

3. Initial management



WORLD HEALTH ORGANIZATION
DEPARTMENT OF NUTRITION FOR HEALTH AND DEVELOPMENT

**TRAINING COURSE ON THE
MANAGEMENT OF SEVERE MALNUTRITION**

INITIAL MANAGEMENT



World Health Organization
Department of Nutrition for Health and Development

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TRAINING COURSE ON THE MANAGEMENT OF SEVERE MALNUTRITION: INITIAL MANAGEMENT

Introduction

The focus of initial management is to prevent death while stabilizing the child. The first step is to check the child for emergency signs and provide emergency treatment as necessary. Any child presenting to the hospital should be checked for emergency signs as part of standard procedure.¹

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 obviously cannot teach the entire process of emergency management, but it will focus on the steps that must be added or adjusted to treat the severely malnourished child.

Some of the initial management procedures described in this module may be performed in the emergency room, before the child is admitted to the severe malnutrition ward. It is very important that emergency room staff know to treat the severely malnourished child differently. They must be taught to recognize severely malnourished children and to understand that these children may be seriously ill even without showing signs of infection. A severely malnourished child should be seen as quickly as possible in the emergency room. Staff must understand that they should **not** put up a rapid IV but should follow procedures as outlined in the manual, Chapter 4, “Initial Treatment”.

When any necessary emergency treatment has been provided, the child should be moved immediately to the severe malnutrition ward. For several days, it is critical to watch for and treat or prevent such life-threatening problems as hypoglycaemia, hypothermia, shock, dehydration, and infection. Only later, after these problems are under control and the child is stabilized, is the child expected to gain weight. This module describes the life-saving tasks that are essential to initial management of the severely malnourished child.

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

¹ Basic emergency treatment is taught in medical schools and will not be taught in this course. For additional information, you may refer to the WHO document titled *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

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

- Identifying and managing the severely malnourished child with:
 - Hypoglycaemia
 - Hypothermia
 - Shock
 - Very severe anaemia
 - Corneal ulceration
 - Watery diarrhoea and/or vomiting
- Preparing ReSoMal
- Selecting appropriate antibiotics and calculating dosages
- Keeping a written record of initial findings and treatments

1.0 Manage hypoglycaemia

1.1 What is hypoglycaemia?

Hypoglycaemia is a low level of glucose in the blood. In severely malnourished children, the level considered low is less than (<) 3 mmol/litre (or <54 mg/dl). 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. Severely malnourished children are more at risk of hypoglycaemia than other children and need to be fed more frequently, including during the night. Malnourished children may arrive at the hospital hypoglycaemic if they have been vomiting, if they have been too sick to eat, or if they have had a long journey without food. 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.

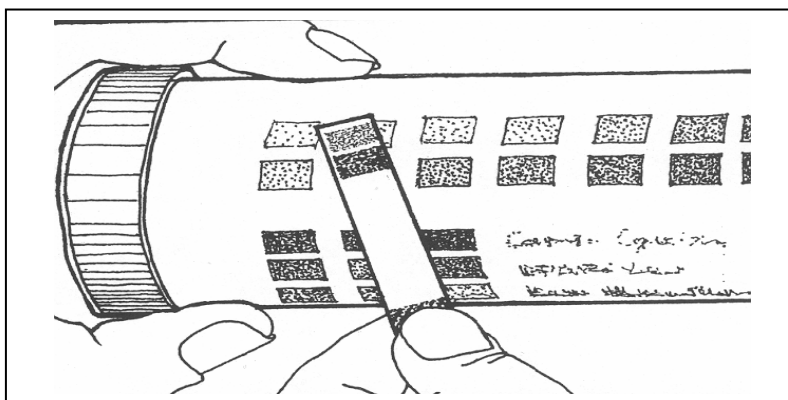
1.2 Test blood glucose level

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

Blood glucose level can be tested using treated paper strips such as Dextrostix, 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 products such as Dextrostix or Glucostix. If expired, the readings may not be true.

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

- Touch the treated paper to the blood sample.
- Wait for 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 glucometer (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/litre. For example, it may say that a certain colour corresponds to 2 - 4 mmol/litre. If a range is given, assume that the child's blood glucose is the lower reading (that is, 2 mmol/litre in this example).

There may not be enough time to take and test a blood sample right away. If hypoglycaemia is suspected, give treatment immediately without laboratory confirmation. If no testing strips are available, or if it is not possible to get enough blood to test, assume that the child has hypoglycaemia.

1.3 Prevent hypoglycaemia / Begin F-75

If the child's blood glucose is not low, begin feeding the child with F-75 right away. Feed the child every 2 hours, even during the night. Appropriate amounts are given in Table 9, on page 15 of the manual and on your *F-75 Reference Card*. These frequent, small feeds will prevent hypoglycaemia and provide nutrients for the child during the initial period of stabilization.



Look at Table 9 on page 15 of the manual now.

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.

Note: The table in the manual and on the front of your *F-75 Reference Card* shows amounts for children who do not have severe oedema. Amounts for children with severe oedema (+++) are less; these amounts are given on the reverse side of your *F-75 Reference Card*.

Feeding with F-75 should begin as soon as possible. Feeding will be discussed in detail in the next module.



1.4 Treat hypoglycaemia

If blood glucose is low or hypoglycaemia is suspected, immediately give the child a 50 ml bolus of 10% glucose or 10% sucrose orally or by NG tube. 50 ml is a very small amount, but 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 NG tube.

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 NG tube.* If the IV dose cannot be given immediately, give the NG dose first.

** If the child will be given IV fluids for shock, there is no need to follow the 10% IV glucose with an NG bolus, as the child will continue to receive glucose in the IV fluids.*

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 $\frac{1}{4}$ of the 2-hourly amount shown on Table 9, page 15 of the manual or on your *F-75 Reference Card*.

Take another blood sample after 2 hours and check the child's blood glucose again. If blood glucose is now 3mmol/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 kilograms. 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 $\frac{1}{4}$ of the two-hourly amount of F-75 for his weight. The two-hourly amount is 80 ml, so Ari should be given 20 ml every half-hour for two hours. Then, if his blood glucose is 3 mmol/l or higher, he should be given 80 ml of F-75 every two hours.

2.0 Manage hypothermia

2.1 What is hypothermia?

Hypothermia is low body temperature. A severely malnourished child is hypothermic if the **rectal temperature is below 35.5°C (95.9°F)** or if the **axillary temperature is below 35°C (95.0°F)**.

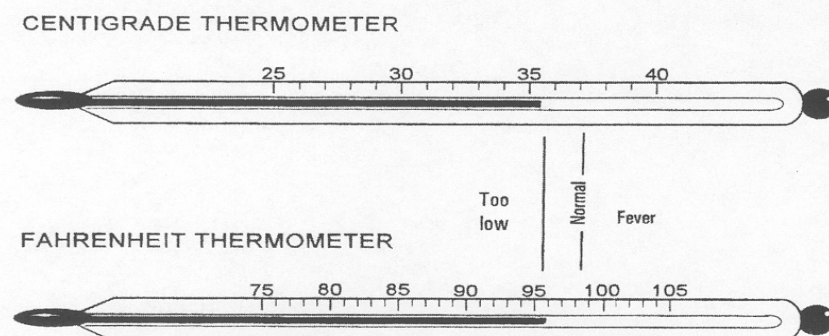
Severely malnourished children are at greater risk of hypothermia than other children and need to be kept warm. The hypothermic child has not had enough calories to warm the body. If the child is hypothermic, he is probably also hypoglycaemic. Both hypothermia and hypoglycaemia are signs that the child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

All hypothermic children should be treated for hypoglycaemia and for infection as well.

