i>	
5 ml x ____ kg (child's weight) = ____ ml. Then give 50 ml bolus NG.	
Time glucose given:	Oral NG IV
<b>HAEMOGLOBIN (Hb)</b> (g/dl): 9	or Packed Cell Vol (PCV): Blood type: B+
<i>If Hb &lt; 4 g/dl (or Hb 4–6 g/dl AND respiratory distress), transfuse 10 ml/kg whole fresh blood (or 5–7 ml/kg packed cells) slowly over 3 hours. Amount:</i>	
Time started:	Ended:

- 1a. What is Tina's nutritional status? Explain why.
- 1b. Should Tina be admitted to the SAM ward for management of SAM in Inpatient Care? 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 seems 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 is very pale when she is 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 Inpatient Management Record sections below.

<b>SIGNS OF SAM:</b> Severe wasting?	<u>Yes</u>	No		
Bilateral Pitting Oedema?	<u>0</u>	+	++	+++
Dermatosis?	<u>0</u>	+	++	+++ (raw skin, fissures)
Weight (kg):	8	Height/length (cm):	83	
WFH z-score:	< -3	MUAC (mm):	109	

<b>TEMPERATURE:</b> 36° C	axillary	<u>rectal</u>
If axillary < 35° C or rectal < 35.5° C, actively warm child. Check temperature every 30 minutes.		

<b>BLOOD GLUCOSE</b> (mmol/L) <i>If no test, treat for hypoglycaemia.</i>	< 3
<i>If &lt; 3 mmol/L and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG). Yes No</i>	
<i>If &lt; 3 mmol/L and lethargic, unconscious or convulsing, give sterile 10% glucose IV:</i>	
5 ml x ____ kg (child's weight) = ____ ml. Then give 50 ml bolus NG.	
Time glucose given:	Oral NG IV
<b>HAEMOGLOBIN (Hb)</b> (g/dl): 4	or Packed Cell Vol (PCV): Blood type: B+
<i>If Hb &lt; 4 g/dl (or Hb 4–6 g/dl AND respiratory distress), transfuse 10 ml/kg whole fresh blood (or 5–7 ml/kg packed cells) slowly over 3 hours. Amount:</i>	
Time started:	Ended:

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 is lethargic and limp on arrival at the hospital, and the physician assumes his blood glucose is 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.

<b>SIGNS OF SAM: Severe wasting?</b>		Yes	No
Bilateral Pitting Oedema?		0	+ ++ +++
Dermatosis?	0	+	++ +++ (raw skin, fissures)
Weight (kg):	5.8	Height/length (cm): 69	
WFH z-score:	< -3	MUAC (mm): 111	

<b>TEMPERATURE:</b>	???? ° C	axillary	rectal	assumed < 35.5° C
If axillary < 35° C or rectal < 35.5° C, actively warm child. Check temperature every 30 minutes.				

<b>BLOOD GLUCOSE</b> (mmol/L)	<i>If no test, treat for hypoglycaemia.</i>	< 3
<i>If &lt; 3 mmol/L and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG). Yes No</i>		
<i>If &lt; 3 mmol/L and lethargic, unconscious or convulsing, give sterile 10% glucose IV:</i>		
5 ml x ___ kg (child’s weight) = ___ ml. Then give 50 ml bolus NG.		
Time glucose given:	Oral	NG IV
<b>HAEMOGLOBIN (Hb)</b> (g/dl):	or Packed Cell Vol (PCV):	Blood type:
<i>If Hb &lt; 4 g/dl (or Hb 4–6 g/dl AND respiratory distress), transfuse 10 ml/kg whole fresh blood (or 5–7 ml/kg packed cells) slowly over 3 hours. Amount:</i>		
Time started:	Ended:	

<b>SIGNS OF SHOCK</b>	None	Lethargic/unconscious	Cold hands	Slow capillary refill (> 3 seconds)	Weak or fast pulse					
<i>If lethargic or unconscious*, plus cold hands, plus either slow capillary refill or weak or fast pulse, give oxygen. Give IV glucose as described under Blood Glucose (left).</i>										
<i>Then give IV fluids: Amount IV fluids per hour: 15 ml x ___ kg (child’s wt) = _____ ml</i>										
	Start:	Monitor every 10 minutes				**2 <sup>nd</sup> hr:	Monitor every 10 minutes			
Time						**				
Resp. rate						**				
Pulse rate						**				
* In case of suspected hypernatraemic dehydration, see Operational Guide or CMAM Manual Appendix, page 183. ** If respiratory and pulse rates are slower after 1 hour, repeat same amount IV fluids for second hour; then alternate ReSoMal and F-75 for up to 10 hours as in right part of chart below. If no improvement on IV fluids, transfuse whole fresh blood. (See left, Haemoglobin.)										

3a. What are four treatments that John needs immediately?

- 
- 
- 
- 

3b. What amount of sterile 10% glucose should be given by IV?

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

John is given IV fluids starting at 9:45. 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 Hb is 8 g/dl. 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? (*Hint: Use John's new weight to determine amount.*)

When you have finished this exercise, discuss your answers with a facilitator.
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## 1.5 Giving Emergency Eye Care for Corneal Clouding and Corneal Ulceration

### What Is Corneal Clouding?

Corneal clouding is loss of epithelial tissue from the surface of the conjunctiva and cornea (eye's surface) due to progressive erosion and necrosis of the tissue. The eye's surface looks dry, opaque and dull, with or without Bitot's spots<sup>6</sup>. This eye condition can quickly aggravate and evolve into corneal ulceration.

### What Is Corneal Ulceration?

Corneal ulceration is a break in the surface of the cornea (membrane covering the pupil and the iris of the eye). The eye may be extremely red or bleeding. A child with corneal ulceration may keep the affected eye shut.

Corneal ulceration is very dangerous. If there is an opening in the cornea, the lens of the eye can extrude (push out) and cause blindness. Photograph 12 in the *Photographs* booklet shows corneal ulceration.

### Examining the Eyes

Wash your hands. Touch the eyes extremely gently and as little as possible. The child's eyes may be sensitive to light and may be closed. If the eyes are closed, wait until the child opens his/her eyes to check them, or gently pull down the lower eyelids to check. Wash your hands again after examining the eyes.

### Give Vitamin A and Atropine Eye Drops Immediately for Corneal Clouding and Corneal Ulceration

If the child has corneal clouding or corneal ulceration, give vitamin A immediately on day 1. The dose will be repeated on day 2 and day 15.

Child's age	Frequency	Vitamin A oil-based Oral Dose	Vitamin A water-based IM Dose
< 6 months	Day 1, 2, 15	50,000 IU	50,000 IU
6–12 months	Day 1, 2, 15	100,000 IU	100,000 IU
> 12 months	Day 1, 2, 15	200,000 IU	100,000 IU

Oral treatment with vitamin A is preferred. Intramuscular (IM) treatment may be used for children that are unconscious and should be changed to oral treatment as soon as possible. For oral administration, an oil-based formulation is preferred. For IM treatment, only water-based formulations are used. (Note: Vitamin A IM doses of 100,000 IU are available.)

Also instil one drop atropine (1%) into the affected eye(s) (3 times a day) to relax the eye and prevent the lens from pushing out. Tetracycline ointment (2 times a day) or chloramphenicol eye drops (4 times a day) and bandaging are also needed, but can wait until later in the day. If the child falls asleep with his eyes open, close them gently to protect them. Continuing treatment of corneal clouding and corneal ulceration is described in **Module 5, Daily Care**.

<sup>6</sup> Bitot's spot is a foamy material on the conjunctiva.

All children with SAM without eye signs of vitamin A deficiency or recent measles will receive vitamin A after 4 weeks in treatment or upon discharge. Children with oedema will receive vitamin A after oedema has completely subsided. Treatment of various eye signs is described in **Module 5, Daily Care**.

## 1.6 Managing Watery Diarrhoea and/or Vomiting with ReSoMal

### What Is ReSoMal?

ReSoMal is a modification of the standard or low-osmolarity oral rehydration solution (ORS) recommended by the World Health Organisation (WHO). ReSoMal contains less sodium, more sugar and more potassium than standard ORS and is intended for children with SAM with diarrhoea, except if profuse liquid diarrhoea (e.g., in the case of cholera). It should be given by mouth or by NGT. Do not give standard ORS to children with SAM, except in case of profuse liquid diarrhoea.

ReSoMal is available commercially in some places, but it may also be prepared from standard or low-osmolarity ORS and some additional ingredients.

<b>Contents of ReSoMal Prepared from <u>Standard ORS</u>:</b>	
Water	2 L
WHO-Standard ORS	1 L packet
Sugar	50 g
CMV	1 levelled scoop
<b>Contents of ReSoMal Prepared from <u>Low-Osmolarity ORS</u>:</b>	
Water	1,700 ml
WHO-Low-Osm ORS	1 L packet
Sugar	40 g
CMV	1 levelled scoop

### Recognising the Need for ReSoMal

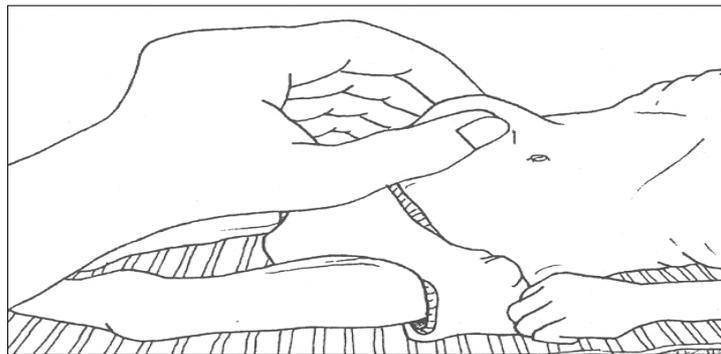
It is difficult to determine the dehydration status of children with SAM, as the usual signs of dehydration (such as lethargy, sunken eyes) may be present in these children all of the time, whether or not they are dehydrated.

