

WHO TRAINING COURSE ON THE MANAGEMENT OF SEVERE MALNUTRITION

UPDATE – 2009

Since the publication of this training course in 2002, three developments have occurred: (a) WHO has produced new growth standards which affect the weight-for-length reference card and some of the exercises, (b) arm circumference is being increasingly used to assess wasting, and (c) ready-to-use therapeutic foods (RUTF) are becoming available. As a result, more opportunities now exist for severely malnourished children to be discharged early from the hospital for continuing care in the community. This update takes account of these developments.

Please note that corrections to the modules are underlined

Facilitator guide

Page 16: Demonstration for nurses groups

For the first 3 children in the list, adjust the weights:

Modify to read:

Girl, 73 cm, 7.4 kg

Boy, 94 cm, 11.0 kg

Girl, 67.2 cm, 5.8 kg

Third paragraph:

Modify to read:

Participants may be confused by negative numbers, so use an example of a boy who is 70 cm in length. Ask participants to look along the row of weights and check the top of the column each time, so they see that 8.4 kg is the median, 7.8 kg is -1 SD and 7.2 kg is -3 SD, etc. Use this example to show that a child who is -3 SD has a lower weight-for-height than a child who is -2 SD. Suggest that, if participants ever forget about the negative numbers, they can always look at the weights and work out the system for themselves.

Fourth paragraph:

Modify to read:

When a weight falls between the weights listed on the card, it may help to first point on the card to the space between the columns where the child's weight falls. Then look at the top of those columns to see which SD scores the weight lies **between**. Then look back at the weights to see where the sign should go. In the example of a boy who is 73 cm, suppose that his weight is 7.6 kg, which is between 7.2 kg (-3 SD) and 7.7 kg (-2 SD). The weight 7.6 is obviously not <7.2 but < 7.7 kg, so the score is written <-2SD.

Pages 16 and 17: 4.Exercise B: Individual work followed by individual feedback

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– **Determining SD scores.**

Page 17: second paragraph:

Modify to read:

Point out the first footnote at the bottom of the *Weight-for-Height Reference Card*. “Recumbent” means the same as “supine” or “lying down”. This footnote explains that children less than 87 cm should be measured lying down, while children 87 cm and taller should be measured standing up. If it is impossible to measure a taller child standing up (e.g., if the child is too weak to stand), subtract 0.7 cm from the length lying down.

Pages 18 and 19: Oral drill: SD scores and admission criteria.

Modify oral drill table with (changes compared to current table underlined):

| Sex, length, height | SD score? | Additional information | Admit? |
|----------------------------|------------------|-------------------------------|---------------|
| Girl, 82 cm, 7.8 kg | $< -3 SD$ | no oedema | <i>yes</i> |
| Boy, 74 cm, 7.9 kg | $\equiv -2 SD$ | no oedema | <i>no</i> |
| Girl, 73.8 cm, 6.2 kg | $< -3 SD$ | no oedema | <i>yes</i> |
| Boy, 67 cm, 6.1 kg | $\equiv -3 SD$ | ++ oedema | <i>yes</i> |
| Girl, 55.5 cm, 3.9 kg | $\leq -2 SD$ | ++ oedema | <i>yes</i> |
| Girl, 67.1 cm, 4.9 kg | $\leq -4 SD$ | no oedema | <i>yes</i> |
| Boy, 90 cm, 10.8 kg | $< -2 SD$ | + oedema (both feet) | <i>yes</i> |
| Girl, 70.5 cm, 6.1 kg | $< -3 SD$ | no oedema | <i>yes</i> |
| Girl, 87 cm, 9.8 kg | $< -2 SD$ | one swollen foot | <i>no</i> |
| Boy, 79.3 cm, 9.4 kg | $< -1 SD$ | no oedema | <i>no</i> |
| Girl, 69.5 cm, 6.8 kg | $\leq -2 SD$ | + oedema (both feet) | <i>yes</i> |
| Boy, 99 cm, 11.2 kg | $< -3 SD$ | no oedema | <i>yes</i> |

Page 26: Demonstration: use of the Critical Care Pathway (CCP).

Initial Management page

Third paragraph, third example of record on Dikki, modify to read:

He weighs 7.0 kg and is 70 cm long. Ask a participant to look up Dikki's SD score. It is $\leq -2 SD$. Record it. Ask if Dikki should be admitted. Answer: He should be admitted because of his oedema.

Page 72: "Involving Mothers in Care" – Preparation for the module

Information to be inserted in the discharge card before the role play to be corrected:

Modify third bullet to read:

- * Admission weight: 7.6 kg Length: 78 cm $< -3 SD$ (~~delete: <70%~~)
weight-for-height
- Discharge weight: 9.4 kg Length: same $-1 SD$ (~~delete: 90%~~)
weight-for-height

(Delete: Note: % weight-for-height is used on the discharge card because it will be more easily understood in clinics that the mother may visit for follow up.)

Page 77 : 7. Optional exercise E : Group discussion – Issues related to early discharge

Second paragraph, modify to read:

Throughout this discussion emphasize the importance, if at all possible, of keeping a child until he reaches -1 SD(delete: 90%) weight-for-height. If hospital policy promotes early discharge, discuss ideas of how to change policies

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1. Introduction

Page 1: Purpose of this training course.

Modify first paragraph to read:

This course is designed for senior nurses and doctors in hospitals that have or plan to have severe malnutrition wards for children. Dieticians and nutritionists may also benefit from this course. The course will teach skills and knowledge specifically needed for management of severely malnourished children in hospitals. The course will not teach basic medical techniques that are taught in schools of medicine and nursing (such as how to insert an IV or take a blood sample).

Modify second paragraph to read:

It is expected that participants will return to their hospitals and begin to implement the case management practices described in this course. In order to implement those practices, the severe malnutrition staff should follow an action plan (example of action plan for implementation is described in Annex 1 of this Introduction), and the severe malnutrition ward will need certain basic supplies and equipment. These required items are listed in the Annex 2 to this *Introduction*.

Page 6: ANNEX

Insert :

ANNEX 1:

Example of action plan for implementation to improve management of severe malnutrition.

Instructions: For each activity, ask yourselves:

1. 'Do we do this now?' (If yes, put a tick under Current Status. If no, write in what you do now).
2. 'What must we do to start this activity?' (Consider all the actions that are needed to introduce each change and write them in).
3. 'Who will take responsibility for seeing that these actions are carried out. And by when?'
4. 'What new resources will we need?'
5. 'Who will take responsibility for getting these resources? And by when?'

| Step (X hospital) | Current status (What we do now) | Changes to be introduced (New things we must do) | Who will organize changes? | | New resources needed | Who will organize resources? | |
|--|---|---|----------------------------|-------|---|------------------------------|-------|
| | | | Who? | When? | | Who? | When? |
| Malnourished children need different care from other children | | | | | | | |
| Priorities severe wasting or oedema in the OPD queue | There is no triage. | Consider training lay person to triage in OPD queue. When IMCI comes on stream, train nurse to triage in under-fives OPD. | | | | | |
| Have a separate room or corner for severe malnutrition | None. | Organize a separate corner Consider having special colored registration cards To denote children for malnutrition treatment protocol. | | | Length board. Check local Unicef office to see if they can help. | | |
| Step 1. Prevent / treat hypoglycaemia | | | | | | | |
| Admit quickly from OPD to the ward | Yes. | | | | | | |
| Feed every 2 hours day and night. Feed on time | Fed 3x daily. Last feed 7pm. Breakfast 6am. Acute staff shortage (2 nurses for 80 beds at night; 2-3 in the day). | Maintain 3-hourly feeds, but feed the very sick 2h. Problem-solve frequent feeds. Community leaders may be able to stress importance of someone accompanying child | | | Need to involve mothers more in feeding and to wake them at night. Currently most mothers return home to look after fields etc so will need a change of attitude. | | |
| Start straightaway | Not done. (Long walk from home to hospital so hypoglycaemia is likely) | Give 50ml 10% glucose to all on arrival | | | | | |
| All staff know danger signs | Not known | Train staff. Consider making wall chart of danger signs. | | | | | |
| -low temperature -feels cold -becomes drowsy | | | | | | | |
| Give antibiotics | (Refer to Step 5. No action needed here) | | | | | | |

| Step (X hospital) | Current status | Changes to be introduced | Who will organize changes? | | New resources needed | Who will organize resources? | |
|---|---------------------------------------|---|----------------------------|-------|----------------------|------------------------------|-------|
| | (What we do now) | (New things we must do) | Who? | When? | | Who? | When? |
| If hypoglycaemic, give 10% glucose or sucrose solution | Not given | Assume hypoglycaemic and give. | | | | | |
| If unconscious give 10% sterile glucose IV | Not given | Introduce and make routine | | | | | |
| Step 2. Prevent / treat hypothermia | | | | | | | |
| Feed every 2 hours day and night | (see step 1) | | | | | | |
| Cover child with blanket | Yes | | | | | | |
| Keep room warm | | | | | | | |
| -use heater | Kept warm. (Patients bring firewood). | | | | | | |
| -exclude draughts | | | | | | | |
| Change wet clothes and bedding | | | | | | | |
| -have 24h linen supply | Yes | | | | | | |
| If hypothermic: | | | | | | | |
| Feed straightaway and rewarm with heater or lamp or kangaroo method | Not always done | Train staff so correct procedures are routinely practised. | | | | | |
| Step 3. Treat / prevent dehydration | | | | | | | |
| Rehydrate orally except in shock | No | Train doctors, relevant staff especially in emergency areas. Consider wall charts of correct treatment. | | | | | |
| Staff know: | | | | | | | |
| -how to prepare ReSoMal | -No. Use WHO ORS | Train why needed, how to prepare, who needs, and when to stop. | | | | | |
| -how much to give and how often | -No | | | | | | |
| Record volume given, and time | Not recorded | Train | | | | | |
| All staff know danger signs of over-hydration | No | Train | | | | | |

