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Programme for the Control of Diarrhoeal Diseases

# A MANUAL FOR THE TREATMENT OF DIARRHOEA

*For use by physicians  
and other senior  
health workers*



World Health Organization

## CONTENTS

1. Introduction .....	1
2. Purpose of this manual .....	2
3. Diarrhoea and dehydration .....	3
3.1 Definition of diarrhoea .....	3
3.2 Dehydration.....	3
4. Assessment of the diarrhoea patient .....	5
4.1 History.....	5
4.2 Physical examination .....	5
4.3 Determining the degree of dehydration .....	6
4.4 Weighing the patient.....	6
5. Management of acute diarrhoea .....	8
5.1 Basic principles .....	8
5.2 Prevention of dehydration .....	8
5.3 Management of the dehydrated patient .....	9
5.3.1 General considerations .....	9
5.3.2 Oral rehydration therapy (ORT) for patients with some dehydration .....	11
5.3.3 Intravenous (IV) therapy for patients with severe dehydration .....	13
5.4 Nutritional management of acute diarrhoea.....	15
6. Management of associated problems .....	18
6.1 Electrolyte disturbances .....	18
6.1.1 Hypernatraemia .....	18
6.1.2 Hyponatraemia .....	18
6.1.3 Hypokalaemia .....	18
6.2 Blood in the stool (dysentery) .....	18
6.3 Persistent diarrhoea .....	19
6.4 Severe protein-energy undernutrition.....	20
6.5 Fever .....	21
6.6 Convulsions .....	21
6.7 Vitamin A deficiency .....	21
7. Drugs and antimicrobial agents .....	23
7.1 Antimicrobial agents .....	23
7.2 "Antidiarrhoeal" drugs .....	25
7.3 Other drugs .....	25
8. Prevention of diarrhoea .....	27
8.1 Breast-feeding .....	27
8.2 Improved weaning practices .....	28
8.3 Use of safe water .....	29
8.4 Hand-washing .....	29
8.5 Use of latrines and proper disposal of stools .....	29
8.6 Measles immunization .....	29

Annex 1.	Important microbial causes of acute diarrhoea in infants and young children .....	30
Annex 2.	Rehydration solutions: composition and physiological considerations .....	33
Annex 3.	Comparison of previous and current classifications of dehydration status .....	36
Annex 4.	Treatment Plan A – to treat diarrhoea at home .....	37
Annex 5.	Treatment Plan B – to treat dehydration .....	38
Annex 6.	Answers to questions on oral rehydration therapy often asked by health workers.....	39
Annex 7.	Treatment Plan C – to treat severe dehydration quickly .....	43
Annex 8.	Management of associated problems .....	44
Annex 9.	Growth chart .....	45
Annex 10.	How to determine if a child is undernourished .....	46

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## 1. INTRODUCTION

The diarrhoeal diseases are a leading cause of childhood morbidity and mortality in the developing countries, and a major cause of undernutrition. An analysis carried out by WHO in 1988 of data from surveys and other sources indicated that over 1.3 thousand million episodes of diarrhoea occur each year in children under 5 years of age in Asia (excluding China), Africa, and Latin America, and that 4 million children in this age group die annually from diarrhoea; 80% of these deaths occur in the first 2 years of life. Repeated attacks of diarrhoea lead to undernutrition and poor growth because of reduced food intake (owing to anorexia or withholding of food), malabsorption of nutrients, and increased nutrient requirements. A number of studies have shown acute diarrhoeal diseases to be more severe and to last longer in undernourished infants and young children. These diseases are also a significant cause of morbidity and lost working time among older children and adults in many countries.

Many new viruses and bacteria have been recognized as causes of diarrhoea during the past two decades, with the result that it is now possible to identify the causative agents in over three-quarters of diarrhoea patients presenting at health facilities. A number of studies have shown that it is nearly always the same organisms that are the most important causes of diarrhoea in the developing countries. Some information about the most common diarrhoea pathogens is summarized in Annex 1.

A significant development in recent years has been the discovery that dehydration from acute diarrhoeas of all etiologies and in all age groups can be safely and effectively treated by the simple method of oral rehydration using a single fluid. Glucose, sodium chloride, trisodium citrate, dihydrate<sup>1</sup>, and potassium chloride – in a mixture known as Oral Rehydration Salts (ORS) – are dissolved in water to form ORS solution (Annex 2). Given orally, ORS solution is absorbed in the small intestine even during copious diarrhoea, thus replacing the water and electrolytes lost in the faeces. Oral rehydration therapy and appropriate feeding during and after diarrhoea are the major elements of the case management strategy promoted by the Diarrhoeal Diseases Control (CDD) Programme of WHO, which is aimed at reducing deaths from diarrhoea and diarrhoea-associated undernutrition. Improved management of cases also serves as an effective entry point for the promotion of appropriate child care and environmental health practices for reducing diarrhoea morbidity, which is a long-term goal of the Programme.