Ask the mother if the child has had watery diarrhoea or vomiting. If the child has a history of recent fluid loss (usually watery diarrhoea with a sudden onset or vomiting), if there is a recent change in the child's appearance, if the eyes are sunken and if they became sunken since the diarrhoea started, assume dehydration and give ReSoMal. (Also ask about blood in the stool, as this will affect choice of antibiotics.)

Even if a child with SAM has oedema, he or she may be dehydrated. The oedema indicates a loss of control of fluid distribution in the body, rather than too much fluid. Note the following signs of dehydration so that improvements can be detected later. Even though the signs may be misleading, if they go away after giving ReSoMal, you will know that the ReSoMal has had a good effect.

## Signs of Dehydration in Children with SAM

<b>Recent history of diarrhoea</b>	Sudden onset watery diarrhoea and/or vomiting with recent change in the child's appearance.
<b>Lethargic</b>	A lethargic child is not awake and alert when he or she should be. The child is drowsy and does not show interest in what is happening around him or her.
<b>Restless, irritable</b>	The child is restless and irritable all the time, or whenever she or he is touched or handled.
<b>Absence of tears</b>	Observe whether the child has tears when he or she cries.
<b>Sunken eyes</b>	The eyes of a child with SAM may always appear sunken, regardless of the child's hydration status. Ask the mother if the child's eyes appear unusual or if the eyes became sunken with the onset of the diarrhoea. Photographs 6, 30 and 31 in the <i>Photographs</i> booklet show sunken eyes.
<b>Dry mouth and tongue</b>	Feel the child's tongue and the inside of the mouth with a clean, dry finger to determine if they are dry.
<b>Thirsty</b>	See if the child reaches out for the cup when you offer ReSoMal. When it is taken away, see if the child wants more.
<b>Skin pinch goes back slowly</b>	Using your thumb and index finger, pinch the skin on the child's abdomen halfway between the umbilicus and the side of the abdomen. Place your hand so that the fold of skin will be in a line up and down the child's body, not across the body. Firmly pick up all the layers of skin and tissue under them. Pinch the skin for 1 second and then release. If the skin stays folded for a brief time after you release it, the skin pinch goes back slowly. ( <i>Important note:</i> The skin pinch may always go back slowly in a wasted child.)



### 1.7 Hypernatraemic Dehydration

Hypernatraemic dehydration is common in areas with a low relative humidity (very dry atmosphere), particularly if there is also a high temperature<sup>7</sup>. It is caused by loss of water without loss of salt, leading to pure water deficiency. This is because water is lost through the skin and breath at a high rate under these conditions. If solutions high in sodium or other osmolyte that is not metabolised are given, then water will still be lost while leaving the osmotically active solute in the body. Also, in areas where bottle feeding is common, mothers

<sup>7</sup> The dry atmosphere is the more important feature. Where the climate is very hot and wet, much less water is lost, so that a child presents first with fever because of an inability to excrete the heat generated during metabolism.

frequently over-concentrate infant formula<sup>8</sup>; this can lead to hypernatraemic dehydration even in wet or cold climates and is lethal in hot and dry climates and seasons. A malnourished child is particularly at risk because he or she has a very low renal-concentrating ability and a high surface area relative to his or her body mass.

During development of the high-plasma osmolarity, there is a balancing increase in intracellular osmolytes to prevent water from being drawn out of the cells. During treatment, if the extracellular fluid osmotic pressure is reduced too quickly, leaving a high intracellular osmotic pressure, sudden cellular swelling occurs that can lead to swelling of the brain to a sufficient degree to give convulsions and death.

Although hypernatraemia is difficult to treat safely, it is easy to prevent safely. Malnourished children, particularly those in dry and hot environments, should have continuous access to sufficient water without a high ion content that requires renal excretion to fulfil their requirements for water.

### Diagnosis of Hypernatraemic Dehydration

The first sign of hypernatraemic dehydration is a change in the texture and feel of the skin, which develops a plasticity similar to the feel of dough (flour and water mixed for bread making). The eyes can sink somewhat. The abdomen then frequently becomes flat and may progressively become sunken and wrinkled (so-called ‘caphoid abdomen’ or ‘prune belly’). The child may then develop a low-grade fever if there is insufficient water to evaporate to excrete the heat generated during normal metabolism.

The child becomes progressively drowsy and then unconscious.

Convulsions follow this stage, which leads to death if treatment for hypernatraemia is not instituted. The convulsions are not responsive to the normal anti-convulsants (e.g., phenobarbital, diazepam).

Failure to control convulsions with anti-convulsants may be the first indication of the underlying diagnosis. The diagnosis can be confirmed by finding elevated serum sodium: Normally hypernatraemia is diagnosed when the serum sodium is > 150 mmol/L.

### Treatment of Hypernatraemic Dehydration

For insipient hypernatraemic dehydration—a conscious, alert child who is **only** showing changes in the texture and feel of the skin—breast milk is the best diet. This can be supplemented with up to about 10 ml/kg body weight/hour of water that should be given as a 10% sugar-water solution in sips over several hours until the thirst of the child is satisfied. At this early stage—when impending water deficiency should be recognised and treated—treatment is relatively safe.

Treatment must be slow for developed hypernatraemic dehydration. If it is possible to measure serum sodium, aim to reduce the serum sodium concentration by about 12 mmol

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<sup>8</sup> All infant formulas have a very much higher renal solute load than breast milk. In very hot and dry climates, even correctly made up infant formula can result in hypernatraemic dehydration. This is a real danger that arises from the failure of breastfeeding in such climates. Because of the low renal solute load of human breast milk, exclusive breastfeeding is the best way to avoid hypernatraemic dehydration.

every 24 hours. Trying to correct the hypernatraemia quicker than this risks death from cerebral oedema. If it is not possible to measure the serum sodium, aim to correct hypernatraemic dehydration over at least 48 hours. The treatment should start slowly, and as the serum sodium approaches normality, the rate of repletion can increase.

The textbook treatment of hypernatraemia is to slowly give normal (0.90%) saline solution either orally or intravenously. This is dangerous in the child with SAM and should not be used, as it is based on the premise that the excess sodium given can be safely excreted by the kidneys, which is not the case in the child with SAM.

Treatment progress is assessed by serial weighing of the child:

- **First**, put the child in a humid, thermoneutral (28° C–32° C) environment<sup>9</sup>. This is critical to prevent further water loss as well as hyperthermia if the humidity in the air is increased in a hot environment.
- Weigh the child on an accurate balance and record the weight.

The objective of treatment is to put the child into a positive water balance of about 60 ml/kg/day<sup>10</sup>, which is equivalent to 2.5 ml/kg/hour of plain water. This amount should not be exceeded until the child is awake and alert.

- If the child is **conscious or semi-conscious** and there is **no diarrhoea**, give 2.5 ml/kg/hour of a 10% sugar-water solution<sup>11</sup> orally or by NGT. Do not give F-75 at this stage, as it gives a renal solute load (mainly as potassium). Never give F-100 or infant formula.
- Reweigh the child every 2 hours.
  - If the weight is static or there is continuing weight loss, recheck the environment to try to prevent ongoing water losses, and then increase the amount of sugar-water intake to compensate for the ongoing weight loss (calculated as g/hour) and increase the intake by this amount.
  - If the weight is increasing, continue treatment until the child is awake and alert.

---

<sup>9</sup> If the child is small, this can be in an incubator similar to that used for neonates. It can also be achieved with aerosol sprays into the atmosphere or a humidifying tent, such as that used to treat bronchiolitis. If such facilities are not available, hanging wet sheets in the room or spraying the walls with water intermittently will both humidify and cool the atmosphere. Wet clothes should not be placed directly onto the child unless he or she has a high fever. In one study in Chad (daytime climate of 43° C with 15% humidity), the turnover of water in malnourished children was one-third of body water per day (250 ml/kg body weight/day). It is critical to prevent this ongoing excessive water loss. Otherwise, it is very difficult to judge the amount of fluid to give the child that is needed for slow rehydration, which is a relatively small fraction of the requirements for replacing ongoing losses, which are unmeasured and very difficult to assess with any accuracy. The **only** way to judge ongoing losses and the rate of rehydration is with serial accurate weights.

<sup>10</sup> The extracellular fluid volume is about 250 ml/kg body weight, depending on the level of body fat and the extent of cellular atrophy. If the extracellular sodium concentration is about 160 mmol/L and this is to be reduced by 12 mmol/day, the extracellular fluid should be expanded by about 0.75% per day. However, the extra water given will be distributed in both the intra- and extracellular compartments, so it is necessary to have a positive water balance of 0.75% of body water per day. There is a higher body water percentage in malnourished children than in normal children. Therefore, the daily positive water balance should be about 60 ml/kg body weight/day, which equals 2.5 ml/kg body weight/hour.

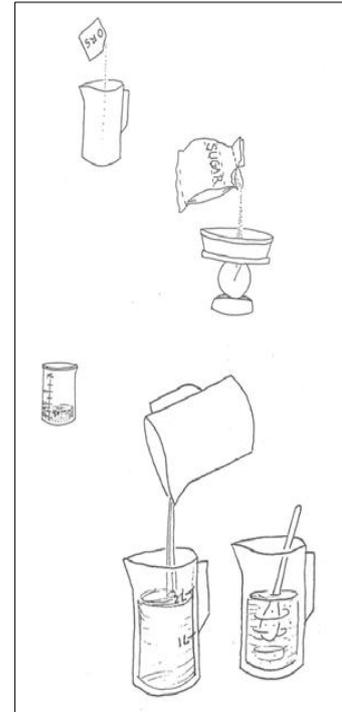
<sup>11</sup> Sugar-water should be used rather than plain water. It is isotonic and so empties from the stomach, and is absorbed more quickly. The treatment will last for about 48 hours. Sugar-water prevents hypoglycaemia in these children.