| Step | Current status | Changes to be introduced | Who will organize changes? | | New resources needed | Who will organize resources? | |
|--|---|--|-----------------------------------|-------|-----------------------------|-------------------------------------|-------|
| | | | Who? | When? | | Who? | When? |
| (X hospital) | (What we do now) | (New things we must do) | | | | | |
| Staff monitor pulse and respirations at least hourly during oral rehydration | Not monitored | Train | | | | | |
| To prevent dehydration, give ReSoMal after each watery stool | Not given | Train | | | | | |
| If in shock: | | | | | | | |
| -give IV 10% glucose | Not given | Display instructions for treatment of shock in emergency areas. | | | | | |
| -give IV fluids | Yes (?type) | | | | | | |
| -use giving set | Yes | | | | | | |
| -monitor pulse and respirations every 5-10 min. | Not monitored | Introduce as routine Train on correct fluids, amount and duration. | | | | | |
| Step 4. Correct electrolyte imbalance | | | | | | | |
| Give daily: CMV or Mineral mix or Potassium chloride or slow K | (Not all have pharmacy) Not given Yes (sterile KCl) | Try to organize continuing supply of CMV. Programme manager is discussing with Unicef. If run out of CMV, use KCl syrup + MgSO4 injection. | | | | | |
| Restrict salt | Yes | | | | | | |
| Do not give diuretics for oedema | Sometimes given. | Issue orders. Train doctors | | | | | |
| Step 5. Treat Infections | | | | | | | |
| Give antibiotics even if no clinical signs | Give antibiotics only if have clinical signs | Change procedure. Train doctors and nurses. | | | | | |
| Give straightaway | Yes | | | | | | |
| Know what to give, and correct dose | Yes | | | | | | |
| All staff give on time | Yes | | | | | | |
| Step | Current status | Changes to be introduced | Who will organize changes? | | New resources needed | Who will organize resources? | |
| | | | | | | | |

| (X hospital) | (What we do now) | (New things we must do) | Who? | When? | | Who? | When? |
|--|---|--|------|-------|--|------|-------|
| Protect broken skin e.g. -use paraffin gauze -bandage hands if scratching | | | | | | | |
| If unimmunized, give measles vaccine if >6m | ? | | | | | | |
| Prevent cross infection: -staff and carers know how infection spreads -one child per bed -wash hands -barrier nurse if infectious -boil water for feeds -store feeds in fridge -feed by cup, not bottles -do not share spoons -no flies, rats etc | ? Carers do not know. Yes Not always ? ? (no fridge) ? ? Flies present | Train staff and carers about need for improved practices. | | | | | |
| Step 6. Treat micronutrient deficiencies Give: - Vitamin A - Folic acid - Multivitamins - CMV or mineral mix - Iron (in catch-up phase) | Yes Not given Yes (see step 4) Yes | | | | | | |
| Know correct doses Do not give iron initially | Yes Iron not withheld | Change procedure. | | | | | |
| Step 7. Start cautious feeding Give F-75 (starter formula) Know how much to give Chart amounts offered, leftover, taken, vomited | Not done Not known Not done | Introduce Train staff about all aspects of feeding, including use of laminated cards and recording forms. Will need patience and supervision. | | | Milk powder, + oil + sugar, 1 litre blender, dietary scale, fridge. Scan recording forms and print. | | |

| Step (X hospital) | Current status | Changes to be introduced | Who will organize changes? | | New resources needed | Who will organize resources? | |
|--|---------------------------|--|----------------------------|-------|----------------------|------------------------------|-------|
| | (What we do now) | (New things we must do) | Who? | When? | | Who? | When? |
| Tube-feed if needed | | | | | | | |
| -know when needed | Staff do not know | Train staff about when to tube feed, and correct techniques. | | | | | |
| -know how to pass tube | No | | | | | | |
| -know how to use e.g. do not push, let feed run in | No | | | | | | |
| Staff know: | | | | | | | |
| -what to do if child vomits | No | Train staff | | | | | |
| -to transfer to F100 when very hungry | No | | | | | | |
| Step 8. Catch-up growth | | | | | | | |
| Give F100 catch-up formula (if no RUTF available) | Not given | Introduce and train | | | | | |
| Give as much as child can eat at least 6 times/day | Not done. | Train staff and carers | | | | | |
| Weigh child daily | Not weighed | Introduce and train | | | | | |
| Plot weight on chart daily | Not plotted | Introduce and train | | | | | |
| Step 9. Give loving care and stimulation | | | | | | | |
| Staff and carers give loving care | Not always | Encourage if feasible | | | | | |
| Provide types of play that improve development | Not provided | No action now | | | | | |
| Use everyday activities to improve development | Not done | Encourage staff and carers to talk, sing etc to children. | | | | | |
| Step 10. Prepare for follow-up | | | | | | | |
| Teach mothers about feeding at home | Not done. | No action now | | | | | |
| Teach mothers how to give structured play | Not done | No action now | | | | | |
| Organize referral letter | Yes. Given follow-up date | | | | | | |

Page 6:

ANNEX

Modify to read:

ANNEX 2

**Equipment and supplies needed
for a severe malnutrition ward**

(List of equipment.)

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2. Principles of care

Page 2: 1.0 Recognize signs of severe malnutrition

* *Severe wasting*

Add after last paragraph:

The child's upper arm circumference will also be small.

Page 7: 2.1 Measure length/height

Paragraphs 1 and 2:

Delete and replace as follows:

Depending on a child's age and ability to stand, measure the child's length or height. A child's length is measured lying down (recumbent). Height is measured standing upright.

- If a child is less than 2 years old (or less than 87 cm if the age is not available), measure recumbent length.
- If the child is aged 2 years or older (or 87 cm or more if the age is not available) and able to stand, measure standing height.

In general, standing height is about 0.7 cm less than recumbent length. This difference was taken into account in developing the WHO growth standards used to make the charts in the *Growth Record*. Therefore, it is important to adjust the measurements if length is taken instead of height, and vice versa.

If a child less than 2 years old will not lie down for measurement of length, measure standing height and add 0.7 cm to convert it to length. If a child aged 2 years or older cannot stand, measure recumbent length and subtract 0.7 cm to convert it to height."

Page 10: 2.3 Weigh the child

Delete and replace paragraph as follows:

Weigh the child as soon as possible after he arrives. If the child is admitted, weigh the child daily, preferably at about the same time each day. The weighing time should be about one hour before or after feed.

It is recommended to weigh children using a scale with the following features:

- Solidly built and durable
- Electronic (digital reading)
- Measures up to 150 kg
- Measures to a precision of 0.1 kg (100g)
- Allows tared weighing

“Tared weighing” means that the scale can be re-set to zero (“tared”) with the person just weighed still on it. Thus, a mother can stand on the scale, be weighed, and the scale tared.

While remaining on the scale, if she is given her child to hold, the child’s weight alone appears on the scale.

Tared weighing has two clear advantages:

- There is no need to subtract weights to determine the child’s weight alone (reducing the risk of error).
- The child is likely to remain calm when held in the mother’s arms for weighing.

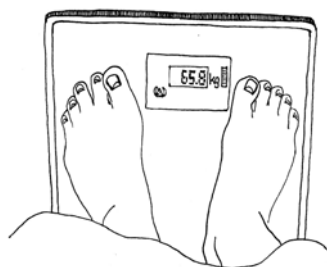
There are many types of scales currently in use.

The UNISCALE has the recommended features listed above. It is recommended to use a UNISCALE where it is available:

If the child is less than 2 years old or is unable to stand, you will do tared weighing.

Explain the tared weighing procedure to the mother as follows. Stress that the mother must stay on the scale until her child has been weighed in her arms.

Be sure that the scale is placed on a flat, hard, even surface. It should not be placed on a loose carpet or rug, but a firm carpet that is glued down is acceptable. Since the scale is solar powered, there must be enough light to operate the scale.



Mother's weight alone. Taring the scale. Baby's weight appear on display.

| ? 9.5

- To turn on the scale, cover the solar panel for a second. When the number 0.0 appears, the scale is ready.
- Check to see that the mother has removed her shoes. You or someone else should hold the naked baby wrapped in a blanket.

- Ask the mother to stand in the middle of the scale, feet slightly apart (on the footprints, if marked), and remain still. The mother's clothing must not cover the display or solar panel.
- Remind her to stay on the scale even after her weight appears, until the baby has been weighed in her arms.
- With the mother still on the scale and her weight displayed, tare the scale by covering the solar panel for a second. The scale is tared when it displays a figure of a mother and baby and the number 0.0.
- Gently hand the naked baby to the mother and ask her to remain still.
- The baby's weight will appear on the display. Record this weight in the Visit Notes of the child's *Growth Record*. Be careful to read the numbers in the correct order (as though you were viewing while standing on the scale rather than upside-down).

If the child is 2 years or older, you will weigh the child alone if the child will stand still.

Explain that the child will need to step on the scale alone and stand very still. Undress the child. Explain that child needs to remove outer clothing in order to obtain an accurate weight. A wet diaper, or shoes and jeans, can weigh more than 0.5 kg. Babies should be weighed naked; wrap them in a blanket to keep them warm until weighing. Older children should remove all but minimal clothing, such as their underclothes.

If the UNISCALE is not available, a beam scale or a hanging scale (Salter type) can be used to weigh the child :

- Remove the child's clothes, but keep the child warm with a blanket or cloth while carrying to the scale.
- Put a cloth in the scale pan to prevent chilling the child.
- Adjust the scale to zero with the cloth in the pan. (If using a scale with a sling or pants, adjust the scale to zero with that in place.)
- Place the naked child gently in the pan (or in the sling or pants).
- Wait for the child to settle and the weight to stabilize.
- Measure weight to the nearest 0.01 kg (10 g) or as precisely as possible. Record immediately on CCP.
- Wrap the child immediately to re-warm.

Page 11: Add: 2.5 Mid-upper arm circumference

Community-based screening programmes for severe malnutrition usually use mid-upper arm circumference (MUAC) less than 11,5 cm to identify severe wasting. To learn more about measuring MUAC, refer to Annex A of this update.

Page 11: 3.1 Determine standard deviation score (SD-score) based on child's weight and length/height

Delete: Although SD-scores generally are not comparable to percentage of the median, the SD-scores may be loosely interpreted as follows:

-1 SD approximately corresponds to 90% of the median weight-for-height.

-2 SD approximately corresponds to 80% of the median weight-for-height.