2.2 Take temperature

Rectal temperatures are preferred because they more accurately reflect core body temperature. If axillary temperatures are taken, convert them to rectal by adding 0.5°C (0.9°F). If axillary temperatures are used for routine monitoring, re-check any patient with an axillary temperature below 35°C (95.0°F) by taking a rectal temperature.

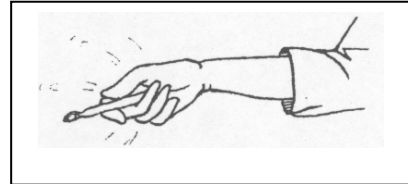
The following illustration shows two low-reading rectal thermometers (one centigrade and the other fahrenheit) with normal, low, and high temperatures indicated:



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.

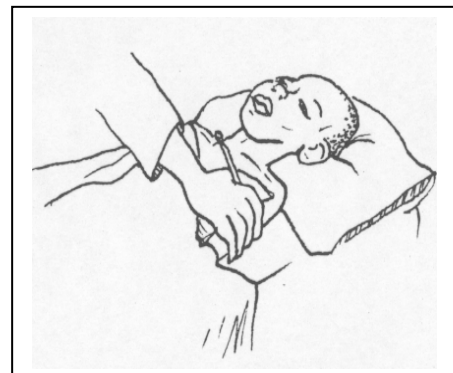
Steps for using a rectal thermometer

- Shake the thermometer down to below 35°C (95.0°F).
- 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.



Steps for using an axillary thermometer

- Shake thermometer down to below 35°C (95.0°F).
- Place thermometer under armpit.
- Keep in place for 3 minutes.
- If below 35°C (95.0°F), take rectal temperature for more accurate reading.



2.3 Warm the child

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

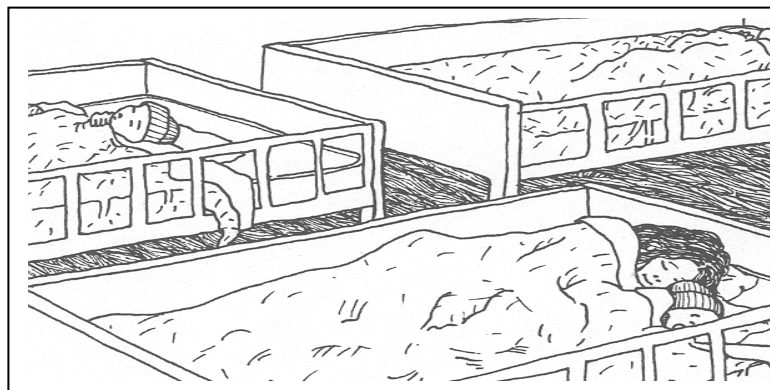
Hypothermia is very dangerous. If the child is hypothermic, re-warming is necessary to raise temperature.

Maintain temperature (prevent hypothermia)

The following measures are important for all severely malnourished children:

- Cover the child, including his head.
- Stop draughts in the room. Move the child away from windows.
- Maintain room temperature of 25 – 30°C (77 – 86°F) 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, let the child sleep snuggled up to the mother, and cover them with a blanket.



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 his skin next to her skin when possible (kangaroo technique), and cover both of them. Keep the child's head covered.



- Use a heater or incandescent lamp with caution. Use indirect heat (not too close). Monitor rectal temperature every 30 minutes to make sure the child does not get too hot. Stop re-warming when the child's temperature becomes normal.
- ⊗ Do NOT use hot water bottles due to danger of burning fragile skin.

Example of Critical Care Pathway (CCP)

The next page shows the first part of a case record called a Critical Care Pathway or CCP. Information has been entered about a child's presenting signs and initial management.

So far, the steps in this module have been related to the CCP sections titled **Signs of Severe Malnutrition, Temperature, Blood Glucose, and Feeding**. As the module continues, you will learn about the other sections of this page of the CCP.

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

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

CRITICAL CARE PATHWAY (CCP) – SEVERE MALNUTRITION WARD

NAME Cara M F DATE OF BIRTH OR AGE 18 mds DATE OF ADMISSION 10 Dec '01 TIME 10:00 am HOSP. ID NUMBER 464

Comments on pre-referral and/or emergency treatment already given: referred by health centre

INITIAL MANAGEMENT

INITIAL MANAGEMENT

SIGNS OF SEVERE MALNUTRITION			Severe wasting?	Yes	No
Oedema?	0	+	+	+	+
Dermatosis?	0	+	+	+	+
Weight(kg):	6.3 kg				72 cm
SD score:	-3				or % of median:

TEMPERATURE 36 °C rectal axillary

BLOOD GLUCOSE (mmol/l): 2-4 mmol/l

Time glucose given: 10:15 Oral NG IV
HAEMOGLOBIN (Hb) (g/l): 90 or Packed cell vol (PCV): Blood type: A+
 If Hb < 40 g/l or PCV < 12%, transfuse 10 ml/kg whole fresh blood (or 5-7 ml/kg packed cells) slowly over 3 hours. Amount: Time started: Ended:

Eye signs	None	Left	Right	Measles	Yes	No
Bitot's spots	(Pus)	Inflammation	Corneal clouding	Corneal ulceration		
If ulceration, give vitamin A & atropine immediately. Record on Daily Care page.						
Oral doses vitamin A:				50 000 IU		
			< 6 months	100 000 IU		
			6 - 12 months	200 000 IU		
			> 12 months			

FEEDING 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: 70 ml F-75* Time first fed: 10:45


* If hypoglycaemic, feed $\frac{1}{4}$ 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.

ANTIBIOTICS (All receive)	Drug / Route
	Cotrimoxazole - oral

SIGNIS OF SHOCK					None	Lethargic/unconscious	Cold hand	Slow capillary refill > 3 seconds	Weak/fast pulse
<p>If lethargic or unconscious, plus cold hand, plus either slow capillary refill or weak/fast pulse, give oxygen. Give IV glucose as described under Blood Glucose (left). Then give IV fluids:</p> <p>Amount IV fluids per hour: 15 ml x _____ kg (child's wt) = _____ ml</p>									
Start:		Monitor every 10 minutes			*2 nd hr:		Monitor every 10 minutes		
Time						*			
Resp. rate						*			
Pulse rate						*			

* If respiratory & pulse rates are slower after 1 hour, repeat same amount IV fluids for 2nd 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.)