- If there is **accompanying diarrhoea**, give 2.5 ml/kg/hour of one-fifth normal (0.18%) saline solution in 5% glucose solution orally or by NGT.
- If the child is **unconscious**, the same volumes of fluid (5% glucose if there is no diarrhoea and one-fifth normal [0.18%] saline solution in 5% glucose if there is diarrhoea) can be given by IV infusion. There should be a peristaltic pump or accurate paediatric burette to ensure that the rate of administration of fluid is not exceeded during treatment.
- When the child is awake and alert, recommence feeding with F-75.

## 2.0 Preparing ReSoMal

If using commercial ReSoMal, follow the package instructions. If preparing ReSoMal from standard or low-osmolarity ORS and CMV, prepare as follows:

- Wash hands.
- Empty **1 L** standard or low-osmolarity ORS packet into container that can hold more than 2 L.
- Measure and add **50 grams** sugar (if standard ORS is used) or **40 grams** sugar (if low-osmolarity ORS) is used. It is best to weigh the sugar on a dietary scale that weighs to a precision of 5 g.
- Measure and add **1 level scoop** of CMV to the other ingredients.
- Measure and add **2 L** (if standard ORS is used) or **1.7 L** (if low-osmolarity ORS is used) cooled, boiled water.
- Stir until dissolved.
- Use within 24 hours.



### Calculating the Amount of ReSoMal to Give and the Frequency to Give It

Give oral ReSoMal to a **child with SAM and signs of dehydration**, in amounts based on the child's weight:

How Often to Give ReSoMal	Amount to Give
Every 30 minutes for first 2 hours	5 ml/kg
Alternate hours for up to 10 hours	5–10 ml/kg*

*\* The amount offered in this range should be based on the child's willingness to drink. F-75 is given in alternate hours during this period until the child is rehydrated.*

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. If the child cannot take ReSoMal orally, give via NGT. Monitor the child's condition carefully, and stop when signs of hydration appear (e.g., making tears, moist mouth, passing urine).

When signs of hydration appear:

- Give ReSoMal to a **child with severe wasting** after each loose stool: 15–30 ml/kg per every loose stool.
- Give ReSoMal to a **child with oedema** after each loose stool: 30 ml per every loose stool.



**SHORT ANSWER EXERCISE**

Fill in the blanks in the following case studies:

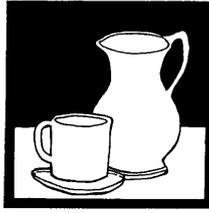
1. Roberto has watery diarrhoea and is severely wasted. He weighs 6.0 kg. He should be given \_\_\_\_\_ ml ReSoMal every \_\_\_\_\_ minutes for \_\_\_\_\_ hours. Then he should be given \_\_\_\_\_–\_\_\_\_\_ ml ReSoMal in \_\_\_\_\_ hours for up to \_\_\_\_\_ hours. In the other hours during this period, \_\_\_\_\_ should be given.
2. Yuma, who is severely wasted, arrived at the hospital in shock and received IV fluids for 2 hours. She has improved and is now ready to switch to ReSoMal. Yuma weighs 8.0 kg. For up to \_\_\_\_\_ hours, she should be given ReSoMal and F-75 in alternate hours. The amount of ReSoMal to offer is \_\_\_\_\_–\_\_\_\_\_ ml per hour.

Answer the question below:

3. After the first 2 hours of ReSoMal, a child with severe wasting is offered 5–10 ml/kg of ReSoMal in alternate hours. What two factors affect how much to offer in this range?

Check your own answers to this exercise against the answers beginning on page 56.

Tell a facilitator when you are ready for the group exercise on the next page. If you reach this point before the rest of the group is ready, you may continue with individual work on page 28.



## Exercise B

In this exercise, the group will prepare and taste ReSoMal and will measure appropriate amounts to give to children with SAM.

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 wasting and has watery diarrhoea 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 wasting and has vomiting and watery diarrhoea. 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?

Tell a facilitator when you have answered the above questions  
and are ready to measure the amounts of ReSoMal.

## Giving 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.

If the mother is able to give the ReSoMal, she should be taught to give it slowly.

An NGT can be used for giving ReSoMal at the same rate if the child is too weak to take enough fluid voluntarily. An NGT should be used in weak or exhausted children, or in those who vomit, have fast breathing or painful mouth sores.



IV fluids should not be used to treat dehydration (except in case of shock as discussed earlier). 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 not be forced on the child. When fluids are given orally, the child's thirst helps regulate the amount given.

## Monitoring the Child Who Is Taking ReSoMal

Monitor the child's progress every half hour for the first 2 hours; then monitor hourly, i.e., every time the child takes F-75 or ReSoMal.

### *Signs to Check*

- Respiratory rate – Count for a full minute.
- Pulse rate – Count for 30 seconds and multiply by 2.
- Urine frequency – Ask: Has the child urinated since last checked?
- Stool or vomit frequency – Ask: Has the child had a stool or vomited since last checked?
- Signs of hydration – Have tears returned? Is the mouth less dry? Is the child less lethargic or irritable? Are the eyes less sunken? Does a skin pinch go back faster?

Record the above information on the Inpatient Management Record; then give ReSoMal and record the amount taken. Notice any changes when you check the signs above.

### *Signs of Improving Hydration Status*

- Fewer or less pronounced signs of dehydration, for example:
  - Less thirsty
  - Skin pinch not as slow
  - Less lethargic

*Note:* Although these changes indicate that rehydration is proceeding, many children with SAM will not show these changes even when fully rehydrated.
- Slowing of rapid respiratory and pulse rates

- Passing urine
- Not thirsty

If a child has three or more of the above signs of improving hydration status, stop giving ReSoMal routinely in alternate hours. Instead, offer ReSoMal after each loose stool, as described in the section on ReSoMal after loose stool below.

### ***Signs of Over-Hydration***

Stop ReSoMal if any of the following signs appear:

- Increased respiratory rate and pulse rate (both must increase to consider it a problem)
- Jugular veins engorged (pulse wave can be seen in the neck)
- Increasing oedema (e.g., puffy eyelids)

### **After Rehydration, Offering ReSoMal after Each Loose Stool**

When the child has three or more signs of improving hydration (see above), stop giving ReSoMal routinely in alternate hours. However, watery diarrhoea may continue after the child is rehydrated. If diarrhoea continues, give ReSoMal after each loose stool to replace stool losses and prevent dehydration.

### ***Severely Wasted Children***

- For children < 2 years, give 50–100 ml after each loose stool.
- For children 2 years and older, give 100–200 ml after each loose stool.

Base the amount given in these ranges on the child's willingness to drink and the amount of stool loss.

### ***Oedematous Children***

- Give 30 ml after each loose stool.

### **In Case of Profuse Liquid Diarrhoea**

In case of profuse liquid diarrhoea (e.g., cases of cholera), ReSoMal should be replaced by a standard or low-osmolarity ORS following the same amounts and frequency as described above for the use of ReSoMal.



### Exercise C

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

#### Case 1 – Marwan

Marwan is an 11-month-old boy. Additional information is given on the Inpatient Management Record parts below. Marwan is awake, has no signs of shock and has no diarrhoea or vomiting. His dextrostix shows blood sugar in the range of < 3 mmol.

<b>SIGNS OF SAM:</b> Severe wasting?	<input checked="" type="radio"/> Yes	<input type="radio"/> No
Bilateral Pitting Oedema?	<input checked="" type="radio"/> 0	<input type="radio"/> + <input type="radio"/> ++ <input type="radio"/> +++
Dermatosis?	<input type="radio"/> 0 <input checked="" type="radio"/> + <input type="radio"/> ++ <input type="radio"/> +++	(raw skin, fissures)
Weight (kg):	6.2	Height/length (cm): 70
WFH z-score:	< -3	MUAC (mm): 109

<b>TEMPERATURE:</b> < 35° C	<input checked="" type="radio"/> axillary	<input type="radio"/> rectal
If axillary < 35° C or rectal < 35.5° C, actively warm child. Check temperature every 30 minutes.		

<b>BLOOD GLUCOSE</b> (mmol/L) <i>If no test, treat for hypoglycaemia.</i>
<i>If &lt; 3 mmol/L and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG). Yes No</i>
<i>If &lt; 3 mmol/L and lethargic, unconscious or convulsing, give sterile 10% glucose IV:</i>
5 ml x ____ kg (child's weight) = ____ ml. Then give 50 ml bolus NG.
Time glucose given:    Oral    NG    IV
<b>HAEMOGLOBIN (Hb)</b> (g/dl):    or Packed Cell Vol (PCV):    Blood type:
<i>If Hb &lt; 4 g/dl (or Hb 4–6 g/dl AND respiratory distress), transfuse 10 ml/kg whole fresh blood (or 5–7 ml/kg packed cells) slowly over 3 hours. Amount:</i>
Time started:    Ended:

<b>EYE SIGNS</b>	None	Left	<input checked="" type="radio"/> Right
Bitot's spots	Pus/Inflammation	Corneal clouding	<input checked="" type="radio"/> Corneal ulceration
<i>If ulceration, give vitamin A and atropine immediately. Record on Daily Care page. If no ulceration, give vitamin A preventive dose on week 4 or upon discharge.</i>			
<b>ORAL DOSES VITAMIN A</b>	< 6 months*	50,000 IU	
* Treatment dose on days 1, 2, 15	6–12 months* **	100,000 IU	
** Preventive dose on week 4 or upon discharge	> 12 months* **	200,000 IU	
<b>MEASLES</b>	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<b>Vaccination upon admission:</b> Yes No (Record on Outcome page)

\*\*\* 'Yes' is circled 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, Daily Care).