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<sup>1</sup>Sodium hydrogen carbonate (sodium bicarbonate) can be used instead of trisodium citrate, dihydrate. The formula containing trisodium citrate has been shown to be more stable and, under suitable climatic conditions, requires less expensive packaging material.

## 2. PURPOSE OF THIS MANUAL

This manual describes the principles and practices of treating diarrhoea in all ages, placing special emphasis on the use of oral rehydration therapy (ORT) in infants and young children, the most vulnerable group, and proper dietary management during and after diarrhoea. It also outlines the child care practices that are vital for the prevention of diarrhoea, including breast-feeding, appropriate weaning practices, and domestic hygiene. It is recognized that this manual may require adaptation to suit local needs and situations.

The manual is intended for physicians and other senior-level health workers. Another publication is available to assist in the training of peripheral health staff (in particular, community health workers). This is entitled: "The treatment and prevention of acute diarrhoea - Practical guidelines" 2nd edition, WHO (1989). There are minor differences in the management procedures described in these documents for two reasons: first, diarrhoea patients seen by physicians and other senior health workers are more likely to be seriously ill than those managed by peripheral level workers, and second, there is a need to simplify patient management for peripheral level workers.

This manual was initially published in 1980 and revised in 1984. This second revision reflects recent clinical experience and research findings in the area of case management, and an effort by the Programme to make its content consistent with other documents and materials of the CDD Programme. The manual no longer focuses entirely on acute watery diarrhoea, but also provides guidelines for the management of persistent diarrhoea and dysentery. Its title has therefore been modified. The most notable change compared with previous versions is in the classification of dehydration. Instead of the categories of "none", "mild", "moderate", and "severe dehydration", the manual classifies diarrhoea cases as having "**no signs of dehydration**", "**some dehydration**", and "**severe dehydration**", and describes a specific treatment plan for each category. Children with no signs of dehydration are treated at home with increased amounts of fluid and continued feeding (Treatment Plan A), children with some dehydration receive ORS solution in the health facility (Treatment Plan B), and children with severe dehydration are treated with intravenous fluid (Treatment Plan C). The previous classification of dehydration and the one used in this manual are compared in Annex 3.

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### 3. DIARRHOEA AND DEHYDRATION

#### 3.1 Definition of diarrhoea

It is difficult to give a precise definition of diarrhoea because the usual frequency with which stools are passed and the consistency and bulk of the stools depend very much on diet, which varies from one society to another. In general terms, diarrhoea may be defined as the passing of liquid or watery stools. The liquid stools are usually passed at least 3 times in a 24-hour period; however, it is the consistency rather than the number of stools that is the most important feature. Frequent passing of formed stools cannot be considered as diarrhoea. Babies fed only breast milk often pass loose, "pasty" stools; this also is not diarrhoea. In most societies mothers will know when their children have diarrhoea and may themselves provide a useful working definition for the local situation.

Diarrhoea may be acute, lasting hours or days, or persistent, lasting for 2 weeks or longer, and sometimes for months. Diarrhoea may also be bloody, in which case it is called dysentery. The manual provides guidelines for the management of each of these types of diarrhoea.

#### 3.2 Dehydration

During diarrhoea there is a loss of water and electrolytes (sodium, chloride, potassium, and bicarbonate) from the body through the diarrhoeal stool. Fluid and electrolytes are also lost through vomit, sweat, urine, and breathing. Dehydration occurs when these losses are not replaced adequately and the body develops a deficit of water and electrolytes.

The volume of fluid lost through the stools in 24 hours can vary from 5 ml/kg (near normal) to 100-200 ml/kg or more. The concentration and amounts of electrolytes lost are also variable. The total body sodium deficit in infants with severe dehydration due to diarrhoea is usually about 70-110 millimoles per litre of water deficit. Potassium and chloride losses are in a similar range. Deficits of this magnitude can occur with acute diarrhoea of any etiology, although some agents are more apt to cause clinically evident dehydration (e.g., rotavirus, *Vibrio cholerae* O1).

The degree of dehydration is graded according to clinical signs and symptoms that reflect the amount of fluid lost. In the very early stages of dehydration there may be no signs or symptoms, or dehydration may be characterized only by increased thirst. As dehydration increases, fluid loss is manifested by thirst, restless or irritable behaviour, decreased skin turgor, dry mucous membranes, sunken eyes, sunken fontanelle (in infants), and absence of tears. In severe dehydration, these signs and symptoms become more pronounced and the patient may develop evidence of hypovolaemic shock, including diminished consciousness, lack of urine output, and diminished blood flow to the extremities. Death may follow if rehydration is not started quickly.