DIARRHOEA	Watery diarrhoea? Yes (No) 		If diarrhoea, circle signs present:		Skin pinch goes back slowly		Thirsty	
	Blood in stool? Yes (No)	Vomiting? Yes (No)	Restless/irritable	Lethargic	Sunken eyes	Dry mouth/tongue	No tears	
If diarrhoea and/or vomiting, give ReSoMal. Every 30 minutes for first 2 hours, monitor and give.*								
5 ml x ____ kg (child's wt) = ____ ml ReSoMal			5 to 10 ml x ____ kg (child's wt) = ____ to ____ ml ReSoMal					
Time	Start:							
Resp. rate								
Pulse rate								
Passed urine? Y N								
Number stools								
Number vomits								
Hydration signs								
Amount taken (ml)				F-75		F-75		F-75
Stop ReSoMal if: Increase in pulse & resp. rates Jugular veins engorged Increasing oedema, e.g., puffy eyelids								

Dose / Frequency / Duration	Time of 1 st dose
1ml syrup, every 12 hours, for 5 days	10:30 am

3.0 Manage a severely malnourished child with shock

3.1 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 severely malnourished children, some of the signs of shock may appear all the time, so it is difficult to diagnose. Thus, IV fluids are given in severe malnutrition only if the child meets the following criteria:

The severely malnourished child 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 color. 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.

3.2 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 1.4).
- Give IV fluids as described on the next page.
- Keep the child warm.

Giving IV fluids

Shock from dehydration and sepsis are likely to coexist in severely malnourished children. They are difficult to differentiate on clinical signs alone. Children with dehydration will respond to 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. Overhydration can cause heart failure and death.

To give IV fluids:

- Check the starting respiratory and pulse rates and record them on the CCP. Also record the starting time.
- Infuse IV fluid at 15ml/kg over 1 hour. Use one of the following solutions, listed in order of preference:
Half-strength Darrow's solution with 5% glucose (dextrose)
Ringer's lactate solution with 5% glucose*
0.45% (half-normal) saline 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 and pulse rate increase, 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 nasogastric rehydration with ReSoMal (special rehydration solution for children with severe malnutrition). 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 CCP as a reminder.

SIGNS OF SHOCK	None	Lethargic/unconscious	Cold hand	Slow capillary refill(>3 seconds)								
Weak/fast pulse												
<i>If lethargic or unconscious, plus cold hand, plus either slow capillary refill or weak/fast pulse, give oxygen. Give IV glucose as described under Blood Glucose (left). Then give IV fluids:</i>												
Amount IV fluids per hour: 15 ml x ____ kg (child's wt) = _____ml												
	Start:	Monitor every 10 minutes					*2 nd hr:	Monitor every 10 minutes				
Time							*					
Resp. rate							*					
Pulse rate							*					
<i>*If respiratory & pulse rates are slower after 1 hour, repeat same amount IV fluids for 2nd 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)</i>												

3.3 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 in section 4.2 for more details.*)

4.0 Manage very severe anaemia

4.1 What is very severe anaemia?

Anaemia is a low concentration of haemoglobin in the blood. Very severe anaemia is a haemoglobin concentration of < 40 g/l (or packed cell volume <12%). Very severe anaemia can cause heart failure 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 severely malnourished children and should be treated later with iron, after the child has stabilized. (Do NOT give iron now as it can damage cell membranes and make infections worse.)

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

4.2 If haemoglobin <40 g/l, give blood transfusion

If haemoglobin is less than 40 g/l, (or packed cell volume is less than 12 %), give a blood transfusion.²

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, 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. If there are signs of congestive heart failure, be ready to give packed cells (5 – 7 ml/kg) instead of whole blood.

² Where testing for HIV and viral hepatitis B is not possible, or where HIV is very common, give transfusion only when haemoglobin falls below 30 g/l (or packed cell volume < 10%), or when there are signs of life-threatening heart failure.

4. Give a diuretic³ to make room for the blood. Furosemide (1 mg/kg, given by IV) is the most appropriate choice.
5. If there are no signs of congestive heart failure, transfuse whole fresh blood at 10 ml/kg slowly over 3 hours. If there are signs of heart failure, give 5 – 7 ml/kg packed cells over 3 hours instead of whole blood.

³ 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 CCPs for several children. You will then answer questions about treatment needed. Use your manual or reference cards as needed.

Case 1 – Tina

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

SIGNS OF SEVERE MALNUTRITION				Severe wasting?	Yes	No
Oedema?	0	+	++	+++		
Dermatosis?	0	+	++	+++ (raw skin, fissures)		
Weight(kg):	6.3 kg			Height/length (cm):	70 cm	
SD score:				or % of median:		

TEMPERATURE	35.5 °C	rectal	axillary
If rectal < 35.5°C (95.9°F), or axillary < 35°C (95°F), actively warm child. Check temperature every 30 minutes.			

BLOOD GLUCOSE (mmol/l):	3.5 mmol/l
If < 3mmol/ and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG).	
If < 3mmol/ and lethargic, unconscious, or convulsing, give sterile 10% glucose IV: 5 ml x ____ kg (child's wt) = ____ ml Then give 50 ml bolus NG.	
Time glucose given:	Oral NG IV
HAEMOGLOBIN (Hb) (g/l):	90 or Packed cell vol (PCV):
Blood type: B ⁺	
If Hb < 40 g/l or PCV < 12%, transfuse 10 ml/kg whole fresh blood (or 5-7 ml/kg packed cells) slowly over 3 hours. Amount:	
Time started:	Ended:

- 1a. What is Tina's weight-for-height SD-score?
- 1b. Should Tina be admitted to the severe malnutrition ward? Why or why not?
- 1c. Is Tina hypothermic?
- 1d. Is Tina hypoglycaemic?
- 1e. Does Tina have very severe anaemia?
- 1f. Tina is alert and does not have cold hands. Her capillary refill is 2 seconds. Her pulse 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 CCP sections below.

SIGNS OF SEVERE MALNUTRITION				Severe wasting?	Yes	No
Oedema?	0	+	++	+++		
Dermatosis?	0	+	++	+++ (raw skin, fissures)		
Weight(kg):	8 kg	Height/length (cm):		83 cm		
SD score:	< -3	or % of median:				

TEMPERATURE	36	°C	rectal	axillary
If rectal < 35.5°C (95.9°F), or axillary < 35°C (95°F), actively warm child. Check temperature every 30 minutes.				

BLOOD GLUCOSE (mmol/l):	< 3 mmol/l
If < 3mmol/ and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG). If < 3mmol/ and lethargic, unconscious, or convulsing, give sterile 10% glucose IV: 5 ml x ____ kg (child's wt) = ____ ml Then give 50 ml bolus NG. Time glucose given: Oral NG IV	
HAEMOGLOBIN (Hb) (g/l):	39 or Packed cell vol (PCV):
Blood type: B ⁺ If Hb < 40 g/l or PCV < 12%, transfuse 10 ml/kg whole fresh blood (or 5-7 ml/kg packed cells) slowly over 3 hours. Amount: 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 doctor 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:

SIGNS OF SEVERE MALNUTRITION				Severe wasting?	Yes	No
Oedema?	0	+	++	+++		
Dermatosis?	0	+	++	+++ (raw skin, fissures)		
Weight(kg):	5.8 kg			Height/length (cm):	69 cm	
SD score:	< -3			or % of median:		

TEMPERATURE	_____ °C	rectal	axillary	assumed < 35.5° C
If rectal < 35.5°C (95.9°F), or axillary < 35°C (95°F), actively warm child. Check temperature every 30 minutes.				