-3 SD approximately corresponds to 70% of the median weight-for-height.

Modify to read:

Optional: to learn more about SD-scores, how they are calculated, and how they relate to percentage of the median, refer to Annex B of this module.

Page 11: footnote 2

Replace 85 cm by 87 cm.

Page 12: Second paragraph.

Modify to read:

To use the reference table (in Annex C of this module or on your *Weight-for-Height Reference Card*):

Examples of SD scores

Insert before first paragraph:

Note: When the WHO weight-for-height growth standard is used, the answers to exercises sometimes differ from those stated in your answer book.

The re-worked answers are provided in this update, where appropriate.

Modify to read:

Example 1:

A boy is 80 cm in length and weighs 9.2 kg. His score is above -2 and below -1. Record his SD-score as < -1 SD. (Delete: roughly 80% of the median weight for boys his length.)

Example 2:

(Delete: roughly 70% of the median weight for girls her length.)

Page 13: Exercise B

Replace first sentence to read:

Refer to the table of SD Scores in annex B of this update

Page 14: 3.2 Recommended criteria for admission to a severe malnutrition ward

Under **Recommended admission criteria:**

Add:

If no outpatient programme on management of severe malnutrition is in place

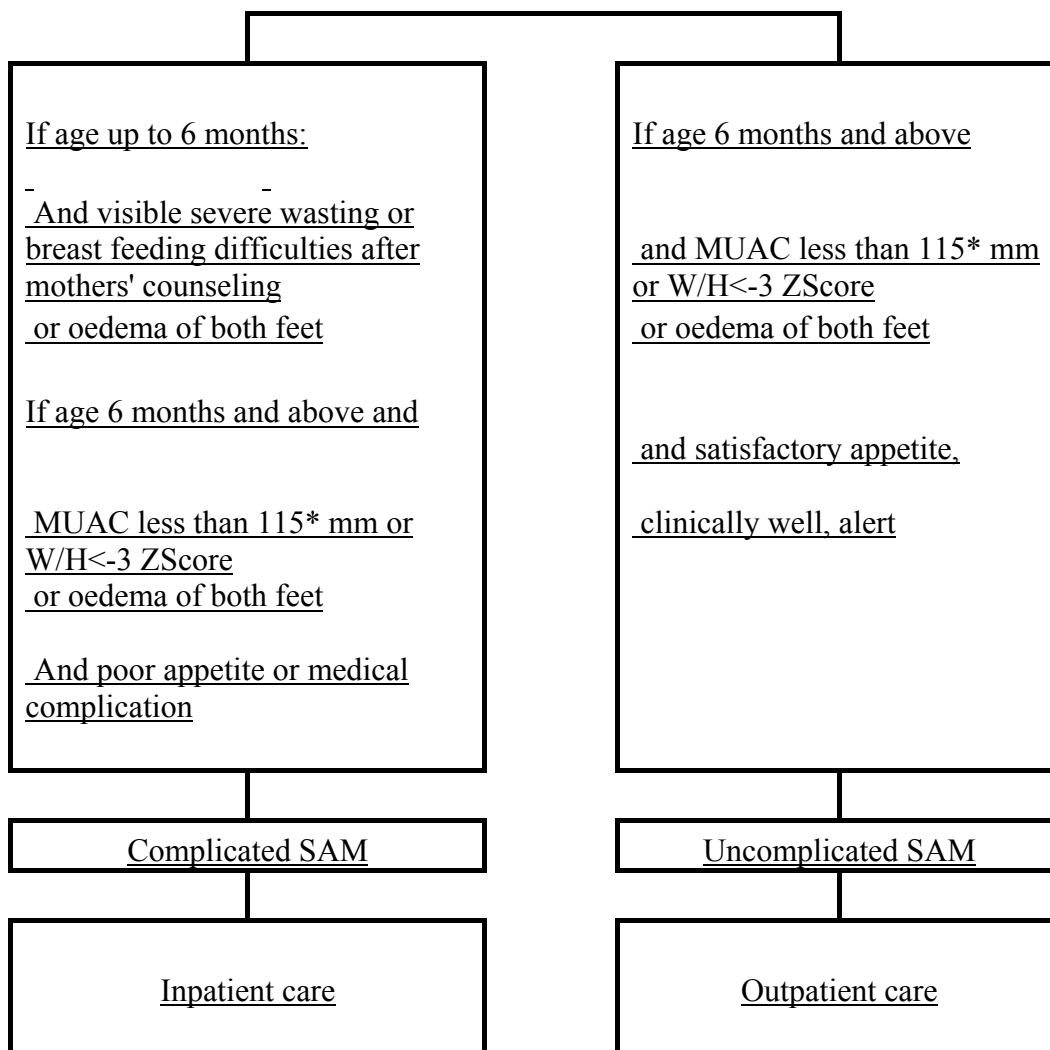
Replace first bullet to read:

- weight-for-height less than -3 SD, or mid-upper arm circumference less than 115 mm*, and/or

Add second bullet:

- If an outpatient programme on management of severe malnutrition is in place:

Differentiating complicated and uncomplicated SAM



Under: *Reasons for criteria:*

Replace first sentence to read:

If the child is less than -3 SD or has a very small arm circumference, he or she is severely wasted.

Page 20: Recipes for F-75 and F-100

Modify, for each recipe:

Mineral Mix* 20ml **to read:** Complex Mineral and Vitamin mix* ½ leveled scoop.

Modify reference * below chart to read:

* Where CMV is not available, a mineral mix should be used (20 ml for one liter of preparation). Contents of mineral mix are given in appendix 4 of the manual.

Page 26: 6.0 Discharge policies for severe malnutrition ward

Modified to read:

If an outpatient programme on management of severe malnutrition is in place:

WHO recommends that children be kept in the severe malnutrition ward or area until their condition is stabilized (regained appetite, reduced oedema and good acceptance of RUTF during the transition phase).

It usually requires about 5 to 10 days for a child to achieve the target weight if feeding recommendations are followed. The child should then be referred for outpatient care.

If a child leaves before being stabilized, he is likely to get worse and have to return, or he may die.

If no outpatient programme on management of severe malnutrition is in place:

WHO recommends that children be kept in the severe malnutrition ward or area until they reach -1 SD weight-for-height. Additional discharge criteria are given in Table 11 on page 25 of the manual.

It usually requires about 2 – 6 weeks for a child to achieve the target weight if feeding recommendations are followed. It may be difficult to keep children for this long, but the risks of early discharge are great. If a child leaves before being achieving -1 SD, he is likely to get worse and have to return.

If early discharge is necessary, many preparations must be made to ensure that the parents can continue care at home. Follow-up visits are essential. There will be a discussion exercise about early discharge situations in the module Involving Mothers in Care.

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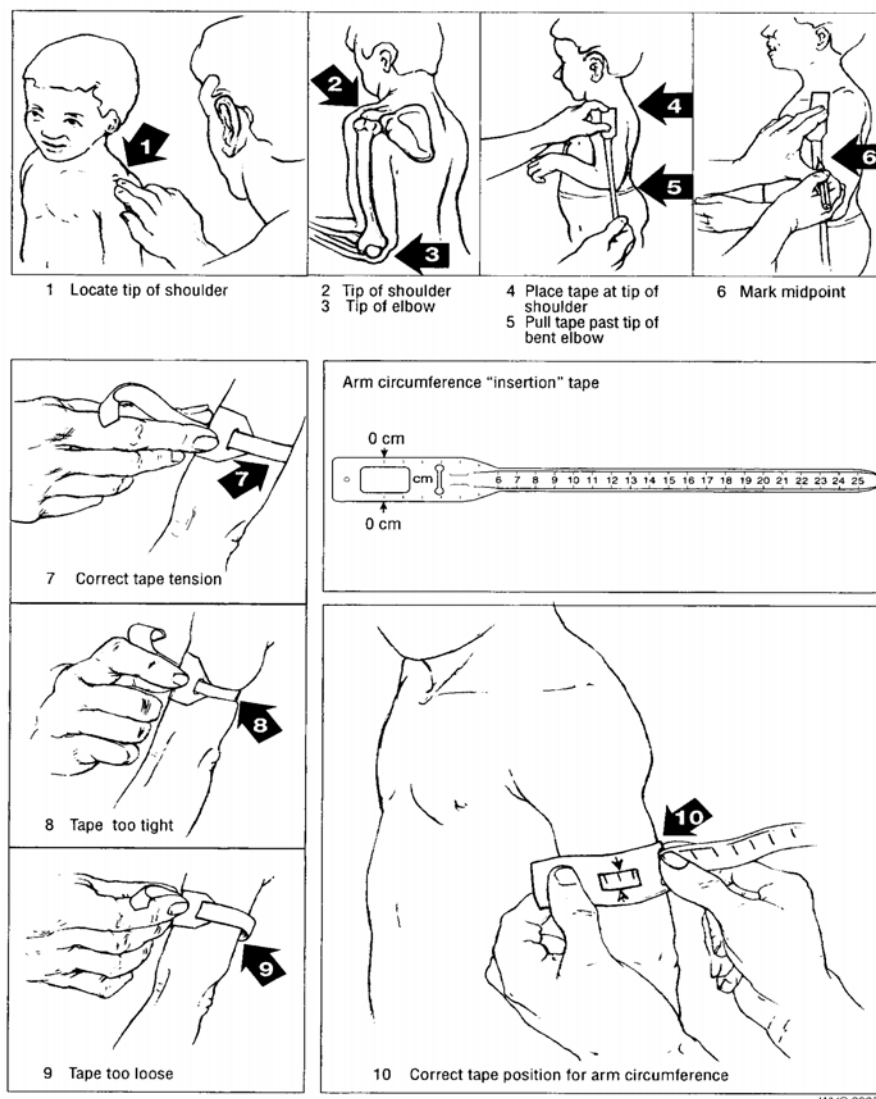
Pages 29: **Add Annex A (WHO growth standards) (continued)**

Annex A

Mid-upper arm circumference.

Arm circumference is measured on the upper left arm. To locate the correct point for measurement, the child's elbow is flexed to 90°C. A measuring tape is used to find the mid point between the end of the shoulder (acromion) and the tip of the elbow (olecranon); this midpoint should be marked (see figure below). The arm is then allowed to hang freely, palm towards the thigh, and the measuring tape is placed snugly around the arm at the midpoint mark. The tape should not be pulled too tight.