1a. What are three things that should be done immediately for Marwan?

- 
- 
- 

1b. In a half-hour, what should be given to Marwan? How much should be given?

**Case 2 – Ram** (*For this case, use the first page of a blank Inpatient Management Record, 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. 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. His MUAC is 104 mm.

Ram's rectal temperature is 38° C, and his blood glucose is 5 mmol/L. His Hb is 12 g/dl. His eyes appear clear, and he has not had measles. He has no signs of shock.

When the physician does a skin pinch, Ram cries but he has no tears. The skin pinch goes back slowly. Ram has a dry mouth and drinks eagerly.

2a. Using the above information about Ram, complete as many parts of the Inpatient Management Record as you can.

*Note:* You will not complete the section of the Inpatient Management Record 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 diarrhoea but no signs of shock, he needs ReSoMal. Ram is first given ReSoMal at 9:00. His respiratory rate is 28 and his pulse rate is 105. He eagerly takes the full amount. At 9:30, 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 Inpatient Management Record, complete the ‘Start’ (9:00) column and the column for 9:30. (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 Inpatient Management Record if you want to.

Time	10:00	10:30
Resp. rate	28	25
Pulse rate	105	100
Passed urine? Yes No	No	Yes
Number stools	0	0
Number vomits	1	0
Hydration signs	Same	Moist mouth

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 Inpatient Management Record.

2d. What signs of over-hydration 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 Inpatient Management Record 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. When a skin pinch is done, it returns normally. Ram now has tears as well as a moist mouth. Ram is weighed again. He now weighs 4.5 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?

2g. Should ReSoMal be continued routinely in alternate hours? Why or why not?

- 2h. What should be given to Ram in the next hour (starting at 12:00)? How much should be given? Record this information in the 'FEEDING' section of the Inpatient Management Record.

Ram should continue taking F-75 every 2 hours, even during the night. He must also be kept warm. Ram should also be given antibiotics, which you will learn about in the next section of this module.

- 2i. If Ram's diarrhoea continues, what should he be given after each loose stool? How much should he be given?

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

**Case 3 – Irena** (*For this case, use the first page of a blank Inpatient Management Record, 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 March 3. 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. Her MUAC is 109 mm.

Irena has a rectal temperature of 36° C and a blood glucose level of 4 mmol/L. Her Hb 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 lethargic. When the physician 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).

Although Irena has had steady diarrhoea, her mother says there has been no blood in the stool. When the physician pinches the skin of Irena's abdomen, it stays folded for 2 seconds. Irena does not cry or respond to the pinch, so the physician cannot tell if she has tears. She seems to have sunken eyes, but her mother says they are always that way. She has a dry mouth.

- 3a. Using the information about Irena, complete as many parts of the Inpatient Management Record 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?

What amount of sterile 10% glucose should she be given by IV? Enter the amount on the Inpatient Management Record in the ‘BLOOD GLUCOSE’ section.

What amount of IV fluids should Irena be given in the first hour? Enter the amount on the Inpatient Management Record in the ‘SIGNS OF 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.

Time	Respiratory rate	Pulse rate	
10:40	38	130	
10:50	36	120	
11:00	35	100	Irena sits up, seems alert
11:10	33	90	
11:20	32	85	
11:30	30	80	

3e. Enter Irena’s starting time and rates on her Inpatient Management Record. 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.

3f. Finish completing the ‘IV’ section of Irena’s Inpatient Management Record.

3g. What should be given to Irena at 12:30?

How much should be given? Enter the range of amounts on the Inpatient Management Record 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 diarrhoeal stool, but no vomiting. She is alert, but her skin pinch still goes back slowly. Her eyes are still sunken.

- 3h. Complete the column for 12:30 in the right-hand part of the 'DIARRHOEA' section of the Inpatient Management Record. 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 diarrhoeal stool, no vomiting and no urine. Her eyes still appear sunken. Her skin pinch goes back quickly.

- 3i. Complete the 13:30 column of the 'DIARRHOEA' section of the Inpatient Management Record.
- 3j. Using Irena's new weight of 6.2 kg, look in the CMAM manual or on your F-75 Look-Up Tables to find the amount of F-75 to give at 13:30. Record this amount in the 'FEEDING' section of the Inpatient Management Record.

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

Twelve hours after her arrival at the hospital, Irena is much better. She responded well to IV fluids and ReSoMal. It is clear that she is rehydrated. She needs to continue 2-hourly feeds of F-75, but she no longer needs ReSoMal routinely. She needs antibiotics, which you will learn about in the next section of the module.

- 3l. Irena's diarrhoea continues after she is rehydrated. What does she need after each loose stool? How much does she need?

## 3.0 Selecting Appropriate Antibiotics and Calculating Dosages

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

Antibiotic recommendations may vary from place to place based on local patterns of resistance. It is recommended that adaptations are made according to the CMAM Manual. The important principle is that all children with SAM should be given appropriate antibiotics.

### 3.1 Selecting Antibiotics and Prescribing the Regimen

Selection of antibiotics depends on the presence or absence of medical complications. Complications include septic shock, hypoglycaemia, hypothermia, skin infections or dermatosis (+++ with raw skin/fissures), respiratory or urinary tract infections and lethargic, sickly appearance.

As shown on the summary chart on the next page:

- **If there are no medical complications**, give amoxicillin 15–30 mg/kg, orally, 3 times per day (every 8 hours), for 5 days.
- **If there are medical complications**, give first-line amoxicillin-clavulanic acid 15–30 mg/kg, orally, 3 times per day (every 8 hours), for 5–10 days, and gentamicin, 7.5 mg/kg, IV or IM, 1 time per day, for 5–10 days.
- **If the child fails to improve within 48 hours**, give second-line chloramphenicol, 25 mg/kg, IV or IM, 3 times per day (every 8 hours), for 5–10 days, **OR**, if no improvement with second-line antibiotic after 48 hours, give third-line ceftriaxone 100 mg/kg, IV or IM, 1 time per day, for 5–10 days. Chloramphenicol should not be given to infants under 2 months.
- **If a specific infection is identified that requires a specific antibiotic not already being given**, or an additional medicine, give the appropriate additional medicine to address that infection. For example, dysentery and pneumonia may require additional antibiotics. Certain skin infections, such as candidiasis, require specific antifungals. See the Routine and Other Medicine Protocols and Vaccines for Children under 5 with SAM in Inpatient Care Job Aid.
- **If the child is HIV-positive**, give oral cotrimoxazole and link to care in line with the national guidelines for HIV/AIDS.



See job aids: Action Protocols – Emergency Treatment of Severe Acute Malnutrition in Children under 5; 10 Steps for the Management of SAM in Children 6–59 Months in Inpatient Care; and Routine Medicine Protocols and Vaccines and Other Medicine Protocols for Children under 5 with SAM in Inpatient Care.

Different formulations of drugs (e.g., tablets or syrups of varying strengths) are available. The formulation of the drug will affect the amount to measure for a dose. Some common formulations are given in the Medicine Protocols and Vaccines for Children under 5 with SAM in Inpatient Care Job Aid. For each formulation of a drug, the tables have

recommended doses to use for children of different weights. Refer to the job aid as you read the following steps and example.

**Summary Chart: Antibiotics for Children under 5 with SAM in Inpatient Care**

<b>IF SAM without medical complication (severe infection) (first-line antibiotic)</b>	AMOXICILLIN	15–30 mg/kg, orally, 3 times per day, for 5 days
<b>IF SAM with medical complication (severe infection) (first-line antibiotic)</b>	AMOXICILLIN-CLAVULANIC ACID	15–30 mg/kg, orally, 3 times per day, for 5–10 days
	GENTAMICIN	7.5 mg/kg, IV or IM, 1 time per day, for 5–10 days
<b>IF no improvement with first-line antibiotic within 48 hours (second-line antibiotic)</b>	CHLORAMPHENICOL	25 mg/kg, IV or IM, 3 times per day, for 5–10 days; added to first-line treatment; not given for an infant < 2 months
<b>IF no improvement with second-line antibiotic after 48 hours (third-line antibiotic)</b>	CEFTRIAXONE (Third-generation cephalosporin)	100 mg/kg, IV or IM, 1 time per day, for 5–10 days

**Steps to Determine the Dose**

1. Refer to the summary table above to determine what drug is needed and by what route it should be given.
2. Determine the child’s weight. (Never base the dose for a child with SAM on age.)
3. Determine what formulation of the drug (e.g., tablet or syrup) is available and the 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.

**Example of Determining the Dose**

Khalil is 82 cm in height and weighs 8.6 kg. He is severely wasted with a z-score of < -3 and MUAC of 107 mm. He has mild oedema. His rectal temperature is 36° C and his blood glucose is about 4 mmol/L. He is alert and irritable. He has no dermatosis. He has no signs of shock. He has had some loose stools but no blood in the stools. There is no evidence of respiratory or urinary tract infections.

1. Khalil has no complications, so he should be given amoxicillin. It should be given orally every 8 hours for 5 days.
2. Khalil’s body weight is 8.6 kg.
3. The hospital has amoxicillin syrup containing 125 mg per 5 ml.

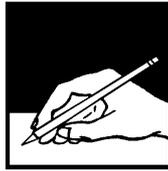
4. The physician looks up the dose for this strength amoxicillin syrup and Khalil's weight. The dose is 5 ml. He prescribes 5 ml amoxicillin syrup to be taken orally every 8 hours for 5 days.

### **3.2 Choosing and Using the Best Route of Administration**

Sometimes there is a choice of whether to give a drug intravenously or by IM injection. IM injections are very painful for a child with SAM. If an IV line is in and being used for giving fluid, use it for the antibiotic(s) as well. If there is no IV line in, 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 are 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.