BLOOD GLUCOSE (mmol/l):	assumed < 3
If < 3mmol/ and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG).	
If < 3mmol/ and lethargic, unconscious, or convulsing, give sterile 10% glucose IV: 5 ml x _____ kg (child's wt) = _____ ml Then give 50 ml bolus NG.	
Time glucose given:	Oral NG IV
HAEMOGLOBIN (Hb) (g/l):	or Packed cell vol (PCV): Blood type:
If Hb < 40 g/l or PCV < 12%, transfuse 10 ml/kg whole fresh blood (or 5-7 ml/kg packed cells) slowly over 3 hours. Amount: Time started: Ended:	

SIGNS OF SHOCK		None	Lethargic/unconscious	Cold hand	Slow capillary refill(> 3 seconds)	Weak/fast pulse
<p><i>If lethargic or unconscious, plus cold hand, plus either slow capillary refill or weak/fast pulse, give oxygen. Give IV glucose as described under Blood Glucose (left). Then give IV fluids:</i></p> <p>Amount IV fluids per hour: 15 ml x _____ kg (child's wt) = _____ ml</p>						
	Start:	Monitor every 10 minutes				*2 nd hr:
Time						
Resp. rate						
Pulse rate						
<p><i>*If respiratory & pulse rates are slower after 1 hour, repeat same amount IV fluids for 2nd 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.)</i></p>						

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 a.m. 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 a.m. his respiratory rate is 40 and his pulse rate is 105.

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

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

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

3f. How much F-75 should be given at each feed? (*Hint: Use John's new weight to determine amount.*)

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

5.0 Give emergency eye care for corneal ulceration

5.1 What is corneal ulceration?

Corneal ulceration is a break in the surface of the cornea (eye's surface). The eye may be extremely red or bleeding, or the child may keep the 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.

5.2 Examine the eyes

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

5.3 Give vitamin A and atropine eye drops immediately for corneal ulceration

If the child has corneal ulceration, give vitamin A immediately.

Child's age	Vitamin A Oral Dose
< 6 months	50 000 IU
6 – 12 months	100 000 IU
>12 months	200 000 IU

Oral treatment with vitamin A is preferred, except for initial treatment of children with severe anorexia, oedematous malnutrition, or septic shock. IM treatment is preferred for these children for the first dose.

For oral administration, an oil-based formulation is preferred. For IM treatment, only water-based formulations should be used. The IM dosage is 100 000 IU (water-based) except for children under age 6 months, who should be given 50 000 IU.

Also instil one drop atropine (1%) into the affected eye(s) to relax the eye and prevent the lens from pushing out. Tetracycline eye drops and bandaging are also needed but may 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 ulceration is described in *Daily Care*.

All severely malnourished children need vitamin A on Day 1, and many need additional eye care, but treatment can wait until later in the day. Treatment of various eye signs is described in *Daily Care*.

6.0 Manage watery diarrhoea and/or vomiting with ReSoMal

6.1 What is ReSoMal?

ReSoMal is Rehydration Solution for Malnutrition. It is a modification of the standard Oral Rehydration Solution (ORS) recommended by WHO. ReSoMal contains less sodium, more sugar, and more potassium than standard ORS and is intended for severely malnourished children with diarrhoea. It should be given by mouth or by nasogastric tube. Do not give standard ORS to severely malnourished children.

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

Contents of ReSoMal as prepared from standard ORS:

water	2 litres
WHO-ORS	one 1 litre packet
sugar	50 g
mineral mix solution*	40 ml

*The mineral mix solution is the same that is used in making F-75 and F-100. Composition of mineral mix is described in Appendix 4 of the manual. It may be prepared by the hospital pharmacy. Alternatively, a commercial product, called *Combined Mineral Mix (CMV)*, may be used.

6.2 Recognize the need for ReSoMal

It is difficult to determine dehydration status in a severely malnourished child, 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.

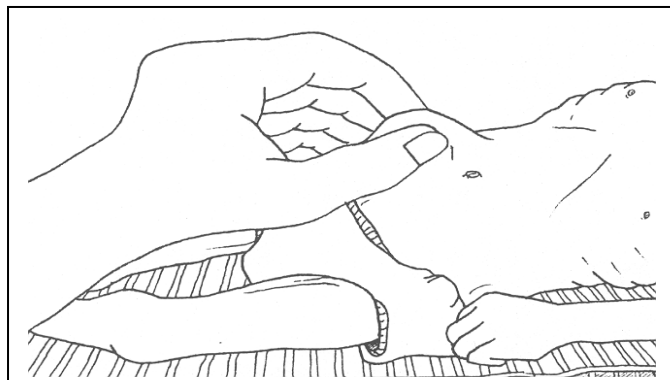
Ask the mother if the child has had watery diarrhoea or vomiting. If the child has watery diarrhoea or vomiting, assume dehydration and give ReSoMal. (Also ask about blood in the stool, as this will affect choice of antibiotics.)

Even if a severely malnourished child has oedema, he may be dehydrated. The oedema indicates a loss of control of fluid distribution in the body, rather than too much fluid. If the child has diarrhoea or vomiting, give ReSoMal even if the child has oedema.

Note the following signs of dehydration in order to detect improvements 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

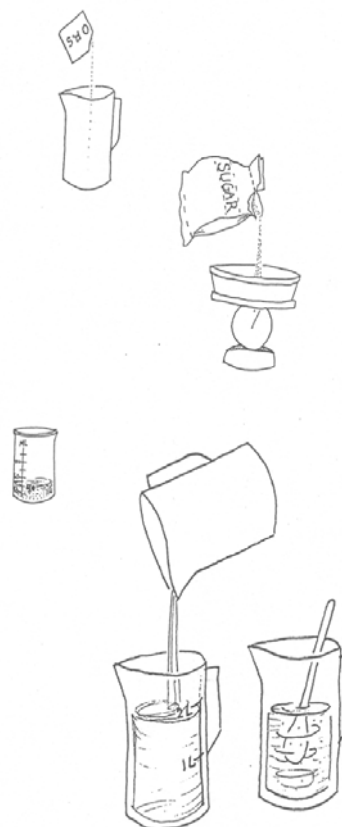
Lethargic	A lethargic child is not awake and alert when he should be. He is drowsy and does not show interest in what is happening around him.
Restless, irritable	The child is restless and irritable all the time, or whenever he is touched or handled.
Absence of tears	Observe whether the child has tears when he cries.
Sunken eyes	The eyes of a severely malnourished child may always appear sunken, regardless of the child's hydration status. Ask the mother if the child's eyes appear unusual. Photographs 6, 30, and 31 (in the <i>Photographs</i> booklet) show sunken eyes.
Dry mouth and tongue	Feel the child's tongue and the inside of the mouth with a clean, dry finger to determine if they are dry.
Thirsty	See if the child reaches out for the cup when you offer ReSoMal. When it is taken away, see if the child wants more.
Skin pinch goes back slowly	Using your thumb and first 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 one second and then release. If the skin stays folded for a brief time after you release it, the skin pinch goes back slowly. (<i>Note: The skin pinch may always go back slowly in a wasted child.</i>)



6.3 Prepare ReSoMal

If using commercial ReSoMal, follow the package instructions. If preparing ReSoMal from standard ORS and mineral mix solution, prepare as follows:

- Wash hands.
- Empty one 1-litre standard ORS packet into container that holds more than 2 litres.
- Measure and add 50 grams sugar. (It is best to weigh the sugar on a dietary scale that weighs to 5 g.)
- Measure 40 millilitres of mineral mix solution (*or proper amount of CMV*) in a graduated medicine cup or syringe; add to other ingredients.
- Measure and add 2 litres cooled, boiled water.
- Stir until dissolved.
- Use within 24 hours.