Fig. A3.4 Measuring child's mid-upper-arm circumference¹



¹ Adapted, with permission, from *Assessing the nutritional status of young children: preliminary version*. New York, United Nations Department of Technical Co-operation for Development and Statistical Office, 1990.

Pages 30 – 31: Revised “Annex A: Explanation of SD-Scores”

Modify to read:

Annex B: Explanation of z-scores (SD-scores)

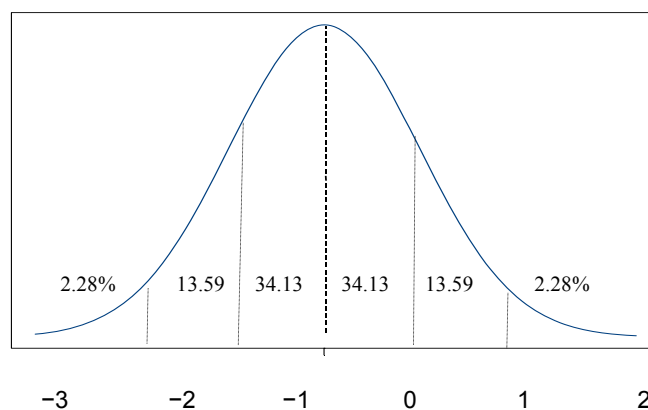
What does a Z-score tell us?

The reference lines on the growth charts are called z-score lines based on z-scores, also known as standard deviation (SD) scores. Z-scores are used to describe how far a measurement is from the median (or average). For example a weight-for-height z-score of -2.33 means that the child's weight is 2.33 SDs below the expected median weight of children of the same height. The child has a lower weight for his/her height compared to the standard and s/he is classified as “wasted”. A positive z-score indicates that the child's weight is to the right of the median, i.e. the child is heavier compared to the standard.

The z-scores are calculated differently for measurements that are distributed normally and non-normally in the reference population.

Normally distributed measurements

The concept of a normal distribution is helpful for understanding what a z-score is. In a normal distribution, most values are grouped around the middle as shown below.



The distribution of heights of all boys (or all girls) of a given age forms a bell-shaped curve, or a normal (or almost normal) distribution. Each segment on the horizontal axis represents one standard deviation or z-score, and the z-scores -1 and 1 are at equal distances in opposite directions from the median. The distance from the median to 1 is half of the distance to 2.

The z-score of an observed point in this distribution is calculated as follows:

$$\text{z-score} = \frac{(\text{observed value}) - (\text{median reference value})}{\text{z-score of the reference population}}$$

Non-normally distributed measurements

Unlike the distribution of height, the distribution of weight, has a shape when graphed that looks like a “deformed” bell whose right side is longer than the left and is described as right-skewed (not normal):



It is more difficult to calculate z-scores for weight-based indicators. Unlike in a normal distribution, distances between adjacent z-scores are not constant.

To calculate the z-score of an observed point involves a series of mathematical calculations that take into account the non-normal distribution of measurements in the reference population. The following formula is used:

$$\text{z-score} = \frac{(\text{observed value} \div M)^L - 1}{L \times S}$$

In this formula, M, L and S are values for the reference population. M is the reference median value which estimates the population mean. L is the power needed to transform the data in order to remove skewness (i.e. to normalize the data). S is the coefficient of variation (or equivalent).

This formula (sometimes called the LMS formula) is used to calculate z-scores for weight-for-age, weight-for-length/height, and BMI-for-age.

To select children for interventions if they are below specified weight-for-height cut-offs based on the WHO standards, the simplified field tables of should be used (see pages 31-32).

How do Z-scores relate to percent-of-median?

In the past, the percent of median was derived based on the NCHS reference and described the ratio, for example, of a child's weight to the average (median) weight of a child of the same height in the reference, expressed as percentage.

The percent-of-median classification system had the following main drawbacks:

- The indicators are age dependent, i.e. 60% weight-for-age suggests severe malnutrition in infants but only moderate malnutrition in school children.
- There are different cut-off levels to indicate severity depending on the indicator. While 60% weight-for-age suggests severe malnutrition, 60% weight-for-height is incompatible with life.

The WHO child growth standards do not present percent of median figures. WHO recommends using the z-score classification system figures which is comparable across ages and heights, and among different indicators.

Pages 32-33: Revised to read: **Annex C** (WHO growth standards)

Annex B: Weight-for-Length Reference Card^a

| Boys' weight (kg) | | | | | Length ^b | Girls' weight (kg) | | | | |
|-------------------|-------|-------|-------|--------|---------------------|--------------------|-------|-------|-------|-------|
| -4 SD | -3 SD | -2 SD | -1 SD | Median | (cm) | Median | -1 SD | -2 SD | -3 SD | -4 SD |
| 1.7 | 1.9 | 2.0 | 2.2 | 2.4 | 45 | 2.5 | 2.3 | 2.1 | 1.9 | 1.7 |
| 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 46 | 2.6 | 2.4 | 2.2 | 2.0 | 1.9 |
| 2.0 | 2.1 | 2.3 | 2.5 | 2.8 | 47 | 2.8 | 2.6 | 2.4 | 2.2 | 2.0 |
| 2.1 | 2.3 | 2.5 | 2.7 | 2.9 | 48 | 3.0 | 2.7 | 2.5 | 2.3 | 2.1 |
| 2.2 | 2.4 | 2.6 | 2.9 | 3.1 | 49 | 3.2 | 2.9 | 2.6 | 2.4 | 2.2 |
| 2.4 | 2.6 | 2.8 | 3.0 | 3.3 | 50 | 3.4 | 3.1 | 2.8 | 2.6 | 2.4 |
| 2.5 | 2.7 | 3.0 | 3.2 | 3.5 | 51 | 3.6 | 3.3 | 3.0 | 2.8 | 2.5 |
| 2.7 | 2.9 | 3.2 | 3.5 | 3.8 | 52 | 3.8 | 3.5 | 3.2 | 2.9 | 2.7 |
| 2.9 | 3.1 | 3.4 | 3.7 | 4.0 | 53 | 4.0 | 3.7 | 3.4 | 3.1 | 2.8 |
| 3.1 | 3.3 | 3.6 | 3.9 | 4.3 | 54 | 4.3 | 3.9 | 3.6 | 3.3 | 3.0 |
| 3.3 | 3.6 | 3.8 | 4.2 | 4.5 | 55 | 4.5 | 4.2 | 3.8 | 3.5 | 3.2 |
| 3.5 | 3.8 | 4.1 | 4.4 | 4.8 | 56 | 4.8 | 4.4 | 4.0 | 3.7 | 3.4 |
| 3.7 | 4.0 | 4.3 | 4.7 | 5.1 | 57 | 5.1 | 4.6 | 4.3 | 3.9 | 3.6 |
| 3.9 | 4.3 | 4.6 | 5.0 | 5.4 | 58 | 5.4 | 4.9 | 4.5 | 4.1 | 3.8 |
| 4.1 | 4.5 | 4.8 | 5.3 | 5.7 | 59 | 5.6 | 5.1 | 4.7 | 4.3 | 3.9 |
| 4.3 | 4.7 | 5.1 | 5.5 | 6.0 | 60 | 5.9 | 5.4 | 4.9 | 4.5 | 4.1 |
| 4.5 | 4.9 | 5.3 | 5.8 | 6.3 | 61 | 6.1 | 5.6 | 5.1 | 4.7 | 4.3 |
| 4.7 | 5.1 | 5.6 | 6.0 | 6.5 | 62 | 6.4 | 5.8 | 5.3 | 4.9 | 4.5 |
| 4.9 | 5.3 | 5.8 | 6.2 | 6.8 | 63 | 6.6 | 6.0 | 5.5 | 5.1 | 4.7 |
| 5.1 | 5.5 | 6.0 | 6.5 | 7.0 | 64 | 6.9 | 6.3 | 5.7 | 5.3 | 4.8 |
| 5.3 | 5.7 | 6.2 | 6.7 | 7.3 | 65 | 7.1 | 6.5 | 5.9 | 5.5 | 5.0 |
| 5.5 | 5.9 | 6.4 | 6.9 | 7.5 | 66 | 7.3 | 6.7 | 6.1 | 5.6 | 5.1 |
| 5.6 | 6.1 | 6.6 | 7.1 | 7.7 | 67 | 7.5 | 6.9 | 6.3 | 5.8 | 5.3 |
| 5.8 | 6.3 | 6.8 | 7.3 | 8.0 | 68 | 7.7 | 7.1 | 6.5 | 6.0 | 5.5 |
| 6.0 | 6.5 | 7.0 | 7.6 | 8.2 | 69 | 8.0 | 7.3 | 6.7 | 6.1 | 5.6 |
| 6.1 | 6.6 | 7.2 | 7.8 | 8.4 | 70 | 8.2 | 7.5 | 6.9 | 6.3 | 5.8 |
| 6.3 | 6.8 | 7.4 | 8.0 | 8.6 | 71 | 8.4 | 7.7 | 7.0 | 6.5 | 5.9 |
| 6.4 | 7.0 | 7.6 | 8.2 | 8.9 | 72 | 8.6 | 7.8 | 7.2 | 6.6 | 6.0 |
| 6.6 | 7.2 | 7.7 | 8.4 | 9.1 | 73 | 8.8 | 8.0 | 7.4 | 6.8 | 6.2 |
| 6.7 | 7.3 | 7.9 | 8.6 | 9.3 | 74 | 9.0 | 8.2 | 7.5 | 6.9 | 6.3 |
| 6.9 | 7.5 | 8.1 | 8.8 | 9.5 | 75 | 9.1 | 8.4 | 7.7 | 7.1 | 6.5 |
| 7.0 | 7.6 | 8.3 | 8.9 | 9.7 | 76 | 9.3 | 8.5 | 7.8 | 7.2 | 6.6 |
| 7.2 | 7.8 | 8.4 | 9.1 | 9.9 | 77 | 9.5 | 8.7 | 8.0 | 7.4 | 6.7 |
| 7.3 | 7.9 | 8.6 | 9.3 | 10.1 | 78 | 9.7 | 8.9 | 8.2 | 7.5 | 6.9 |
| 7.4 | 8.1 | 8.7 | 9.5 | 10.3 | 79 | 9.9 | 9.1 | 8.3 | 7.7 | 7.0 |
| 7.6 | 8.2 | 8.9 | 9.6 | 10.4 | 80 | 10.1 | 9.2 | 8.5 | 7.8 | 7.1 |
| 7.7 | 8.4 | 9.1 | 9.8 | 10.6 | 81 | 10.3 | 9.4 | 8.7 | 8.0 | 7.3 |
| 7.9 | 8.5 | 9.2 | 10.0 | 10.8 | 82 | 10.5 | 9.6 | 8.8 | 8.1 | 7.5 |
| 8.0 | 8.7 | 9.4 | 10.2 | 11.0 | 83 | 10.7 | 9.8 | 9.0 | 8.3 | 7.6 |
| 8.2 | 8.9 | 9.6 | 10.4 | 11.3 | 84 | 11.0 | 10.1 | 9.2 | 8.5 | 7.8 |
| 8.4 | 9.1 | 9.8 | 10.6 | 11.5 | 85 | 11.2 | 10.3 | 9.4 | 8.7 | 8.0 |
| 8.6 | 9.3 | 10.0 | 10.8 | 11.7 | 86 | 11.5 | 10.5 | 9.7 | 8.9 | 8.1 |
| 8.7 | 9.5 | 10.2 | 11.1 | 12.0 | 87 | 11.7 | 10.7 | 9.9 | 9.1 | 8.3 |
| 8.9 | 9.7 | 10.5 | 11.3 | 12.2 | 88 | 12.0 | 11.0 | 10.1 | 9.3 | 8.5 |
| 9.1 | 9.9 | 10.7 | 11.5 | 12.5 | 89 | 12.2 | 11.2 | 10.3 | 9.5 | 8.7 |
| 9.3 | 10.1 | 10.9 | 11.8 | 12.7 | 90 | 12.5 | 11.4 | 10.5 | 9.7 | 8.8 |
| 9.5 | 10.3 | 11.1 | 12.0 | 13.0 | 91 | 12.7 | 11.7 | 10.7 | 9.9 | 9.0 |
| 9.7 | 10.5 | 11.3 | 12.2 | 13.2 | 92 | 13.0 | 11.9 | 10.9 | 10.1 | 9.2 |
| 9.8 | 10.7 | 11.5 | 12.4 | 13.4 | 93 | 13.2 | 12.1 | 11.1 | 10.2 | 9.4 |
| 10.0 | 10.8 | 11.7 | 12.6 | 13.7 | 94 | 13.5 | 12.3 | 11.3 | 10.4 | 9.5 |
| 10.2 | 11.0 | 11.9 | 12.8 | 13.9 | 95 | 13.7 | 12.6 | 11.5 | 10.6 | 9.7 |
| 10.3 | 11.2 | 12.1 | 13.1 | 14.1 | 96 | 14.0 | 12.8 | 11.7 | 10.8 | 9.9 |
| 10.5 | 11.4 | 12.3 | 13.3 | 14.4 | 97 | 14.2 | 13.0 | 12.0 | 11.0 | 10.1 |
| 10.7 | 11.6 | 12.5 | 13.5 | 14.6 | 98 | 14.5 | 13.3 | 12.2 | 11.2 | 10.2 |
| 10.8 | 11.8 | 12.7 | 13.7 | 14.9 | 99 | 14.8 | 13.5 | 12.4 | 11.4 | 10.4 |
| 11.0 | 12.0 | 12.9 | 14.0 | 15.2 | 100 | 15.0 | 13.7 | 12.6 | 11.6 | 10.6 |