Heparinised cannulas can also be used to keep a vein open for giving antibiotics.



## Exercise D

In this exercise, you will select antibiotics and determine dosages for several children.

Refer to the Routine and Other Medicine Protocols and Vaccines for Children under 5 with SAM in Inpatient Care Job Aid 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 – Pershant

Pershant is 77 cm long, weighs 8.0 kg and has a MUAC reading of 102 mm. He has oedema of both feet and mild dermatosis. He has no hypoglycaemia, no hypothermia, no signs of shock and no other complications.

- 1a. What antibiotic does Pershant need? By what route should it be given?
  
- 1b. Look at the formulations listed on the dosage tables. What formulation is most likely to be available in your hospital? (*Use this formulation to answer the next question.*)
  
- 1c. Given Pershant’s weight, what should his dose be?
  
- 1d. Summarise the prescription for Pershant in the table below:

Drug	Route	Dose	Frequency	Duration

**Case 2 – Ana**

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

- 2a. What two antibiotics should Ana be given now?
- 2b. By what possible routes may these antibiotics be given?
- 2c. Assuming that all of the necessary supplies are available, what route should be chosen?
- 2d. 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.*)
- 2e. Given Ana’s body weight, determine the dose of each antibiotic.
- 2f. For each antibiotic to be given to Ana, summarise the prescription below:

Drug	Route	Dose	Frequency	Duration

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.

- 2g. After 2 days, how should Ana’s drug regimen change?

**Case 3 – Dipti (optional)**

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

3a. Dipti has signs of a specific infection (pneumonia) requiring a specific antibiotic. Look on the Routine and Other Medicine Protocols and Vaccines for Children under 5 with SAM in Inpatient Care Job Aid to see what antibiotic is required first and record it below.

3b. Dipti will be given IM injections. What is the dose?

3c. Summarise the prescription for Dipti in the table below:

Drug	Route	Dose	Frequency	Duration

After 5 days, Dipti’s breathing is normal and there is no chest in-drawing. She is taking F-75 well. She still weighs 7.9 kg.

3d. What choice of antibiotics should be given next?

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 (See Video 2, Emergency Treatment). This video will show many of the steps described so far in this module.

## 4.0 Testing and Treating for Malaria, HIV and TB

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### 4.1 Testing and Treating for Malaria

Diagnose malaria and give treatment according to the national protocol. Test for malaria using the Rapid Diagnostic Test Kit or any other available diagnostic tests in the health facility.

In high-prevalence areas, all children with SAM should be systematically screened for malaria. In the absence of screening methods, all children under 5 with SAM with clinical signs of malaria should be treated presumptively.

In low-prevalence areas, if the results are in clinical doubt, the test should be repeated in the week following the initial test. A persistently negative test excludes *P. falciparum* malaria.

#### Notes:

- The usual clinical signs and symptoms of malaria might be absent in a child with SAM because he or she might be unable to mount an acute phase inflammatory response as a result of pathophysiological changes in his/her body.
- In case of malaria with pneumonia or dysentery, artemisinin-based combination therapy can be combined with amoxicillin and nalidixic acid, respectively, but not with cotrimoxazole.

For more information about malarial treatment, see the national malaria treatment guidelines.

### 4.2 Testing and Treating for HIV

Although guidelines for the management of SAM are considered appropriate for HIV-infected patients, with the minor adaptations described below, extensive research is currently under way to further adapt protocols for these patients. These include, among other considerations:

- Comparison of recovery rates of HIV-infected and HIV-negative children with SAM treated in CMAM
- Development of nutrition products specifically designed for HIV-infected children with SAM
- Efficacy of micronutrient supplementation for HIV-infected individuals
- Development of nutrition support for people living with HIV (PLHIV) on antiretroviral therapy (ART)
- Studies on the interaction between ART and nutritional status
- Impact of nutrition support on HIV-infected children
- Integration of HIV programmes with CMAM

Until the evidence base is established, it is advised to treat SAM in HIV-infected children with the standard treatment protocol for SAM, combined with a prophylactic treatment (cotrimoxazole). Thus, the dietary management of HIV-infected children with SAM does not differ from dietary treatment of HIV-negative children with SAM. HIV-infected children with SAM are more likely to present with associated infections, and therefore rates of weight gain and recovery may be lower than in HIV-negative children with SAM. Also, the management should take into account the following.

- High prevalence of TB: Always consider diagnosis of TB<sup>12</sup> in HIV-infected children. The signs are the same as those in HIV-negative children (see SAM and TB, below).
- Cotrimoxazole prophylaxis: Prophylactic doses of cotrimoxazole should be given to children when HIV is suspected, and provision should be indefinite in situations where ART is not yet available. This antibiotic is added to the other routine antibiotics for treatment of SAM.
- ART should be considered for HIV-positive children with SAM where available. The most appropriate schedule for start of ART treatment for HIV-infected children with SAM is not yet established and is currently being investigated.
- Voluntary testing and counselling of children with SAM—and their mothers—is advised in areas with a high prevalence of HIV.
- The treatment option to choose for infants with SAM of HIV-positive mothers has to take into account the national guidance on the prevention of mother-to-child transmission of HIV (PMTCT).
- Knowing the HIV status of a child has implications for the treatment of SAM, and it may lead to detection of HIV in the accompanying mother, with implications for counselling and treatment.

### 4.3 Testing and Treating for TB

The diagnosis of TB in children relies on a thorough assessment of all the evidence derived from a careful history, clinical examination and relevant investigations. Most children with TB have pulmonary TB. The decision to treat a child should be carefully considered, and once such a decision is made, the child should be treated with a full course of therapy.

TB in children with SAM is often missed and/or over-diagnosed. The presence of three or more of the following key features should strongly suggest a diagnosis of TB in children.

1. Careful history:
  - a. Contact with others infected with TB
  - b. Chronic symptoms suggestive of TB, e.g., prolonged fever (> 2 weeks), chronic cough (non-remitting for 2–3 weeks), weight loss or failure to thrive (i.e., if SAM does not respond to treatment)
2. Clinical examination:
  - a. Physical signs highly suggestive of extrapulmonary TB, e.g., gibbus, especially of recent onset, or non-painful enlarged cervical lymphadenopathy with fistula formation
  - b. Physical signs requiring investigation to exclude extrapulmonary TB, e.g., meningitis not responding to antibiotic treatment, distended abdomen with ascitis
3. A positive tuberculin skin test (Mantoux method), i.e., reading after 48 hours with  $\geq 5$  mm diameter of induration in high-risk children (HIV-infected and/or with SAM) and  $\geq 10$  mm in all other children
4. Chest X-ray suggestive of TB, e.g., persistent opacification in the lung together with enlarged hilar or subcarinal lymph glands

For TB treatment, consult the national treatment protocol for TB in children.

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<sup>12</sup> WHO. 2006. *Guidance for national tuberculosis programmes on the management of tuberculosis in children*. Geneva: WHO.

## **5.0 Keeping a Written Record of Initial Findings and Treatments**

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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

The Inpatient Management Record 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.



## Exercise E

In this exercise, there will be a role-play in which the admitting physician briefs the head nurse on a child's conditions and needs. Use the first page of a blank Inpatient Management Record, available in your classroom. Use the CMAM Manual, this module and job aids as needed.

1. Use the information below to complete the first page of a Inpatient Management Record 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 is a 13-month-old girl. She is admitted on October 3, at 9:00. She is severely wasted. She has mild oedema but no dermatosis. She is 72 cm long and weighs 6.3 kg. Her MUAC is 106 mm.

Rayna's rectal temperature is 36.8° C. Her blood glucose level appears to be between 3 and 4 mmol/L. Her Hb is 9.5 g/dl. 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 physician is ready to give the head nurse instructions for Rayna's care, including her first feed and first dose of antibiotic. It is 9:15.

2. When you have finished with the Inpatient Management Record, 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 physician.
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.

## Answers to Exercises

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### Answers to Exercise A, page 13

#### Case 1 – Tina

- 1a. Tina's z-score score is  $-3$ . Her score may be written as  $-3$  z-score. Tina also has a low MUAC, 107 mm. Tina has severe wasting and bilateral pitting oedema.
- 1b. Yes, Tina should be admitted since she has bilateral pitting oedema and severe wasting.
- 1c. Tina is not hypothermic because her temperature is not  $< 35.5^{\circ}$  C.
- 1d. Tina is not hypoglycaemic since her blood sugar is above 3 mmol.
- 1e. Tina does not have very severe anaemia since her Hb is well above 4 g/dl.
- 1f. Tina is not in shock. She is not lethargic or unconscious, and she does not have cold hands.
- 1g. Two things that should be done for Tina immediately:
  - Keep her warm to prevent hypothermia
  - Start F-75; give 70 ml every 2 hours

*Note:* Experienced participants may also mention antibiotics. Antibiotics are needed and are discussed later in the module.

#### Case 2 – Kalpana

- 2a. Give a 50 ml bolus of 10% glucose or sucrose. Since she can drink, give it orally.
- 2b. Begin F-75 half an hour after giving glucose. Every half-hour for 2 hours, give one-quarter of the recommended 2-hourly amount (which is 90 ml for an 8 kg child).

$$\frac{1}{4} \times 90 \text{ ml} = 22.25 \text{ ml}$$

So the amount to give every half-hour is about 22 ml. (*Round amounts to the nearest ml.*)

- 2c. Yes, Kalpana has very severe anaemia since her Hb is 3.9 g/dl. She needs a blood transfusion. Since Kalpana has no signs of congestive heart failure, she can be given whole fresh blood. Stop all oral intake during the transfusion. Give a diuretic and then transfuse 80 ml whole fresh blood slowly over 3 hours ( $10 \text{ ml} \times 8 \text{ kg} = 80 \text{ ml}$ ).