6.4 Calculate amount of ReSoMal to give

Give ReSoMal as follows, 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 body weight
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 and the amount of ongoing losses in the stool. 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.



SHORT ANSWER EXERCISE

Fill in the blanks in the following case studies:

1. Roberto has watery diarrhoea and is severely malnourished. He weighs 6.0 kilograms. 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 arrived at the hospital in shock and received IV fluids for two hours. She has improved and is now ready to switch to ReSoMal. Yuma weighs 8.0 kilograms. For up to _____ hours, she should be given ReSoMal and F-75 in alternate hours. The amount of ReSoMal to offer is _____ – _____ millilitres per hour.

Answer the question below:

3. After the first two hours of ReSoMal, a child 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 by comparing them to the answers given on page 42 at the end of the module.

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 26.



EXERCISE B

In this exercise the group will prepare and taste ReSoMal and will measure appropriate amounts to give to severely malnourished children.

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

1. Ramesh has 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 vomiting and watery diarrhoea. She weighs 11.6 kilograms.
 - 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.

6.5 Give ReSoMal slowly

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

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

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



A nasogastric (NG) tube can be used for giving ReSoMal at the same rate if the child is too weak to take enough fluid voluntarily. An NG tube should be used in weak or exhausted children, and 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 to regulate the amount given.

6.6 Monitor the child who is taking ReSoMal

Monitor the child's progress every half hour for the first two 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 CCP; 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 severely malnourished children will not show these changes even when fully rehydrated.

- Slowing of rapid respiratory and pulse rates
- Passing urine
- Not thirsty

If a child has 3 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 section 6.7 below.

Signs of overhydration

Stop ReSoMal if any of the following signs appear:

- Increased respiratory rate and pulse. (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).

6.7 After rehydration, offer ReSoMal after each loose stool

When the child has 3 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:

- 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.



EXERCISE C

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

Case 1 – Marwan

Marwan is an 11-month-old boy. Additional information is given on the CCP 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 2 – 4 mmol.

SIGNS OF SEVERE MALNUTRITION					Severe wasting?	Yes	No
Oedema?	0	+	++	+++			
Dermatosis?	0	+	++	+++ (raw skin, fissures)			
Weight(kg):	Height/length (cm):						
SD score:	or % of median:						

TEMPERATURE _____ °C	rectal	axillary
<i>If rectal <35.5°C (95.9°F), or axillary <35°C (95°F), actively warm child. Check temperature every 30 minutes.</i>		

BLOOD GLUCOSE (mmol/l):		
<i>If <3mmol/ and alert, give 50 ml bolus of 10% glucose or sucrose (oral or NG).</i>		
<i>If <3mmol/ and lethargic, unconscious, or convulsing, give sterile 10% glucose IV: 5 ml x ____ kg (child's wt) = ____ ml Then give 50 ml bolus NG.</i>		
Time glucose given:	Oral	NG IV
HAEMOGLOBIN (Hb) (g/l):	or Packed cell vol (PCV):	Blood type:
<i>If Hb <40 g/l or PCV <12%, transfuse 10 ml/kg whole fresh blood (or 5-7 ml/kg packed cells) slowly over 3 hours. Amount: Time started: Ended:</i>		

EYE SIGNS	None	Left	Right	MEASLES*	Yes	No
Bitot's spots		Pus/Inflammation	Corneal clouding			Corneal ulceration
<i>If ulceration, give vitamin A & atropine immediately. Record on Daily Care page.</i>						
Oral doses vitamin A:	< 6 months			50 000 IU		
	6 - 12 months			100 000 IU		
	>12 months			200 000 IU		

* 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 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 CCP, available in your classroom.*)

Ram is a 9-month-old boy. He has not been feeding well in the last 3 weeks. He has had loose stools and vomiting in the last 3 days. There has been no blood in the stool. Ram is severely wasted and has some mild dermatosis. He has no oedema. His weight is 4.4 kg and length is 64 cm.

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

When the doctor 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 CCP as you can.

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

Since Ram has diarrhoea but no signs of shock, he needs ReSoMal. Ram is first given ReSoMal at 9:00 a.m. 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 CCP, complete the "Start" (9:00) column and the column for 9:30 a.m. (*You will need to abbreviate or write briefly in the row for hydration signs. Since Ram has had no change in hydration signs, write "same."*)

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

Time	10:00	10:30
Resp. rate	28	25
Pulse rate	105	100
Passed urine? Y N	N	Y
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 CCP.

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

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

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

At 12:00 Ram's respiratory rate remains at 25 and his pulse rate at 100. He has passed no urine or stools in the past hour, and he has not vomited. 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 CCP.

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 CCP, available in your classroom. This case will be done as a group.*)

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

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

Irena has cold hands and is lethargic. When the doctor presses her thumbnail, it takes longer than 3 seconds for the pink color 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 doctor pinches the skin of Irena's abdomen, it stays folded for 2 seconds. Irena does not cry or respond to the pinch, so the doctor 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 CCP as you can.

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

3b. Is Irena hypoglycaemic?

Is she hypothermic?

3c. Does Irena need vitamin A?

Does she need it immediately?

3d. What signs of shock does Irena have?

What amount of sterile 10% glucose should she be given by IV? Enter the amount on the CCP in the Blood Glucose section.

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

Irena's IV is started at 10:30 a.m. 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.

	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 CCP. Then enter the information from monitoring. What should be done next for Irena?

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

3f. Finish completing the IV section of Irena's CCP.

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

How much should be given? Enter the range of amounts on the CCP in the second (right-hand) part of the Diarrhoea section.

At 12:30, Irena's respiratory rate is still 30 and her pulse rate is still 80. She has not passed urine. She has had one 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 CCP. The nurse offers Irena the maximum amount of ReSoMal in her range, and Irena eagerly takes it all. Write this amount in the space for "Amount taken" at the bottom of the 12:30 column.

At 1:30 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 1:30 column of the Diarrhoea section of the CCP.

3j. Using Irena's new weight of 6.2 kg, look in the manual or on your *F-75 Reference Card* to find the amount of F-75 to give at 1:30. Record this amount in the Feeding section of the CCP.