^a A more detailed table is available on http://www.who.int/childgrowth/standards/weight_for_length/en/index.html ^b Length is measured for children below 2 years or, if age is not known, below 87 cm. For children 2 years and above (or, if age is not known, 87 cm or more), height is measured (see following table). Recumbent length is on average 0.7 cm greater than standing height; although the difference is of no importance to individual children, a correction may be made by adding 0.7 cm to the height if the child is less than 2 years (or below 87 cm if age not known) when recumbent length can not be measured.

Weight-for-Height Reference Card^a

| Boys' weight (kg) | | | | | Height ^b (cm) | Girls' weight (kg) | | | | |
|-------------------|-------|-------|-------|--------|-----------------------------|--------------------|-------|-------|-------|-------|
| -4 ET | -3 ET | -2 ET | -1 ET | Median | | Median | -1 ET | -2 ET | -3 ET | -4 ET |
| 5.4 | 5.9 | 6.3 | 6.9 | 7.4 | 65 | 7.2 | 6.6 | 6.1 | 5.6 | 5.1 |
| 5.6 | 6.1 | 6.5 | 7.1 | 7.7 | 66 | 7.5 | 6.8 | 6.3 | 5.8 | 5.3 |
| 5.7 | 6.2 | 6.7 | 7.3 | 7.9 | 67 | 7.7 | 7.0 | 6.4 | 5.9 | 5.4 |
| 5.9 | 6.4 | 6.9 | 7.5 | 8.1 | 68 | 7.9 | 7.2 | 6.6 | 6.1 | 5.6 |
| 6.1 | 6.6 | 7.1 | 7.7 | 8.4 | 69 | 8.1 | 7.4 | 6.8 | 6.3 | 5.7 |
| 6.2 | 6.8 | 7.3 | 7.9 | 8.6 | 70 | 8.3 | 7.6 | 7.0 | 6.4 | 5.9 |
| 6.4 | 6.9 | 7.5 | 8.1 | 8.8 | 71 | 8.5 | 7.8 | 7.1 | 6.6 | 6.0 |
| 6.5 | 7.1 | 7.7 | 8.3 | 9.0 | 72 | 8.7 | 8.0 | 7.3 | 6.7 | 6.1 |
| 6.7 | 7.3 | 7.9 | 8.5 | 9.2 | 73 | 8.9 | 8.1 | 7.5 | 6.9 | 6.3 |
| 6.8 | 7.4 | 8.0 | 8.7 | 9.4 | 74 | 9.1 | 8.3 | 7.6 | 7.0 | 6.4 |
| 7.0 | 7.6 | 8.2 | 8.9 | 9.6 | 75 | 9.3 | 8.5 | 7.8 | 7.2 | 6.6 |
| 7.1 | 7.7 | 8.4 | 9.1 | 9.8 | 76 | 9.5 | 8.7 | 8.0 | 7.3 | 6.7 |
| 7.3 | 7.9 | 8.5 | 9.2 | 10.0 | 77 | 9.6 | 8.8 | 8.1 | 7.5 | 6.8 |
| 7.4 | 8.0 | 8.7 | 9.4 | 10.2 | 78 | 9.8 | 9.0 | 8.3 | 7.6 | 7.0 |
| 7.5 | 8.2 | 8.8 | 9.6 | 10.4 | 79 | 10.0 | 9.2 | 8.4 | 7.8 | 7.1 |
| 7.7 | 8.3 | 9.0 | 9.7 | 10.6 | 80 | 10.2 | 9.4 | 8.6 | 7.9 | 7.2 |
| 7.8 | 8.5 | 9.2 | 9.9 | 10.8 | 81 | 10.4 | 9.6 | 8.8 | 8.1 | 7.4 |
| 8.0 | 8.7 | 9.3 | 10.1 | 11.0 | 82 | 10.7 | 9.8 | 9.0 | 8.3 | 7.6 |
| 8.1 | 8.8 | 9.5 | 10.3 | 11.2 | 83 | 10.9 | 10.0 | 9.2 | 8.5 | 7.7 |
| 8.3 | 9.0 | 9.7 | 10.5 | 11.4 | 84 | 11.1 | 10.2 | 9.4 | 8.6 | 7.9 |
| 8.5 | 9.2 | 10.0 | 10.8 | 11.7 | 85 | 11.4 | 10.4 | 9.6 | 8.8 | 8.1 |
| 8.7 | 9.4 | 10.2 | 11.0 | 11.9 | 86 | 11.6 | 10.7 | 9.8 | 9.0 | 8.3 |
| 8.9 | 9.6 | 10.4 | 11.2 | 12.2 | 87 | 11.9 | 10.9 | 10.0 | 9.2 | 8.4 |
| 9.1 | 9.8 | 10.6 | 11.5 | 12.4 | 88 | 12.1 | 11.1 | 10.2 | 9.4 | 8.6 |
| 9.3 | 10.0 | 10.8 | 11.7 | 12.6 | 89 | 12.4 | 11.4 | 10.4 | 9.6 | 8.8 |
| 9.4 | 10.2 | 11.0 | 11.9 | 12.9 | 90 | 12.6 | 11.6 | 10.6 | 9.8 | 9.0 |
| 9.6 | 10.4 | 11.2 | 12.1 | 13.1 | 91 | 12.9 | 11.8 | 10.9 | 10.0 | 9.1 |
| 9.8 | 10.6 | 11.4 | 12.3 | 13.4 | 92 | 13.1 | 12.0 | 11.1 | 10.2 | 9.3 |
| 9.9 | 10.8 | 11.6 | 12.6 | 13.6 | 93 | 13.4 | 12.3 | 11.3 | 10.4 | 9.5 |
| 10.1 | 11.0 | 11.8 | 12.8 | 13.8 | 94 | 13.6 | 12.5 | 11.5 | 10.6 | 9.7 |
| 10.3 | 11.1 | 12.0 | 13.0 | 14.1 | 95 | 13.9 | 12.7 | 11.7 | 10.8 | 9.8 |
| 10.4 | 11.3 | 12.2 | 13.2 | 14.3 | 96 | 14.1 | 12.9 | 11.9 | 10.9 | 10.0 |
| 10.6 | 11.5 | 12.4 | 13.4 | 14.6 | 97 | 14.4 | 13.2 | 12.1 | 11.1 | 10.2 |
| 10.8 | 11.7 | 12.6 | 13.7 | 14.8 | 98 | 14.7 | 13.4 | 12.3 | 11.3 | 10.4 |
| 11.0 | 11.9 | 12.9 | 13.9 | 15.1 | 99 | 14.9 | 13.7 | 12.5 | 11.5 | 10.5 |
| 11.2 | 12.1 | 13.1 | 14.2 | 15.4 | 100 | 15.2 | 13.9 | 12.8 | 11.7 | 10.7 |
| 11.3 | 12.3 | 13.3 | 14.4 | 15.6 | 101 | 15.5 | 14.2 | 13.0 | 12.0 | 10.9 |
| 11.5 | 12.5 | 13.6 | 14.7 | 15.9 | 102 | 15.8 | 14.5 | 13.3 | 12.2 | 11.1 |
| 11.7 | 12.8 | 13.8 | 14.9 | 16.2 | 103 | 16.1 | 14.7 | 13.5 | 12.4 | 11.3 |
| 11.9 | 13.0 | 14.0 | 15.2 | 16.5 | 104 | 16.4 | 15.0 | 13.8 | 12.6 | 11.5 |
| 12.1 | 13.2 | 14.3 | 15.5 | 16.8 | 105 | 16.8 | 15.3 | 14.0 | 12.9 | 11.8 |
| 12.3 | 13.4 | 14.5 | 15.8 | 17.2 | 106 | 17.1 | 15.6 | 14.3 | 13.1 | 12.0 |
| 12.5 | 13.7 | 14.8 | 16.1 | 17.5 | 107 | 17.5 | 15.9 | 14.6 | 13.4 | 12.2 |
| 12.7 | 13.9 | 15.1 | 16.4 | 17.8 | 108 | 17.8 | 16.3 | 14.9 | 13.7 | 12.4 |
| 12.9 | 14.1 | 15.3 | 16.7 | 18.2 | 109 | 18.2 | 16.6 | 15.2 | 13.9 | 12.7 |
| 13.2 | 14.4 | 15.6 | 17.0 | 18.5 | 110 | 18.6 | 17.0 | 15.5 | 14.2 | 12.9 |
| 13.4 | 14.6 | 15.9 | 17.3 | 18.9 | 111 | 19.0 | 17.3 | 15.8 | 14.5 | 13.2 |
| 13.6 | 14.9 | 16.2 | 17.6 | 19.2 | 112 | 19.4 | 17.7 | 16.2 | 14.8 | 13.5 |
| 13.8 | 15.2 | 16.5 | 18.0 | 19.6 | 113 | 19.8 | 18.0 | 16.5 | 15.1 | 13.7 |
| 14.1 | 15.4 | 16.8 | 18.3 | 20.0 | 114 | 20.2 | 18.4 | 16.8 | 15.4 | 14.0 |
| 14.3 | 15.7 | 17.1 | 18.6 | 20.4 | 115 | 20.7 | 18.8 | 17.2 | 15.7 | 14.3 |
| 14.6 | 16.0 | 17.4 | 19.0 | 20.8 | 116 | 21.1 | 19.2 | 17.5 | 16.0 | 14.5 |
| 14.8 | 16.2 | 17.7 | 19.3 | 21.2 | 117 | 21.5 | 19.6 | 17.8 | 16.3 | 14.8 |
| 15.0 | 16.5 | 18.0 | 19.7 | 21.6 | 118 | 22.0 | 19.9 | 18.2 | 16.6 | 15.1 |
| 15.3 | 16.8 | 18.3 | 20.0 | 22.0 | 119 | 22.4 | 20.3 | 18.5 | 16.9 | 15.4 |
| 15.5 | 17.1 | 18.6 | 20.4 | 22.4 | 120 | 22.8 | 20.7 | 18.9 | 17.3 | 15.6 |