### Case 3 – John

3a. Four treatments that John needs immediately:

- Oxygen
- 5 ml/kg sterile 10% glucose by IV
- IV fluids
- Active re-warming (kangaroo technique or heater/lamp)

*Note:* Experienced participants may mention the need for antibiotics. Antibiotics are needed and are discussed later in the module.

3b. Give 29 ml sterile 10% glucose by IV ( $5 \text{ ml} \times 5.8 \text{ kg} = 29.0 \text{ ml}$ , calculated under Blood Glucose on the Inpatient Management Record).

*Note:* Since John will receive IV fluids containing glucose, there is no need to follow his 10% IV glucose with a 50 ml bolus by NGT.

3c. Give 87 ml IV fluids in first hour. This amount is calculated on the Inpatient Management Record:

$$15 \text{ ml} \times 5.8 \text{ kg} = 87 \text{ ml}$$

3d. Repeat the same amount of IV fluids (87 ml) for next hour.

3e. John should be given ReSoMal and F-75 in alternate hours.

3f. John should be given 65 ml of F-75 at each feed.

### Answers to Short Exercises, page 25

The answers to the short exercise are written in the blanks below:

1. Roberto has watery diarrhoea and SAM. He weighs 6.0 kg. He should be given 30 ml ReSoMal every 30 minutes for 2 hours. Then he should be given 30 – 60 ml ReSoMal in alternate hours for up to 10 hours. In the other hours during this period, F-75 should be given.
2. Yuma, who has severe wasting, arrived at the hospital in shock and received IV fluids for 2 hours. She has improved and is now ready to switch to ReSoMal. Yuma weighs 8.0 kg. For up to 10 hours, she should be given ReSoMal and F-75 in alternate hours. The amount of ReSoMal to offer is 40 – 80 ml per hour.
3. Answers:
  - The child's willingness to drink
  - The amount of ongoing losses in the stool

## Answers to Exercise B, page 26

### Ramesh

- 1a.  $5 \text{ ml} \times 7.3 \text{ kg} = 36.5 \text{ ml}$ , rounded to 37 ml ReSoMal every 30 minutes for 2 hours
- 1b. Least amount:  $5 \text{ ml} \times 7.3 \text{ kg} = 36.5 \text{ ml}$ , rounded to 37 ml ReSoMal.
- 1c. Greatest amount:  $10 \text{ ml} \times 7.3 \text{ kg} = 73 \text{ ml}$  ReSoMal.

### Sula

- 2a.  $5 \text{ ml} \times 11.6 \text{ kg} = 58 \text{ ml}$  ReSoMal every 30 minutes for 2 hours
- 2b.  $5 \text{ ml} \times 11.6 \text{ kg} = 58 \text{ ml}$  ReSoMal is the least amount
- 2c.  $10 \text{ ml} \times 11.6 \text{ kg} = 116 \text{ ml}$  ReSoMal is the greatest amount

## Answers to Exercise C, page 29

### Case 1 – Marwan

- 1a. Three things that should be done immediately for Marwan:
  - Give 50 ml bolus of 10% glucose orally
  - Give 100,000 IU vitamin A and atropine eye drops immediately
  - Actively re-warm him (kangaroo technique or heater/lamp)

*Note:* Experienced participants may mention the need for antibiotics. Antibiotics are needed and will be discussed later in the module.

- 1b. In a half-hour, give F-75. Give one-quarter of the 2-hourly amount for a 6.2 kg child:  
$$\frac{1}{4} \times 70 \text{ ml} = 17.5 \text{ ml (round up to 18 ml.)}$$

### Case 2 – Ram

2a–2c. Answers are given on the Inpatient Management Record for Ram below.

- 2d. Signs of over-hydration:
  - Increase in pulse and respiratory rates (both)
  - Jugular veins engorged
  - Increasing oedema, e.g., puffy eyelids
- 2e. Answers are given on the Inpatient Management Record for Ram below.
- 2f. Signs of improving hydration:
  - He has passed urine (recorded at 10:30 monitoring).
  - He is no longer thirsty.

- He has a moist mouth and tears.
  - His skin pinch is normal.
- 2g. Stop offering ReSoMal routinely in alternate hours since he has more than three signs of improving hydration. (Give ReSoMal after each loose stool instead.)
- 2h. Give F-75. Give 50 ml (based on new weight of 4.5 kg).
- 2i. Since Ram is under 2 years old, he should be given 50–100 ml ReSoMal after each loose stool to replace stool losses.

Name: Ram Sex: M F Age: 9 mths Date of admission: JUNE 10 Time: 11:00 AM Hospital ID number: \_\_\_\_\_ Page 1 of 6

**INITIAL MANAGEMENT** Comments on pre-referral and/or emergency treatment already given:

<b>SIGNS OF SAM</b> Severe wasting? <input checked="" type="radio"/> Yes <input type="radio"/> No Bilateral Pitting Oedema? <input checked="" type="radio"/> 0 <input type="radio"/> + <input type="radio"/> ++ <input type="radio"/> +++ Dermatosis? 0 <input checked="" type="radio"/> + <input type="radio"/> ++ <input type="radio"/> +++ (raw skin, fissures) Weight (kg): <u>4.4</u> Height / length (cm): <u>64</u> WFH z-score: <u>-3</u> MUAC (mm): <u>104</u>		<b>SIGNS OF SHOCK</b> <input checked="" type="radio"/> None <input type="radio"/> Lethargic/unconscious <input type="radio"/> Cold hands <input type="radio"/> Slow capillary refill (> 3 seconds) <input type="radio"/> Weak or fast pulse If <b>lethargic or unconscious*</b> , plus 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: Amount IV fluids per hour: 15 ml x _____ kg (child's wt) = _____ ml																																																																																																					
TEMPERATURE: <u>38</u> °C axillary/rectal If axillary < 35° C or rectal < 35.5° C, actively warm child. Check temperature every 30 minutes.		<table border="1"> <tr> <td>Start:</td> <td>Monitor every 10 minutes</td> <td>**2<sup>nd</sup> hr</td> <td>Monitor every 10 minutes</td> </tr> <tr> <td>Time</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Resp. rate</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Pulse rate</td> <td></td> <td></td> <td></td> </tr> </table>		Start:	Monitor every 10 minutes	**2 <sup>nd</sup> hr	Monitor every 10 minutes	Time				Resp. rate				Pulse rate																																																																																							
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<b>BLOOD GLUCOSE</b> (mmol/L): <u>5</u> If no test available, treat for hypoglycaemia. If < 3 mmol/L and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG): Yes No If < 3 mmol/L and lethargic, unconscious or convulsing, give sterile 10% glucose IV: 5 ml x _____ kg (child's weight) = _____ ml. Then give 50 ml bolus NG. Time glucose given: Oral NG IV		* In case of suspected hypernatraemic dehydration, see Operational Guide or CMAM Manual Appendix, page 183. ** If respiratory and pulse rates are slower after 1 hour, repeat same amount IV fluids for second hour; then alternate ReSoMal and F-75 for up to 10 hours as in right section of chart below. If no improvement on IV fluids, transfuse whole fresh blood. (See 'Haemoglobin' section at left.) Give maintenance IV fluids (4 ml/kg/hour) while waiting for blood.																																																																																																					
<b>HAEMOGLOBIN (Hb)</b> (g/dl): <u>12</u> or Packed Cell Vol (PCV): _____ Blood type: _____ If Hb < 4 g/dl (or Hb 4–6 g/dl AND respiratory distress), transfuse 10 ml/kg whole fresh blood (or 5–7 ml/kg packed cells) slowly over 3 hours. Amount: Time started: _____ Ended: _____		<b>DIARRHOEA</b> Watery diarrhoea? <input checked="" type="radio"/> Yes <input type="radio"/> No Blood in stool? <input checked="" type="radio"/> Yes <input type="radio"/> No Vomiting? <input checked="" type="radio"/> Yes <input type="radio"/> No Number of days with diarrhoea: _____ If diarrhoea, circle signs present: Skin pinch goes back slowly <input checked="" type="radio"/> Lethargic <input checked="" type="radio"/> Restless/irritable <input checked="" type="radio"/> Dry mouth/tongue <input checked="" type="radio"/> Sunken eyes <input checked="" type="radio"/> No tears <input type="radio"/>																																																																																																					
<b>EYE SIGNS</b> <input checked="" type="radio"/> None <input type="radio"/> Left <input type="radio"/> Right Bitot's spots Pus or inflammation Corneal clouding Corneal ulceration If ulceration, give vitamin A and atropine immediately. Record on Daily Care page. If no ulceration, give vitamin A preventive dose on week 4 or upon discharge.		If diarrhoea and/or vomiting, give ReSoMal orally*. Every 30 minutes for first 2 hours, monitor and give:* 5 ml x <u>4.4</u> kg (child's wt) = <u>22</u> ml ReSoMal For up to 10 hours, give ReSoMal and F-75 orally* in alternate hours. Monitor every hour. Amount of ReSoMal to offer**: 5 to 10 ml x <u>4.4</u> kg (child's wt) = <u>22</u> to <u>44</u> ml ReSoMal																																																																																																					
<b>ORAL DOSES VITAMIN A</b> *Treatment dose on days 1, 2, 15 **Preventive dose on week 4 or upon discharge		<table border="1"> <tr> <td>Time</td> <td>Start</td> <td></td> </tr> <tr> <td>Resp. rate</td> <td><u>28</u></td> <td><u>28</u></td> <td><u>28</u></td> <td><u>25</u></td> <td><u>25</u></td> <td><u>25</u></td> <td></td> </tr> <tr> <td>Pulse rate</td> <td><u>105</u></td> <td><u>105</u></td> <td><u>105</u></td> <td><u>100</u></td> <td><u>100</u></td> <td><u>100</u></td> <td></td> </tr> </table>		Time	Start																			Resp. rate	<u>28</u>	<u>28</u>	<u>28</u>	<u>25</u>	<u>25</u>	<u>25</u>														Pulse rate	<u>105</u>	<u>105</u>	<u>105</u>	<u>100</u>	<u>100</u>	<u>100</u>																																																					
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<b>MEASLES</b> Yes <input checked="" type="radio"/> No <input type="radio"/> Vaccination upon admission: Yes No (Record on Outcome page)		<table border="1"> <tr> <td>Passed urine? Y N</td> <td></td> <td><u>N</u></td> <td><u>N</u></td> <td><u>Y</u></td> <td><u>N</u></td> <td><u>N</u></td> <td></td> </tr> <tr> <td>Number stools</td> <td></td> <td><u>1</u></td> <td><u>0</u></td> <td><u>0</u></td> <td><u>1</u></td> <td><u>0</u></td> <td></td> </tr> <tr> <td>Number vomits</td> <td></td> <td><u>N</u></td> <td><u>1</u></td> <td><u>0</u></td> <td><u>N</u></td> <td><u>N</u></td> <td></td> </tr> <tr> <td>Hydration signs</td> <td></td> </tr> <tr> <td>Amount taken (ml)</td> <td></td> <td><u>22</u></td> <td><u>22</u></td> <td><u>22</u></td> <td><u>22</u></td> <td><u>44</u></td> <td>F-75</td> <td>F-75</td> <td>F-75</td> <td>F-75</td> <td>F-75</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>		Passed urine? Y N		<u>N</u>	<u>N</u>	<u>Y</u>	<u>N</u>	<u>N</u>														Number stools		<u>1</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>														Number vomits		<u>N</u>	<u>1</u>	<u>0</u>	<u>N</u>	<u>N</u>														Hydration signs																				Amount taken (ml)		<u>22</u>	<u>22</u>	<u>22</u>	<u>22</u>	<u>44</u>	F-75	F-75	F-75	F-75	F-75								
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<b>FEEDING</b> Begin feeding with F-75 as soon as possible. If child is rehydrated, reweigh before determining amount to feed. New weight: <u>4.5</u> kg. Amount for 2-hourly feedings: <u>50</u> ml F-75* Time first fed: <u>12:00</u> * If hypoglycaemic, feed ¼ of this amount every half hour for first 2 hours; continue until blood glucose reaches 3 mmol/L. Record all feeds on 24-Hour Food Intake Chart page.		* Give ReSoMal orally (or, if child is unconscious or too ill to take the ReSoMal orally, give by NGT). ** Stop ReSoMal if signs of hydration: Passing urine, moist tongue, making saliva, not thirsty. Stop ReSoMal if any sign of over-hydration: Increasing pulse and resp. rates, engorging jugular veins, increasing oedema, puffing of eyelids.																																																																																																					
<b>ANTIBIOTICS (Drug/Route)</b>		Dose/Frequency/Duration Time of 1 <sup>st</sup> Dose																																																																																																					
<b>MALARIA TEST (Type/Date/Outcome):</b>		Antimalarial: _____ Dose/Frequency/Duration _____ Time of 1 <sup>st</sup> Dose _____																																																																																																					
<b>HIV TEST (Type/Date/Outcome):</b>		If + HIV test, give cotrimoxazole: _____																																																																																																					