Infants, older children, and adults with comparable degrees of dehydration from acute diarrhoea have similar water and electrolyte deficits per unit of body weight. Thus, it is feasible to use similar rehydration solutions to treat dehydration associated with diarrhoea of all causes and in all age groups.

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## 4. ASSESSMENT OF THE DIARRHOEA PATIENT

A patient with diarrhoea should be assessed to determine the nature and pattern of the diarrhoea, the degree of dehydration (no signs, some, or severe dehydration), and the presence of any other problems (e.g., blood in the stool or severe undernutrition) so that appropriate treatment can be started without delay.

### 4.1 History

A history should be taken from the patient or a family member.

**ASK** questions to obtain information on:

- duration of diarrhoea;
- consistency of stool;
- presence of blood in the stool;
- presence of fever, convulsions, or other problems (e.g., cough, recent measles);
- pre-illness feeding practices;
- type and quantity of fluids (including breast milk) and food consumed during the illness; and
- drugs or other remedies taken.

There is no purpose in asking about the presence of mucus in the stool, since there is no significant association between its presence and the etiology or outcome of diarrhoea.

The above information should be recorded on an appropriate form.

### 4.2 Physical examination

A careful physical examination should be performed. Particular attention should be paid to the symptoms and signs of dehydration.

**LOOK** at the patient:

- General condition: alert; restless or irritable; floppy, lethargic or unconscious; severely undernourished?
- Are the eyes: sunken, or very sunken and dry?
- Are there tears when the child cries?
- Are the mouth and tongue: moist, dry, or very dry?
- When water is offered to drink: is it taken normally, eagerly, or is the patient unable to drink?

**FEEL** to assess the following:

- Skin turgor. When the skin over the abdomen or the thigh is pinched and released does it flatten: quickly, slowly, or very slowly?

Two additional points are worth noting:

- With severe dehydration hypovolaemic shock may occur. The signs of this include cool, moist extremities, a rapid, feeble pulse (the radial pulse may be undetectable), low or undetectable blood pressure, peripheral cyanosis and central nervous system changes (lethargy, stupor, coma).

- Fever is sometimes associated with severe dehydration in children, or it may be caused by another infection, such as malaria or pneumonia. It is advisable to take the temperature since the skin may be cool despite high fever.

#### 4.3 Determining the degree of dehydration

When examining the patient, use the chart in Table 1 to determine the degree of dehydration and thus the Treatment Plan (A, B, or C) to be used. The signs in column A are typical of patients with **no signs of dehydration**, the signs of **some dehydration** are in column B, and those of **severe dehydration** are in column C. The signs in **bold print with asterisks (\*)** are the most valuable for assessing dehydration; these are called "**key signs**". As a guide, if two or more of the signs from column C are present, *including at least one key sign*, the patient should be considered to have severe dehydration. If this is not the case, but two or more signs from column B (and C) are present, *including at least one key sign*, the patient should be considered to have some dehydration. If this also is not the case, the patient should be considered to have no signs of dehydration. The signs and symptoms that may require special interpretation are accompanied by footnotes in Table 1. It is emphasized that the best tool for assessing dehydration is keen observation based on experience.

#### 4.4 Weighing the patient

Weighing the patient (when combined with clinical assessment of the extent of dehydration) is useful for estimating the fluid requirements. The extent of dehydration is indicated as follows: the category "no signs of dehydration" corresponds to a fluid deficit of less than 50 ml per kg of body weight (<5%); "some dehydration" indicates a deficit of 50-100 ml per kg of body weight (5-10%); and "severe dehydration" means a deficit of more than 100 ml per kg of body weight (>10%). Thus, a child weighing 5 kg and showing signs of "some dehydration" has a fluid deficit of 250-500 ml.

If possible, patients assessed as having some dehydration or severe dehydration should be weighed, as an aid in estimating the fluid requirements. *However, treatment should never be delayed because a weighing machine is not readily available.* In infants and young children, if weighing is not feasible, the child's age may be used to estimate the weight, as shown in Table 2, section 5.3.2.

During the assessment of patients with diarrhoea it is important to identify those with severe undernutrition, since they need to be referred for rehydration and nutritional therapy (see section 6.4). Growth monitoring measurements should be recorded only after the child has been fully rehydrated.