3k. At 2:30 what should Irena be given?

Twelve hours after her arrival at the hospital, Irena is much better. Since she responded so well to IV fluids and ReSoMal, it is clear that she was dehydrated. 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?

7.0 Give antibiotics

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

Antibiotic recommendations may vary from place to place based on local patterns of resistance. The recommendations given in this module may need to be adapted locally. The important principle is that all severely malnourished children should be given appropriate antibiotics.

7.1 Select antibiotics and prescribe regimen

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

As shown on the summary chart on the next page:

- **If no complications**, give oral cotrimoxazole.
- **If complications**, give gentamicin, plus ampicillin followed by amoxicillin.
- **If the child fails to improve within 48 hours**, add chloramphenicol. Almost all children improve on gentamicin plus ampicillin, and it is rare that chloramphenicol is needed.
- **If specific infections are identified which require a specific antibiotic not already being given**, give an additional antibiotic to address that infection. For example, dysentery and pneumonia may require additional antibiotics. Certain skin infections such as *Candidiasis* require specific antibiotics. Antibiotics required for specific infections are described on pages 30 – 33 in section 7.3 of the manual.



Open your manual to pages 30 – 33 now.

Notice the headings for specific infections that require specific antibiotics. You may read these pages carefully at some point when you have time.

Summary: Antibiotics for Severely Malnourished Children

IF:	GIVE:
NO COMPLICATIONS	Cotrimoxazole Oral (25 mg sulfamethoxazole + 5 mg trimethoprim / kg) every 12 hours for 5 days
COMPLICATIONS (shock, hypoglycaemia, hypothermia, dermatosis with raw skin/fissures, respiratory or urinary tract infections, or lethargic/sickly appearance)	<div> Gentamicin¹ IV or IM (7.5 mg/kg), once daily for 7 days, plus: </div> <div> <div> Ampicillin IV or IM (50 mg/kg), every 6 hours for 2 days </div> <div> Followed by: Amoxicillin² Oral (15 mg/kg), every 8 hours for 5 days </div> </div>
If child fails to improve within 48 hours, ADD:	Chloramphenicol IV or IM (25 mg/kg), every 8 hours for 5 days. (Give every 6 hours if suspect meningitis.)
If a specific infection requires an additional antibiotic, ALSO GIVE:	Specific antibiotic as directed on pages 30 – 33 of the manual

¹If the child is not passing urine, gentamicin may accumulate in the body and cause deafness. Do not give the second dose until the child is passing urine.

²If amoxicillin is not available, give ampicillin, 50 mg/kg orally every 6 hours for 5 days.

Different formulations of drugs are available (e.g., tablets or syrups of varying strengths). The formulation of the drug will affect the amount to measure for a dose. Some common formulations are given in the dosage tables on the *Antibiotics Reference Card*, which is also printed in Annex B of this module. For each formulation of a drug, the dosage tables have rounded practical doses to use for children of different weights. Refer to the *Antibiotics Reference Card* (or Annex B) as you read the following steps and example.

Steps to determine the dose

- Refer to the summary table to determine what drug is needed and by what route it should be given.
- Determine the child's weight. (Never base the dose on age.)
- Determine what formulation of the drug is available (e.g., tablet or syrup, and strength).
- Look up the formulation on the dosage tables, and find the amount to give for the child's weight. For most drugs, the dosages are given for weight ranges. For gentamicin and chloramphenicol, doses are given for specific weights.

Example of determining a dose

Khalil is 82 cm in height and weighs 8.6 kg. He is severely wasted with an SD score of less than -3. 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.

- a. Khalil has no complications, so he should be given cotrimoxazole. It should be given orally every 12 hours for 5 days.
- b. Khalil's body weight is 8.6 kg.
- c. The hospital has cotrimoxazole syrup containing 200 mg SMX per 5 ml.
- e. The doctor looks up the dose for this strength cotrimoxazole syrup and Khalil's weight. The dose is 5 ml. He prescribes 5 ml cotrimoxazole syrup to be taken orally every 12 hours for 5 days.

7.2 Choose and use the best route of administration

Sometimes there is a choice of whether to give a drug intravenously (IV) or by intramuscular (IM) injection. IM injections are very painful for a severely malnourished child. If an IV line is in and being used for giving fluid, use it for the antibiotic 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 would be needed, it is preferable to use a 21 or 23 gauge butterfly needle to keep a vein open for injecting antibiotics. Use the IV dose. This option allows the staff to conveniently give the antibiotic intravenously without leaving an IV bag up, and it is less painful for the child.

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

7.3 Prescribe metronidazole if it is policy to do so

Some experienced doctors also routinely give metronidazole (orally, 7.5 mg/kg, 8 hourly for 7 days). The purpose of giving metronidazole is to kill harmful bacteria growing in the upper gut. However, the efficacy of this treatment has not been proven by clinical trials. Possible side effects of metronidazole are anorexia, nausea, and metallic aftertaste.



EXERCISE D

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

Refer to the *Antibiotics Reference Card* or Annex B of this module 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 and weighs 8.0 kg. He has oedema of both feet. 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. Summarize the prescription for Pershant in the table below:

Drug	Route	Dose	Frequency	Duration

Case 2 – Ana

Ana weighs 6 kg. She is severely malnourished and has 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, summarize 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 two days, how should Ana's drug regimen change?
- 2h. What formulation of the new drug is most likely to be available in your hospital?

2i. Given the formulation listed in 2h, what is the appropriate dose for Ana?

2j. Summarize the prescription for the new drug below:

Drug	Route	Dose	Frequency	Duration

Case 3 – Dipti (optional)

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

3a. Dipti has signs of a specific infection (pneumonia) requiring a specific antibiotic. Look on page 31 of the manual to see what antibiotic is required first and record it below.

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

3c. Summarize 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 indrawing. She is taking F-75 well. She still weighs 7.9 kg.

3d. What choice of antibiotics should be given next? By what route? (*Hint: Look on page 31 of the manual.*)

3e. Choose one of the above antibiotics. What formulation of this drug is most likely to be available in your hospital?

3f. Given the formulation listed in 3e, what is the appropriate dose for Dipti?

3g. Summarize Dipti's new prescription in the table below:

Drug	Route	Dose	Frequency	Duration

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

When everyone is ready, the group will view a video segment about Emergency Treatment. This video will show many of the steps described so far in this module.

8.0 Record initial findings and treatments and communicate to staff

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

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

The Critical Care Pathway (CCP, Annex A) is an example of a tool to help communicate what has been done and what needs to be done for the child. You may use different forms or case records in your hospital, but some type of written record is essential.



EXERCISE E

In this exercise there will be a role play in which the admitting doctor briefs the head nurse on a child's conditions and needs. Use the first page of a blank CCP, available in your classroom. Use the manual, this module, and your reference cards as needed.

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

Rayna

Rayna is a 13-month-old girl. She is admitted on the 3rd of October at 9:00 a.m. She is severely wasted. She has no oedema and no dermatosis. She is 72 cm long and weighs 6.3 kg.