^a A more detailed table is available on http://www.who.int/childgrowth/standards/weight_for_height/en/index.html.

^b For children 2 years and above (or, if age not known, 87 cm or more), height is measured. Recumbent length is on average 0.7 cm greater than standing height; although the difference is of no importance to individual children, a correction may be made by subtracting 0.7cm from the lengths if the child is 2 years or more or above 86.9 cm when standing height can not be measured.

3. Initial management

Page 21: 6.0 Manage watery diarrhoea and/or vomiting with ReSoMal.

6.1 What is ReSoMal?

Insert in the first paragraph:

ReSoMal is Rehydration Solution for Malnutrition. It is a modification of the standards 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, except if profuse liquid diarrhoea (e.g. cholera). It should be given by mouth or by nasogastric tube. Do not give standard ORS to severely malnourished children, except in case of profuse liquid diarrhoea.

Page 27:

Add paragraph:

6.8 Case with profuse liquid diarrhoea.

In case of profuse liquid diarrhoea (e.g. cases of cholera), ReSoMal should not be given and should be replaced by WHO reduced osmolarity ORS without changing the amounts and frequency.

Page 43:

Annex A:

Critical Care Pathway*

Add footnote:

* Correction: the percentage of the median indicated in the Critical Care Pathways “Initial Management” and “Comments/Outcome” should not be used

=====

4: Feeding

Page 3: Recipes for F-75 and F-100

Modify for each recipe:

“Mineral Mix* 20ml” to read: “Complex Mineral and Vitamin mix* ½ leveled scoop”.

Modify reference * below chart to read:

* Where CMV is not available, a mineral mix should be used (20 ml per liter of preparation). Contents of mineral mix are given in Appendix 4 of the manual.

Page 4: Directions for making cooked F-75 with cereal flour (top recipes)

Modify to read under “If using an electric blender”:

2. Add the flour, milk or milk powder, sugar oil (~~Delete: and mineral mix~~). Blend.
5. Some water will evaporate while cooking, so transfer the mixture back to the blender after cooking and add enough boiled water to make 1000 ml. Add the Combined Mineral and Vitamin Mix (CMV). Blend again.

Modify to read under “If using a hand whisk”:

1. Mix the flour, milk or milk powder, sugar, oil (~~Delete: and mineral mix~~) in a 1-litre measuring jug. (If using milk powder, this will be a paste.)
3. Some water will evaporate while cooking, so transfer the mixture back to the measuring jug after cooking and add enough boiled water to make 1000 ml. Add the Combined Mineral and Vitamin Mix (CMV). Whisk again.

Page 35:

Add section 4.4: Accustom to RUTF

If an outpatient programme has been established for continuing care in the community using ready-to-use therapeutic food (RUTF), the child must be accustomed to RUTF before referral. Replace F100 with RUTF and discharge when the child eats at least 75% of expected amount (i.e. at least 150 kcal/kg/day).

=====

5: Daily care

Page 32: 7.0 Weigh the child daily and maintain weight chart

Modify second bullet to read:

- Use a reference table to determine the child's desired discharge weight (i.e. -1 SD, discharge criteria when there is no outpatient programme on management of severe malnutrition). Mark the desired discharge weight with a horizontal line across the chart.

Page 33: *Example of weight chart for a boy with no oedema*

Modify to read:

Starting weight: 6.0 kg, length: 69 cm

Desired discharge weight (-1 SD): 7.6 kg. (~~Delete: 90% weight-for-height~~)

Page 35 : *Example of weight chart for a girl with mild oedema (+)*

Modify to read:

Starting weight: 5.3 kg Length: 67 cm

Desired discharge weight (-1 SD): _____ kg (~~Delete: 90% weight-for-height~~)

Page 36: EXERCISE E

Modify to read:

1. Knowing that there is no programme on outpatient management of severe malnutrition in place, what is Daniel's desired discharge weight?
Enter this weight in the appropriate blank beside the Weight Chart.

Page 40: Answers, page 34.

Example of weight chart for a girl with mild oedema (+)

Modify to read:

Starting weight: 5.3 kg Length: 67 cm

Desired discharge weight (-1 SD): 6.9 kg (~~Delete: 90% weight-for-height.~~)

=====

6: Monitoring and problem solving

Page 11: CCP for Ceri

Under SIGNS OF SEVERE MALNUTRITION, **modify: -3 SD to read: ≤ -3 SD.**

Page 31: 4.1 Record each patient outcome on the CCP

Successful outcome:

Replace to read:

If outpatient programme on management of severe malnutrition in place:

- Referral after regaining appetite, reduced oedema and good acceptance of RUTF.

If no outpatient programme on management of severe malnutrition in place:

- Discharge at -1 SD.

Example from CCP

Modify to read:

Under PATIENT OUTCOME

Discharge at -1 SD (**Delete: 90% weight-for-height**)

Under CIRCUMSTANCES/COMMENTS

SD score _____ (**Delete: or %**)

SD score (**Delete: or %**): -2 SD (**Delete 80%**)

SD score (**Delete : or %**)

Page 33: EXERCISE D

Modify to read:

Study the CCP excerpts for Kofi (correction to be done on Kofi's CCP: SD score equal to -4), Vijay, and Luca (correction to be done on Luca's CCP: SD score below -3) on the following pages.

Page 44: 5.0 As needed, monitor practices and procedures

5.1 Monitor case management practices.

Modify to read:

Deaths during initial case management are often the result of well-intentioned but incorrect practice. Monitor to ensure that all clinicians are following the case management practices described in the manual, particularly during initial treatment. Ensure that emergency room personnel are also following appropriate practices for severely malnourished children. Two wall charts are provided in the participants support materials in order to help staff from the malnutrition

ward and from the emergency room to follow appropriate practices. No checklist is given for monitoring case management, as it would be too lengthy.

However, some examples of common incorrect practices to look for are described below.

Page 48: Add following paragraphs:

5.5 Who should monitor?

Monitoring can be done by trained health care providers from the hospital or trained nutrition officers from Ministry of Health supported, if needed, by trained public health nutrition officers from other institutions (e.g. WHO, UNICEF, NGOs).

5.6 How often to monitor?

Usually 3 days are needed to monitor practices and procedures in a malnutrition ward, this would include the on-site problem solving sessions (paragraph 6.0). The frequency of visits for monitoring purposes need to be discussed at other levels of the system.

=====

7: Involving mothers in care

Page 6: 3.0 Teach groups of mothers about feeding and care.

Example outline of teaching session

Modify to read: paragraph 1.