### Case 3 – Irena

See the completed Inpatient Management Record for Irena below.

3a. Answers are given on the Inpatient Management Record for Irena.

3b. Irena is not hypoglycaemic.

Irena is not hypothermic.

3c. Yes, she needs vitamin A, as do almost all severely malnourished children, but it is not necessary immediately. We will wait until week 4 or upon discharge.

3d. Irena is lethargic, has cold hands, slow capillary refill and fast pulse.

Give 5 ml/kg sterile 10% glucose by IV ( $5 \text{ ml} \times 6.1 \text{ kg} = 30.5 \text{ ml}$ ).

*Note:* Since Irena will receive IV fluids containing glucose, there is no need to follow her IV 10% glucose with a 50 ml bolus by NGT.

Give  $15 \text{ ml} \times 6.1 \text{ kg} = 91.5 \text{ ml}$  IV fluids in the first hour.

3e. See monitoring data on Inpatient Management Record. Irena should be given the same amount of IV fluids over the next hour.

3f. See second hour of IV section of Irena's Inpatient Management Record.

3g. At 12:30 she needs ReSoMal. Calculate range of amounts as follows:

$$5\text{--}10 \text{ ml} \times 6.2 \text{ kg} = 31\text{--}62 \text{ ml ReSoMal per hour}$$

This range of amounts should be entered on the Inpatient Management Record.

3h. See 'Diarrhoea' section of Irena's Inpatient Management Record.

3i. See 'Diarrhoea' section of Irena's Inpatient Management Record.

3j. 70 ml F-75. (This amount should be recorded in the Feeding section of the first page of the Inpatient Management Record.)

3k. She should be offered 62 ml ReSoMal at 14:30.

3l. Since Irena is 25 months old, she needs 100–200 ml ReSoMal after each loose stool.

Name: IRENA Sex: M (F) Age: 25 mths Date of admission: MARCH 3 Time: 10:00 Am Hospital ID number: \_\_\_\_\_ Page 1 of 6

**INITIAL MANAGEMENT** Comments on pre-referral and/or emergency treatment already given:

<b>SIGNS OF SAM</b> Severe wasting? <input checked="" type="radio"/> Yes <input type="radio"/> No Bilateral Pitting Oedema? <input checked="" type="radio"/> 0 <input type="radio"/> + <input type="radio"/> ++ <input type="radio"/> +++		<b>SIGNS OF SHOCK</b> None <input checked="" type="radio"/> Lethargic/unconscious <input checked="" type="radio"/> Cold hands <input checked="" type="radio"/> Slow capillary refill (> 3 seconds) <input checked="" type="radio"/> Weak or fast pulse																																																																																																																									
Dermatosis? <input checked="" type="radio"/> 0 <input type="radio"/> + <input type="radio"/> ++ <input type="radio"/> +++ (raw skin, fissures)		If <b>lethargic or unconscious*</b> , plus <b>cold hands</b> , plus either <b>slow capillary refill</b> or <b>weak or fast pulse</b> , give oxygen. Give IV glucose as described under Blood Glucose (left). Then give IV fluids: Amount IV fluids per hour: 15 ml x <u>6.1</u> kg (child's wt) = <u>91.5</u> ml																																																																																																																									
Weight (kg): <u>6.1</u> Height / length (cm): <u>74</u> WFH z-score: <u>-3</u> MUAC (mm): <u>109</u>		<table border="1"> <tr> <td></td> <td>Start:</td> <td colspan="5">Monitor every 10 minutes</td> <td>**2<sup>nd</sup> hr</td> <td colspan="5">Monitor every 10 minutes</td> </tr> <tr> <td>Time</td> <td></td> <td>10:30</td> <td>10:40</td> <td>10:50</td> <td>11:00</td> <td>11:10</td> <td>11:20</td> <td>**11:30</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Resp. rate</td> <td></td> <td>40</td> <td>38</td> <td>36</td> <td>35</td> <td>33</td> <td>32</td> <td>**30</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Pulse rate</td> <td></td> <td>140</td> <td>130</td> <td>120</td> <td>100</td> <td>90</td> <td>85</td> <td>**80</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>			Start:	Monitor every 10 minutes					**2 <sup>nd</sup> hr	Monitor every 10 minutes					Time		10:30	10:40	10:50	11:00	11:10	11:20	**11:30							Resp. rate		40	38	36	35	33	32	**30							Pulse rate		140	130	120	100	90	85	**80																																																																				
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Resp. rate		40	38	36	35	33	32	**30																																																																																																																			
Pulse rate		140	130	120	100	90	85	**80																																																																																																																			
<b>TEMPERATURE:</b> <u>36</u> °C axillary / <u>rectal</u> If axillary < 35° C or rectal < 35.5° C, actively warm child. Check temperature every 30 minutes.		* In case of suspected hypernatraemic dehydration, see Operational Guide or CMAM Manual Appendix, page 183. ** If respiratory and pulse rates are slower after 1 hour, repeat same amount IV fluids for second hour; then alternate ReSoMal and F-75 for up to 10 hours as in right section of chart below. If no improvement on IV fluids, transfuse whole fresh blood. (See 'Haemoglobin' section at left.) Give maintenance IV fluids (4 ml/kg/hour) while waiting for blood.																																																																																																																									
<b>BLOOD GLUCOSE</b> (mmol/L): <u>4</u> If no test available, treat for hypoglycaemia. If < 3 mmol/L and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG): Yes No If < 3 mmol/L and lethargic, unconscious or convulsing, give sterile 10% glucose IV: 5 ml x ___ kg (child's weight) = ___ ml. Then give 50 ml bolus NG. Time glucose given: Oral NG <input checked="" type="radio"/> IV		<b>DIARRHOEA</b> Watery diarrhoea? <input checked="" type="radio"/> Yes <input type="radio"/> No Blood in stool? Yes <input type="radio"/> No <input checked="" type="radio"/> Vomiting? <input checked="" type="radio"/> Yes <input type="radio"/> No Number of days with diarrhoea: _____																																																																																																																									
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<b>ORAL DOSES VITAMIN A</b> < 6 months* 50,000 IU *Treatment dose on days 1, 2, 15 6–12 months* ** 100,000 IU **Preventive dose on week 4 or upon discharge > 12 months* ** 200,000 IU		<table border="1"> <tr> <td>Time</td> <td>Start</td> <td></td> <td></td> <td></td> <td></td> <td>12:30</td> <td>1:30</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Resp. rate</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>30</td> <td>30</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Pulse rate</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>80</td> <td>80</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Passed urine? Y N</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>N</td> <td>N</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Number stools</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Number vomits</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>N</td> <td>N</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Hydration signs</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Some</td> <td>Y</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Amount taken (ml)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>6.2</td> <td>F-75</td> <td></td> <td>F-75</td> <td></td> <td>F-75</td> <td></td> <td>F-75</td> <td></td> </tr> </table>		Time	Start					12:30	1:30								Resp. rate						30	30								Pulse rate						80	80								Passed urine? Y N						N	N								Number stools						1	1								Number vomits						N	N								Hydration signs						Some	Y								Amount taken (ml)						6.2	F-75		F-75		F-75		F-75	
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<b>FEEDING</b> Begin feeding with F-75 as soon as possible. If child is rehydrated, reweigh before determining amount to feed. New weight: <u>6.2</u> kg. Amount for 2-hourly feedings: <u>70</u> ml F-75* Time first fed: <u>1:30</u> * If hypoglycaemic, feed 1/4 of this amount every half hour for first 2 hours; continue until blood glucose reaches 3 mmol/L. Record all feeds on 24-Hour Food Intake Chart page.		<table border="1"> <tr> <td>ANTIBIOTICS (Drug/Route)</td> <td>Dose/Frequency/Duration</td> <td>Time of 1<sup>st</sup> Dose</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>		ANTIBIOTICS (Drug/Route)	Dose/Frequency/Duration	Time of 1 <sup>st</sup> Dose																																																																																																																					
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<b>HIV TEST</b> (Type/Date/Outcome): _____		If + HIV test, give cotrimoxazole: _____																																																																																																																									