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

Rayna has no signs of shock, no diarrhoea, no blood in the stool, and no vomiting. The admitting doctor is ready to give the head nurse instructions for Rayna's care, including her first feed and first dose of antibiotic. It is 9:15 a.m.

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

Tell a facilitator when you are ready for the role play.
--

ANSWERS TO SHORT ANSWER EXERCISE

The answers to the exercise on page 24 of the module are written in the blanks below:

1. Roberto has watery diarrhoea and is severely malnourished. He weighs 6.0 kilograms. 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 arrived at the hospital in shock and received IV fluids for two hours. She has improved and is now ready to switch to ReSoMal. Yuma weighs 8.0 kilograms. 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 millilitres per hour.
3. Answers:
 - *The child's willingness to drink*
 - *The amount of ongoing losses in the stool*

Annex A:

Critical Care Pathway

This Annex contains all pages of a blank Critical Care Pathway (CCP). The CCP will be used as a tool throughout this course. Copies of the CCP should be available in your classroom.



CRITICAL CARE PATHWAY (CCP) – SEVERE MALNUTRITION WARD

M F DATE OF BIRTH OR AGE _____ DATE OF ADMISSION _____ TIME _____ HOSP. ID NUMBER _____

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

INITIAL MANAGEMENT

TEMPERATURE _____ °C rectal axillary

*If rectal < 35.5°C (95.9°F), or axillary < 35°C (95°F), actively warm child.
Check temperature every 30 minutes.*

EYE SIGNS	None		Left		Right		MEASLES	
	Bitot's spots		Pus/Inflammation		Corneal clouding		Corneal ulceration	
<i>If ulceration, give vitamin A & atropine immediately. Record on Daily Care page.</i>								
<i>Dral doses vitamin A:</i>								
			< 6 months		50 000 IU			
			6 - 12 months		100 000 IU			
			> 12 months		200 000 IU			

FEEDING Begin feeding with F-75 as soon as possible. If child is rehydrated, reweigh before determining amount to feed. New weight: _____ kg)

_____ ml F-75* Time first feed: _____

* If hypoglycemic, 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.

[illegible]

DIARRHOEA	Watery diarrhoea? Yes No Blood in stool? Yes No Vomiting? Yes No	→	If diarrhoea, circle signs present:	Skin pinch goes back slowly Restless/irritable Sunken eyes	Lethargic Dry mouth/tongue	Thirsty No tears
<p><i>If diarrhoea and/or vomiting, give ReSoMal. Every 30 minutes for first 2 hours, monitor and give:*</i></p> <p>5 ml x _____ kg (child's wt) = _____ ml ReSoMal</p> <p><i>For up to 10 hours, give ReSoMal and F-75 in alternate hours. Monitor every hour. Amount of ReSoMal to offer:*</i></p> <p>5 to 10 ml x _____ kg (child's wt) = _____ to _____ ml ReSoMal</p>						

*If diarrhoea and/or vomiting, give ReSoMal. Every 30 minutes for first 2 hours, monitor and give.**

5 to 10 ml x _____ kg (child's wt) = _____ to _____ ml ReSol[®]

[illegible]

Dose / Frequency / Duration

[illegible]



WEIGHT CHART

Name: _____

Weight on admission: _____ kg

Height / length: _____ cm

Oedema on admission: 0 + ++ +++

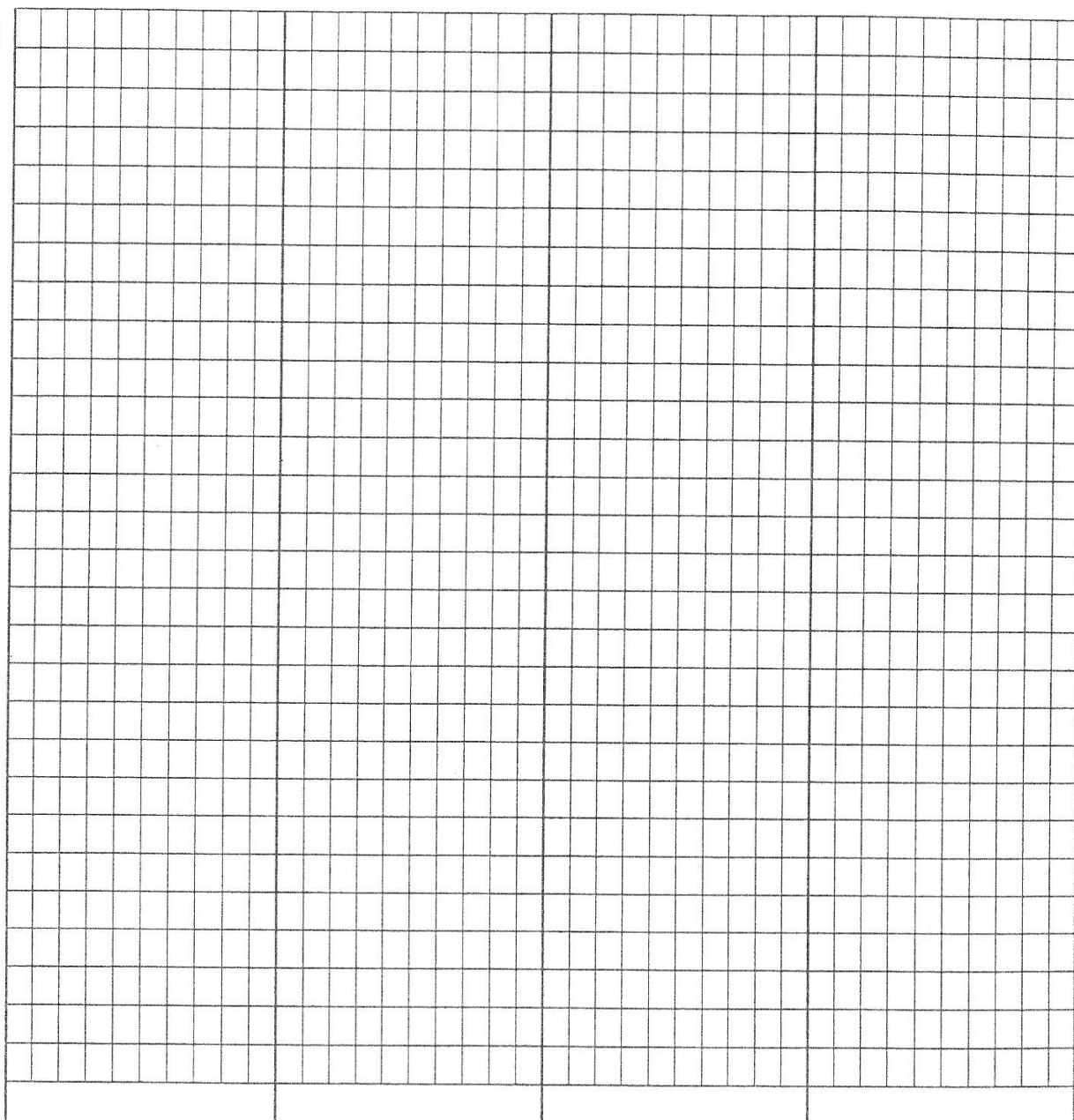
Desired weight at discharge
(-1SD, 90% weight for height): _____ kg

Actual weight at discharge: _____ kg

Weight (Use appropriate scale.)