On the following page is an outline of a teaching session that could be used with parents of malnourished children. The purpose of the training session is to teach parents how to prepare nutritious food at home. This food, called khichuri, would be appropriate for children of ages 6 to 24 months when they have recovered and are eating at home. The recipe given makes 589 grams of cooked food (cooked soft). The recipe provides 115 kcal and 2.9 g protein per 100 g.

Page 9: 4.0 Prepare for feeding the child at home

Modify to read: paragraph 1

After the child recovers and reaches $-1SD$ (**Delete:** 90% of median weight-for-height), the child should be fed at home according to national IMCI recommendations or other MOH guidelines. For a child age 2 years or older, this means giving the child 3 meals each day, plus giving nutritious food between meals twice daily.

Page 13: 6.0 Give general discharge instructions

Add as last bullet:

If a programme on outpatient management of severe malnutrition is in place, the following actions should be taken:

- Complete a referral slip to outpatient care, including a summary section informing health care providers at the outpatient care site about the medical intervention and treatment given to the child.
- Inform the mother/caregiver where and on which day to go for outpatient care, at the health facility closest to her community, and is given sufficient RUTF to last until the next outpatient care follow-on session (usually one week's worth).
- Give mothers/caretakers key messages about the use of RUTF and basic hygiene are discussed again with the mother/caregiver. The mother/caregiver is also given any remaining medications and instructions on how to use them. S/he should repeat these instructions to the health care provider to make sure they were clearly understood and will be followed correctly.
- Staff in the inpatient care facility should not retain children that are ready for outpatient care (children with good appetite who have had their medical complications treated).
- Inform the mother/caregiver on what to do if the child's condition deteriorates before the next outpatient care follow-on session.

Page 15: 7.0 If early discharge* is unavoidable, make special arrangements for follow-up

Modify to read:

If a child must be discharged before reaching -1 SD (~~Delete: (90% of median)~~ and there is no programme for outpatient care, it is critical to make arrangements for follow-up of the child (for example, special visits by a health worker to the child's home, or outpatient care at a health facility or nutritional rehabilitation centre). Mothers will need special training to prepare feeds and give iron, folic acid, and multivitamins at home.

* If a programme on outpatient management of severe malnutrition is in place, early discharge means before the reduction of oedema or regaining appetite. If no programme is in place, early discharge means before reaching Weight/Height equal to -1 SD.

Page 16: EXERCISE E (OPTIONAL)

Modify to read: paragraph 1:

This exercise is an optional discussion for participants who work in hospitals where early discharge (before child reaches -1 SD (~~Delete: or 90% of median~~)) may be common.

=====

ANSWER SHEETS (For exercises in modules)

Principles of Care

Answers to Exercise B, Principles of Care, page 13

Replace by:

1. <-3 SD
2. <-3 SD
3. -3 SD
4. -3 SD

Answers to Exercise C, Principles of Care, page 15

Modify to read:

Photo 19:

This child should be admitted to the severe malnutrition ward. Her weight-for-length is below -4 SD.

Note: If you were to look on a weight-for-age chart, you would find that this child's weight-for-age is very low. This child is stunted. She is small for her age.

Photo 20:

This child should be admitted. He is less than -4 SD. Note: It will be important to remove his shirt to examine him. Notice that the mother in this photo is also extremely thin.

Initial Management

Answers to Exercise A, Initial Management, page 15

Case 1 – Tina

Modify to read:

- a. Tina's SD score is equal to -3. Her score may be written: -3D.

Answers to Exercise C, Initial Management, page 28

Case 2 – Ram

Modify to read:

2a – 2c. Answers are given on the CCP for Ram (correction: SD-score on the CCP: <-4 SD).

Answers to Exercise C, Initial Management, continued

Case 3 – Irena

Modify to read:

3a. Answers are given on the CCP for Irena (correction: SD-score on the CCP: <-4 SD).

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Support materials for participants

Insert the following wall chart:

Emergency treatment wall chart.

EMERGENCY TREATMENT OF SEVERELY MALNOURISHED CHILDREN

Severely malnourished children are different from other children. So they need different treatment.

| CONDITION | IMMEDIATE ACTION |
|--|---|
| <p>Treat shock</p> <p>Shock is if the child is lethargic or unconscious and cold hands Plus either: Slow capillary refill (longer than 3 seconds) or Weak fast pulse</p> <p>Monitor closely: use the Critical Care Pathway Initial Management Chart</p> | <p>If child is in shock:</p> <ol style="list-style-type: none"> 1. Give oxygen 2. Give sterile 10% glucose (5ml/kg) by IV 3. Give IV fluid at 15ml/kg over 1 hour, using one of the following solutions in order of preference: <ul style="list-style-type: none"> • half-strength Darrow's solution with 5% glucose (or dextrose) • Ringers' lactate with 5% glucose* or • half-normal saline with 5% glucose* or <p><i>*if either of these is used, add sterile potassium chloride (20 mmol/l) if possible.</i></p> <ol style="list-style-type: none"> 4. Keep the child warm. 5. Measure and record pulse and respirations every 10 minutes <p>If there are signs of improvement (pulse and respiration rates fall) repeat IV 15ml/kg for one more hour</p> <p>If there are no signs of improvement after the 1st hour of IV fluid assume child has septic shock. In this case:</p> <ol style="list-style-type: none"> 1. Give maintenance fluids (4ml/kg/h) while waiting for blood 2. Order 10ml/kg fresh whole blood and when blood is available, stop oral intake and IV fluids 3. Give a diuretic 4. Transfuse whole fresh blood (10ml/kg slowly over 3 hours) <p>If signs of heart failure: give packed cells instead of whole blood.</p> |
| <p>Treat severe dehydration</p> <p>Assume severe dehydration if there is history of watery diarrhoea, thirst, hypothermia, sunken eyes, weakness or absent radial pulse, cold hands and feet, reduced urine output.</p> | <p>DO NOT GIVE IV FLUIDS EXCEPT IN SHOCK</p> <ol style="list-style-type: none"> 1. Give ReSoMal 5ml/kg every 30min for 2 hours (orally or by NG). Do not give standard ORS to severely malnourished children 2. Measure and record pulse and respirations every 30 minutes. 3. Give ReSoMal 5-10 ml/kg/hour for next 4-10 hours in alternate hours with F75. <p>STOP rehydration if 3 or more signs of rehydration or any signs of overhydration (increased respiratory rate and pulse rate, increase oedema and puffy eyelids). Only give ReSoMal for up to 10 hours.</p> <p>Monitor during rehydration for signs of over-hydration:</p> <ul style="list-style-type: none"> • increasing pulse and respiratory rate • increasing oedema and puffy eyelids <p>Check for signs at least hourly. Stop if pulse increases by 25 beats/minute and respiratory rate by 5 breaths/minute.</p> |
| <p>Treat very severe anaemia</p> <p>Very severe anaemia is Hb less than 4g/dl</p> | <p>If very severe anaemia (or Hb 4-6g/dl AND respiratory distress):</p> <ol style="list-style-type: none"> 1. Stop all oral intake and IV fluids during the transfusion 2. Look for signs of congestive failure 3. Give furosemide 1ml/kg IV at the start of the transfusion 4. <u>If no signs of congestive failure</u>, give whole fresh blood 10ml/kg body weight slowly over 3 hours. <p><u>If signs of heart failure</u>, give 5-7ml/kg packed cells rather than whole blood.</p> |
| <p>Treat hypoglycaemia</p> <p>Hypoglycaemia is a blood glucose <3mmol/L</p> <p>Assume hypoglycaemia if no dextrostix available</p> | <p>Perform Dextrostix test on admission, before giving glucose or feeding.</p> <p>If hypoglycemia is suspected and no dextrostix are available or if it is not possible to get enough blood for test, assume that the child has hypoglycemia and give treatment immediately without laboratory confirmation.</p> <p>If conscious:</p> <ol style="list-style-type: none"> 1. Give a bolus of 10% glucose (50ml) or sugar solution (1 rounded teaspoon sugar in 3 tablespoons of water). Bolus of 10% glucose is best, but give sugar solution or F75 formula rather than wait for glucose. 2. Start feeding straightaway: Feed 2-hourly (12 feeds in 24 hours). Use feed chart to find amount to give and feed every 2-3 hours day and night. <p>If unconscious, give glucose IV (5ml/kg of sterile 10% glucose), followed by 50 ml of 10% glucose or sucrose by NG tube.</p> |
| <p>Treat hypothermia</p> <p>Hypothermia is a rectal temperature <35.5°C (95.9°F) or an underarm temperature <35°C (95°F).</p> | <p>If hypothermia:</p> <p>For all children:</p> <ol style="list-style-type: none"> 1. Feed straightaway and then every 2-3 hours, day and night. 2. Keep warm. 3. Use the kangaroo technique, cover with a blanket. Let mother sleep with child to keep child warm. 3. Keep room warm, no draughts. 4. Keep bedding/clothes dry. Dry carefully after bathing (do not bathe if very ill). 5. Avoid exposure during examinations, bathing. 6. Use a heater or incandescent lamp with caution, do not use hot bottle water or fluorescent lamp. |
| <p>Emergency Eye Care Corneal Ulceration</p> | <p>If corneal ulceration:</p> <ol style="list-style-type: none"> 1. Give Vitamin A immediately (<6 months 50,000IU, 6-12 months 100,000 IU, >12 months 200,000IU) 2. Instil one drop atropine (1%) into affected eye to relax the eye and prevent the lens from pushing out. |

10 steps protocol for the inpatient management of severe malnutrition wall chart.