**Answers to Exercise D, page 37**

**Case 1 – Pershant**

See below completed Inpatient Management Record for Pershant.

- 1a. Amoxicillin, orally.
- 1b. Answers will vary. The formulation should be one of the following:

Tablet, 250 mg  
 Syrup, 125 mg/5 ml  
 Syrup, 250 mg/5 ml

- 1c. If tablet is given, give 125 mg or ½ tablet if 250 mg.  
 If syrup of 250 mg/5 ml is given, give 2.5 ml.  
 If syrup of 125 mg/5 ml is given, give 5 ml.

*(Notice that the 8.0 kg child is included in the highest weight range given. The middle range includes children up to but not including 8.0 kg.)*

- 1d.

Drug	Route	Dose	Frequency	Duration
Amoxicillin	Oral	½ tablet (or 5 ml or 2.5 ml syrup)	Every 8 hours	5 days

**Case 2 – Ana**

- 2a. Amoxicillin-clavulanic acid and gentamicin.
- 2b. IV or IM.
- 2c. IV, using butterfly needle. Since Ana would need to receive 1 IV/IM injection daily (one injection of gentamicin) for the first 7 days, it is preferable to use a butterfly needle to keep a vein open for injecting drugs.
- 2d. Amoxicillin-clavulanic orally of 15–30 mg/kg/day every 8 hours

For gentamicin, three choices are possible:

- a. Vial containing 20 mg (2 ml at 10 mg/ml), undiluted
- b. Vial containing 80 mg (2 ml at 40 mg/ml) mixed with 6 ml sterile water to give 80 mg/8 ml
- c. Vial containing 80 mg (2 ml at 40 mg/ml), undiluted

2e. Amoxicillin-clavulanic: Give 5 ml every 8 hours for 5 days

Gentamicin:

If formulation a above, give 4.5 ml

If formulation b above, give 4.5 ml

If formulation c above, give 1.1 ml

2f.

Drug	Route	Dose	Frequency	Duration
<i>Gentamicin</i>	<i>IV/IM</i>	<i>4.5 ml or 1.1 ml (see above)</i>	<i>1 time per day</i>	<i>7 days</i>
<i>Amoxicillin-clavulanic acid</i>	<i>Oral</i>	<i>5 ml</i>	<i>Every 8 hours</i>	<i>5 days</i>

2g. There will no change, because Ana will complete the antibiotics in 5–7 days.

### Case 3 – Dipti (optional)

3a. Amoxicillin-clavulanic acid and gentamicin

3b. Only one formulation is given for IM injection. The dose is 0.7 ml.

3c.

Drug	Route	Dose	Frequency	Duration
<i>Amoxicillin-clavulanic acid</i>	<i>Oral</i>	<i>15–30 mg/kg/dose</i>	<i>Every 8 hours</i>	<i>5 days</i>
<i>Gentamicin</i>	<i>IM</i>	<i>7.5 mg/kg/dose</i>	<i>1 time per day</i>	<i>7 days</i>

3d. Dipti will continue antibiotics for 5–7 days. There will be no need to change or to add other antibiotics because Dipti’s condition is improving.

### Answers to Exercise E, page 44

1. A copy of a completed first page of the Inpatient Management Record for Rayna is on the next page.
2. Some examples of key points to discuss with the head nurse might be:
  - Keep Rayna covered and warm at all times, especially at night.
  - Watch her carefully.
  - Starting now, feed her 70 ml of F-75 every 2 hours, even at night.
  - Give 200,000 IU vitamin A today as soon as convenient.
  - Give amoxicillin (45–90 mg/kg/day) three times a day for 5 days. Give her the first dose now.
  - Call me if she seems worse, or if her temperature increases or decreases, or pulse and respiratory rates increase.

3. Some examples of possible questions are:
  - We are short of staff tonight. Can we feed Rayna every 3 or 4 hours tonight if we give her more?
  - If she is asleep, should we wake her to feed her?
  - What should I do if she vomits?

Name: RAYNA Sex: M  F  Age: 13 mths Date of admission: October 3 Time: 9:00 AM Hospital ID number: \_\_\_\_\_ Page 1 of 6

**INITIAL MANAGEMENT** Comments on pre-referral and/or emergency treatment already given:

<b>SIGNS OF SAM</b> Severe wasting? <input checked="" type="radio"/> Yes <input type="radio"/> No Bilateral Pitting Oedema? 0 <input checked="" type="radio"/> + <input type="radio"/> ++ <input type="radio"/> +++ Dermatitis? <input checked="" type="radio"/> 0 <input type="radio"/> + <input type="radio"/> ++ <input type="radio"/> +++ (raw skin, fissures) Weight (kg): <u>6.3</u> Height / length (cm): <u>72</u> WFH z-score: <u>-3</u> MUAC (mm): <u>106</u>		<b>SIGNS OF SHOCK</b> <input checked="" type="radio"/> None <input type="radio"/> Lethargic/unconscious <input type="radio"/> Cold hands <input type="radio"/> Slow capillary refill (> 3 seconds) <input type="radio"/> Weak or fast pulse If lethargic or unconscious*, plus 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: Amount IV fluids per hour: 15 ml x _____ kg (child's wt) = _____ ml																																																							
<b>TEMPERATURE:</b> <u>36.8</u> °C axillary / <u>rectal</u> If axillary < 35° C or rectal < 35.5° C, actively warm child. Check temperature every 30 minutes.		<table border="1"> <tr> <th>Time</th> <th>Start</th> <th>Monitor every 10 minutes</th> <th>**2<sup>nd</sup> hr</th> <th>Monitor every 10 minutes</th> </tr> <tr> <td>Resp. 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> </table>		Time	Start	Monitor every 10 minutes	**2 <sup>nd</sup> hr	Monitor every 10 minutes	Resp. rate			**		Pulse rate			**																																								
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<b>BLOOD GLUCOSE</b> (mmol/L): <u>3-4</u> If no test available, treat for hypoglycaemia. If < 3 mmol/L and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG): Yes No If < 3 mmol/L and lethargic, unconscious or convulsing, give sterile 10% glucose IV: 5 ml x _____ kg (child's weight) = _____ ml. Then give 50 ml bolus NG. Time glucose given: Oral _____ NG _____ IV _____		* In case of suspected hypernatraemic dehydration, see Operational Guide or CMAM Manual Appendix, page 183. ** If respiratory and pulse rates are slower after 1 hour, repeat same amount IV fluids for second hour; then alternate ReSoMal and F-75 for up to 10 hours as in right section of chart below. If no improvement on IV fluids, transfuse whole fresh blood. (See 'Haemoglobin' section at left.) Give maintenance IV fluids (4 ml/kg/hour) while waiting for blood.																																																							
<b>HAEMOGLOBIN (Hb)</b> (g/dl): <u>9</u> or Packed Cell Vol (PCV): _____ Blood type: _____ If Hb < 4 g/dl (or Hb 4-6 g/dl AND respiratory distress), transfuse 10 ml/kg whole fresh blood (or 5-7 ml/kg packed cells) slowly over 3 hours. Amount: Time started: _____ Ended: _____		<b>DIARRHOEA</b> Watery diarrhoea? Yes <input checked="" type="radio"/> No <input type="radio"/> Blood in stool? Yes <input checked="" type="radio"/> No <input type="radio"/> Vomiting? Yes <input checked="" type="radio"/> No <input type="radio"/> Number of days with diarrhoea: _____ If diarrhoea, circle signs present: Skin pinch goes back slowly Lethargic _____ Thirsty _____ Restless/irritable _____ Dry mouth/tongue _____ No tears _____ Sunken eyes _____																																																							
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<b>ANTIBIOTICS (Drug/Route)</b> <u>AMOXICILLIN ORALLY</u>		Dose/Frequency/Duration <u>300 mg/day OR 100 mg/dose</u> <u>3 times a day</u> Time of 1 <sup>st</sup> Dose <u>9:30</u>																																																							
<b>MALARIA TEST (Type/Date/Outcome):</b>		Antimalarial: _____ Dose/Frequency/Duration _____ Time of 1 <sup>st</sup> Dose _____																																																							
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