Enter likely range of weights on the vertical axis in an appropriate scale (e.g., each row representing 0.1 kg). Allow rows below the starting weight in case weight decreases; weight may decrease by as much as 30% if the child has severe oedema.

Draw a bold horizontal line across the graph to show the desired discharge weight.



Days 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

[illegible]

<i>Circle outcome:</i>	DATE	CIRCUMSTANCES / COMMENTS
Discharge at -1SD (90% weight for height)		
Early departure (against advice)		SD score (or %): _____
Early discharge		SD score (or %): _____
Referral		SD score (or %): _____
Death		Number of days after admission (circle): <24 hrs 1-3 days 4-7 days >7 days Approximate time of death: Day Night Apparent cause(s): Had child received IV fluids? Yes No

Immunization	First	Second	Third	Booster
BCG	At birth	Optional: > 6 months	—	—
Polio	At birth	2 months	3 months	12 months
DPT	3 months	4 months	5 months	12 months
Measles	6 or 9 months	—	—	—

Annex B:

Antibiotics Reference Card

Summary: Antibiotics for Severely Malnourished Children

IF:	GIVE:
NO COMPLICATIONS	Cotrimoxazole Oral (25 mg sulfamethoxazole + 5 mg trimethoprim / kg) every 12 hours for 5 days
COMPLICATIONS (shock, hypoglycaemia, hypothermia, dermatosis with raw skin/fissures, respiratory or urinary tract infections, or lethargic/sickly appearance)	Gentamicin¹ IV or IM (7.5 mg/kg), once daily for 7 days, plus: <div style="display: flex; justify-content: space-between; border-top: 1px dashed black; padding-top: 5px;"> <div style="width: 45%;"> Ampicillin IV or IM (50 mg/kg), every 6 hours for 2 days </div> <div style="width: 50%;"> Followed by: Amoxicillin² Oral (15 mg/kg), every 8 hours for 5 days </div> </div>
If child fails to improve within 48 hours, ADD:	Chloramphenicol IV or IM (25 mg/kg), every 8 hours for 5 days (Give every 6 hours if suspect meningitis.)
If a specific infection requires an additional antibiotic, ALSO GIVE:	Specific antibiotic as directed on pages 30 – 33 of the manual <i>Management of Severe Malnutrition</i>

¹If the child is not passing urine, gentamicin may accumulate in the body and cause deafness. Do not give the second dose until the child is passing urine.

²If amoxicillin is not available, give ampicillin, 50 mg/kg orally every 6 hours for 5 days.

Doses for Specific Formulations and Body Weight Ranges

ANTIBIOTIC	ROUTE / DOSE/ FREQUENCY/ DURATION	FORMULATION	DOSE ACCORDING TO CHILD'S WEIGHT		
			3 up to 6 kg	6 up to 8 kg	8 up to 10 kg
Amoxicillin	Oral: 15 mg/kg every 8 hours for 5 days	Tablet, 250 mg	¼ tablet	½ tablet	½ tablet
		Syrup, 125 mg/5ml	2.5 ml	5 ml	5 ml
		Syrup, 250 mg/5ml	1.5 ml	2 ml	2.5 ml
Ampicillin	Oral: 50 mg/kg every 6 hours for 5 days	Tablet, 250 mg	1 tablet	1½ tablet	2 tablets
	IV/IM: 50 mg/kg every 6 hours for 2 days	Vial of 500 mg mixed with 2.1 ml sterile water to give 500 mg /2.5 ml	1 ml	1.75 ml	2.25 ml
Cotrimoxazole sulfamethoxazole + trimethoprim, SMX + TMP	Oral: 25 mg SMX + 5 mg TMP /kg every 12 hours for 5 days	Tablet, 100 mg SMX + 20 mg TMP	1 tablet	1½ tablet	2 tablets
		Syrup, 200 mg SMX + 40 mg TMP per 5 ml	2.5 ml	4 ml	5 ml
Metronidazole	Oral: 7.5 mg/kg every 8 hours for 7 days	Suspension, 200 mg / 5 ml	1 ml	1.25 ml	1.5 ml
Nalidixic Acid	Oral: 15 mg/kg every 6 hours for 5 days	Tablet, 250 mg	¼ tablet	½ tablet	½ tablet
Benzylpenicillin	IV or IM: 50 000 units / kg every 6 hours for 5 days	IV: vial of 600 mg mixed with 9.6 ml sterile water to give 1 000 000 units /10 ml	2 ml	3.5 ml	4.5 ml
		IM: vial of 600 mg mixed with 1.6 ml sterile water to give 1 000 000 units /2ml	0.4 ml	0.7 ml	0.9 ml

Doses for Selected Antibiotics, for Specific Formulations and Body Weights

ANTIBIOTIC	ROUTE / DOSE FREQUENCY/ DURATION	FORMULATION	DOSES FOR SPECIFIC BODY WEIGHTS <i>(Use closest weight)</i>									
			3 kg	4 kg	5 kg	6 kg	7 kg	8 kg	9 kg	10 kg	11 kg	12 kg
Chloramphenicol	IV or IM: 25 mg/kg every 8 hours (or every 6 hours if suspect meningitis) for 5 days	IV: vial of 1 g mixed with 9.2 ml sterile water to give 1g/10 ml	0.75 ml	1 ml	1.25 ml	1.5 ml	1.75 ml	2 ml	2.25 ml	2.5 ml	2.75 ml	3 ml
		IM: vial of 1 g mixed with 3.2 ml sterile water to give 1g/4ml	0.3 ml	0.4 ml	0.5 ml	0.6 ml	0.7 ml	0.8 ml	0.9 ml	1 ml	1.1 ml	1.2 ml
Gentamicin	IV or IM: 7.5 mg/kg once daily for 7 days	IV/IM: vial containing 20 mg (2 ml at 10mg/ml), undiluted	2.25 ml	3 ml	3.75 ml	4.5 ml	5.25 ml	6 ml	6.75 ml	7.5 ml	8.25 ml	9 ml
		IV/IM: vial containing 80 mg (2 ml at 40 mg/ml) mixed with 6 ml sterile water to give 80 mg/ 8 ml	2.25 ml	3 ml	3.75 ml	4.5 ml	5.25 ml	6 ml	6.75 ml	7.5 ml	8.25 ml	9 ml
		IV/IM: vial containing 80 mg (2 ml at 40 mg/ml), undiluted	0.5 ml	0.75 ml	0.9 ml	1.1 ml	1.3 ml	1.5 ml	1.7 ml	1.9 ml	2 ml	2.25 ml

Doses of Iron Syrup for a Common Formulation

Weight of child	Dose of Iron Syrup: Ferrous Fumerate 100 mg per 5 ml (20 mg elemental iron per ml)
3 up to 6 kg	0.5 ml
6 up to 10 kg	0.75 ml
10 up to 15 kg	1 ml

For further information, please contact:

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Fax: +41 22 791 4156

Website: <http://www.who.int/nut/publications>