PROTOCOL FOR THE IN-PATIENT MANAGEMENT OF SEVERELY MALNOURISHED CHILDREN

| STEP | PREVENTION | WARNING SIGNS | IMMEDIATE ACTION |
|---|--|---|--|
| <p>1. Treat or prevent Hypoglycemia <i>(Low blood sugar)</i></p> <p>Hypoglycemia is a blood glucose <3mmol/L</p> | <p>For all children:-</p> <ol style="list-style-type: none"> 1. Feed straightaway and then every 2-3 hours, day and night. 2. Encourage mothers to watch for any deterioration, help feed and keep child warm. | <ol style="list-style-type: none"> 1. Low temperature (hypothermia) noted on routine check. 2. Lethargy, limpness and loss of consciousness. 3. Child can become drowsy. | <p>Perform Dextrostix test on admission, before giving glucose or feeding. If hypoglycemia is suspected and no dextrostix are available or if it is not possible to get enough blood for test, assume that the child has hypoglycemia and give treatment immediately without laboratory confirmation.</p> <p>If conscious:</p> <ol style="list-style-type: none"> 1. Give a bolus of 10% glucose (50ml) or sugar solution (1 rounded teaspoon sugar in 3 tablespoons of water). Bolus of 10% glucose is best, but give sugar solution or F75 formula rather than wait for glucose. 2. Start feeding straightaway: Feed 2-hourly (12 feeds in 24 hours). Use feed chart to find amount to give and feed every 2-3 hours day and night. <p>If unconscious, give glucose IV (5ml/kg of sterile 10% glucose), followed by 50 ml of 10% glucose or sucrose by NG tube.</p> |
| <p>2. Treat or prevent Hypothermia <i>(Low temperature)</i></p> <p>Hypothermia is a rectal temperature <35.5°C (95.9°F) or an underarm temperature <35°C (95°F).</p> | <p>For all children:-</p> <ol style="list-style-type: none"> 1. Feed straightaway and then every 2-3 hours, day and night. 2. Keep warm. 3. Use the kangaroo technique, cover with a blanket. Let mother sleep with child to keep child warm. 3. Keep room warm, no draughts. 4. Keep bedding/clothes dry. Dry carefully after bathing (do not bathe if very ill). 5. Avoid exposure during examinations, bathing. 6. Use a heater or incandescent lamp with caution, do not use hot bottle water or fluorescent lamp. | <p>Low temperature</p> <p>NOTE: Hypothermia in malnourished children often indicates coexisting hypoglycemia and serious infection.</p> | <p>Take rectal temperature on admission. (Ensure thermometer is well shaken down).</p> <p>If the rectal temperature is below 35.5°C:</p> <ol style="list-style-type: none"> 1. Feed straightaway (or start rehydration if needed). 2. Re-warm. Put the child on the mother's bare chest (skin to skin contact) and cover them, OR clothe the child including the head, cover with a warmed blanket and place a heater or lamp nearby. 3. Feed 2-hourly (12 feeds in 24 hours). <p>Monitor during re-warming</p> <ul style="list-style-type: none"> • Take rectal temperature every two hours: stop re-warming when it rises above 36.5°C • Take every 30 minutes if heater is used because the child may become overheated. |
| <p>3. Treat or prevent dehydration <i>(Too little fluid in the body)</i></p> | <p>When a child has watery diarrhoea, give ReSoMal between feeds after each loose stool. As a guide, give 50-100ml after each watery stool if child is aged <2 years, or 100-200ml if aged 2 years or older.</p> | <p>Profuse watery diarrhoea, thirst, hypothermia, sunken eyes, weak or absent radial pulse, cold hands and feet, reduced urine output.</p> | <p>DO NOT GIVE IV FLUIDS EXCEPT IN SHOCK (see separate protocol for treating shock)</p> <p>If dehydrated:</p> <ol style="list-style-type: none"> 1. Give ReSoMal 5ml/kg every 30 minutes for 2 hours (orally or by nasogastric tube) 2. Then give 5-10ml/kg in alternate hours for up to 10 hours (i.e. give ReSoMal and F75 formula in alternate hours). Use Initial Management Chart. 3. Stop ReSoMal when there are 3 or more hydration signs, or signs of over-hydration. <p>Monitor during rehydration for signs of over-hydration:</p> <ul style="list-style-type: none"> • increasing pulse and respiratory rate • increasing oedema and puffy eyelids <p>Check for signs at least hourly. Stop if pulse increases by 25 beats/minute and respiratory rate by 5 breaths/minute.</p> |
| <p>4. Correct electrolyte imbalance <i>(Too little potassium and magnesium, and too much sodium)</i></p> | <ol style="list-style-type: none"> 1. Use ReSoMal and F75 formula as these are low in sodium. 2. Do not add salt to food introduced during the rehabilitation phase. | <p>Oedema develops or worsens.</p> | <p>Follow feeding recommendation, as well as recommendation or prevention or treatment of dehydration:</p> <p>Extra potassium (4mmol/kg body weight) and magnesium (0.6mmol/kg) are important.</p> <p>For potassium, add CMV or electrolyte/mineral solution or 10% potassium chloride solution to feeds and to prepare ReSoMal. If these are unavailable, give crushed Slow K ½ tablet/kg body weight daily.</p> <p>For magnesium, add CMV or electrolyte/mineral solution to feeds and to ReSoMal.</p> <p>NOTE: Potassium and magnesium are already added in ready to dilute F75 and F100 packets.</p> |

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|---|---|---|--|
| <p>5. Treat infections</p> | <ol style="list-style-type: none"> 1. Keep malnutrition ward in a separate room 2. Reduce overcrowding if possible. 3. Wash hands before preparing feeds and before and after dealing with any child. 4. Give measles vaccine to unimmunized children over 6 months of age. 5. Good nursing care | <p>NOTE: The usual signs of infection, such as fever, are often absent so assume all severely malnourished children have infection and treat with antibiotics.</p> <p>Hypothermia and hypoglycaemia are signs of severe infection.</p> <p>NOTE: ensure all doses are given. Give them on time.</p> | <p>Starting on the first day, give broad-spectrum antibiotics* to all children.</p> <p>1. If the child has no complications, give:- Cotrimoxazole 5 ml paediatric suspension orally twice a day for 5 days</p> <p style="text-align: center;">OR</p> <p>2. If the child is severely ill (apathetic, lethargic) or has complications (hypoglycemia, hypothermia, raw skin/fissures, respiratory tract or urinary tract infection) give IV/IM ampicillin AND gentamicin.</p> <ul style="list-style-type: none"> • Ampicillin: 50mg/kg IM/IV 6-hourly for 2 days, then oral amoxycillin 15mg/kg 8-hourly for 5 days or if amoxycillin is not available continue with ampicillin but give orally, 50mg/kg 6-hourly • Gentamicin: 7.5mg/kg IM/IV once daily for 7 days. <p>In addition, give Metronidazole according to national policy.</p> <p>If a child fails to improve after 48 hours ADD chloramphenicol 25mg/kg 8 hourly IM/IV for 5 day.</p> <p>* Should be in line with national policy. For parasitic worms (helminthiasis, whipworm): treatment should be delayed until the rehabilitation phase. For children over 2 years: Give Albendazole (400 mg, single dose) and Mebendazole 100mg orally twice a day for three days. For children under 2 years: Give pyrantel (10 mg/kg, single dose) or ascariasis with pyrantel or piperazine.</p> |
| STEP | | MANAGEMENT | |
| <p>6. Correct micronutrient deficiencies</p> | <ol style="list-style-type: none"> 1. Give Vitamin A on day 1. If under 6 months give 50,000 units; if 6-12 months give 100,000 units; and if >12 months give 200,000 units. If the child has any signs of vitamin A deficiency, repeat this dose on day 2 and day 14. <p>Give the following daily:</p> <ol style="list-style-type: none"> 2. Folic acid : 5mg on day 1; then 1 mg daily if micronutrients not included in the feeds. 3. Multivitamin syrup 5 ml only if micronutrients not included in the feeds. 4. Zinc (2mg/kg body weight) and copper (0.3mg/kg body weight) if micronutrients not included in the feeds 5. Start iron (3mg/kg/day) after 2 days on F100 catch-up formula. (Do not give iron in the stabilisation phase and do not give iron if child receiving RUTF) <p>NOTE: Vitamin A, folic acid, multivitamins, zinc and copper are already added in F75 and F100 packets. They are also in CMV.</p> | | |
| <p>7. Begin cautious feeding stabilisation phase and transition phase</p> | <p>Stabilisation phase:</p> <ol style="list-style-type: none"> 1. Give F75 formula (see feed chart for amounts). These provide 130ml/kg/day. 2. Give 8-12 feeds over 24 hours 3. If the child has oedema +++, reduce the volume to 100 ml/kg/day (see feed chart for amounts) 4. If the child has poor appetite, encourage the mother to coax and support the child finishing the feed. If eating 80% or less of the amount offered for 2 consecutive feeds, use a nasogastric tube. If in doubt, see feed chart for intakes below which tube feeding is needed. 5. Keep a 24-hour intake chart. Measure feeds carefully. Record leftovers. 6. If the child is breastfed, encourage continued breastfeeding but also give F75. 7. Transfer to F100 formula as soon as appetite has returned (usually within one week) and oedema has been lost or is reduced 8. Weigh daily and plot weight. <p>Transition phase:</p> <ol style="list-style-type: none"> 1. Change to F100: <ul style="list-style-type: none"> • for 2 days, replace F75 with the same amount of F100 <p>on the next day increase each feed by 10ml until some feed remains uneaten.</p> | | |
| <p>8. Increase feeding to recover weight loss: "Catch-up growth" rehabilitation phase</p> | <ol style="list-style-type: none"> 1. Give 6 feeds over 24 hours. These can be 3 feeds of F100 and 3 specially modified family meals, high in energy and protein. Ready-to-use therapeutic food is an alternative to F100, recommended to be given if the child is being referred to outpatient care. 2. Encourage the child to eat as much as possible, so the child can gain weight rapidly. If the child is finishing everything, offer more and increase subsequent feeds. Make sure that the child is actively fed. 3. Weigh daily and plot weight. | | |
| <p>9. Stimulate emotional and sensorial development: Loving care, play and stimulation</p> | <ol style="list-style-type: none"> 1. Provide tender loving care 2. Help and encourage mothers to comfort, feed, and play with their children 3. Give structured play when the child is well enough. | | |
| <p>10. Prepare for discharge and follow-up.</p> | <ol style="list-style-type: none"> 1. Obtain information on family background and socio-economic status. 2. Instruct mothers how to modify family foods, how often to feed and how much to give. 3. Establish a link with community health workers for home follow-up. 4. Write full clinical summary in patient-held card. 5. Send a referral letter to the clinic. 6. If outpatient management of severe malnutrition exists, inform the mother of the closest outpatient care referral point to her home and give the mother a weekly ration of RUTF for home based rehabilitation. | | |