**Table 1: Assessment of diarrhoea patients for dehydration**

<b>FIRST, ASSESS YOUR PATIENT FOR DEHYDRATION</b>			
	<b>A</b>	<b>B</b>	<b>C</b>
<b>1. LOOK AT: CONDITION</b>	Well, alert	<b>* Restless, irritable *</b>	<b>* Lethargic or unconscious; floppy *</b>
EYES <sup>1</sup>	Normal	Sunken	Very sunken and dry
TEARS	Present	Absent	Absent
MOUTH and TONGUE <sup>2</sup>	Moist	Dry	Very dry
THIRST	Drinks normally, not thirsty	<b>*Thirsty, drinks eagerly *</b>	<b>* Drinks poorly or not able to drink *</b>
<b>2. FEEL: SKIN PINCH<sup>3</sup></b>	Goes back quickly	<b>* Goes back slowly *</b>	<b>* Goes back very slowly *</b>
<b>3. DECIDE:</b>	The patient has <b>NO SIGNS OF DEHYDRATION</b>	If the patient has two or more signs, including at least one <b>* sign *</b> , there is <b>SOME DEHYDRATION</b>	If the patient has two or more signs, including at least one <b>* sign *</b> , there is <b>SEVERE DEHYDRATION</b>
<b>4. TREAT:</b>	Use Treatment Plan A	Weigh the patient, if possible, and use Treatment Plan B	Weigh the patient and use Treatment Plan C <b>URGENTLY</b>

<sup>1</sup> In some infants and children the eyes normally appear somewhat sunken. It is helpful to ask the mother if the child's eyes are normal or more sunken than usual.

<sup>2</sup> Dryness of the mouth and tongue can also be palpated with a clean finger. The mouth may always be dry in a child who habitually breathes through the mouth. The mouth may be wet in a dehydrated patient owing to recent vomiting or drinking.

<sup>3</sup> The skin pinch is less useful in infants or children with marasmus (severe wasting) or kwashiorkor (severe undernutrition with oedema), or obese children. Other signs that may be altered in children with severe undernutrition are described in section 6.4.

These three topics are discussed in sections 5.2, 5.3, and 5.4. The management of patients with dysentery, persistent diarrhoea, severe undernutrition, or fever is discussed later.

## 5. MANAGEMENT OF ACUTE DIARRHOEA

**5.1 Basic principles** The essential parts of the management of patients with acute diarrhoea are:

- **prevention of dehydration**, if there are no signs of dehydration;
- **treatment of dehydration**, when it is present; and
- **feeding** during and after diarrhoea, to prevent nutritional damage.

### 5.2 Prevention of dehydration

Most patients with diarrhoea show no signs or symptoms of dehydration. However, they require extra quantities of appropriate home fluids to replace the continuing water and electrolyte losses due to diarrhoea and to provide for their normal daily fluid requirements. If these are not given, dehydration may develop. Mothers should be taught how to prevent dehydration **at home** by giving the child increased amounts of fluid, how to continue feeding the child, and why these actions are important. They should also know how to recognize the signs indicating that the child should be taken to a health worker. These steps are summarized in **Treatment Plan A** (Annex 4).

There are three rules for treating diarrhoea at home:

#### **Rule 1. Give the child more fluids than usual to prevent dehydration**

##### **Suitable fluids**

The following types of fluid may be used for home therapy:

- **Food-based fluids.** These include gruels (i.e., thick drinks made from cooked rice, wheat, maize, sorghum, millet, cassava, etc.), soups, and yoghurt-like drinks. Soups may contain legumes, cereals, or potatoes, or meat or fish. If possible, these fluids should be lightly salted – i.e., about 3 g/l of common salt.
- **A special sugar-salt solution**, containing about 3 g/l of salt and 18 g/l of sugar.
- **ORS solution.** This is the recommended fluid for the treatment of dehydration, but it can also be used to prevent dehydration.
- **Water.** This is most effective when given with food that contains some salt.

In many countries, there is a nationally recommended home fluid. It is important to remember that a home fluid should be:

- **Readily available:** the ingredients are easy to obtain and inexpensive; preparation is easy.
- **Safe:** the recipe allows an appreciable margin of error to accommodate possible errors in preparation, so that fluids are unlikely to have excessive osmolality (>300 mOsm/l) or content of sodium (>100 mmol/l).

- Familiar: the basic recipe is widely known.
- Acceptable for use during diarrhoea: there are no cultural taboos against its use; the taste is agreeable.
- Considered suitable for giving in large volumes: it should be considered a "drink" that is given freely to satisfy thirst.
- Effective: this is most likely when the fluid contains about 50 mmol/l of salt (3 g/l) and cooked starch (up to 80 g/l) or sucrose (50 mmol/l or 18 g/l).

### Quantity of fluid

The general rule is to give as much fluid as the child or adult wants. As a guide, after each loose stool, children under 2 years old should be given approximately 50-100 ml (a quarter to half a large cup) of fluid; children aged 2 up to 10 years should be given 100-200 ml (a half to one large cup); older children and adults should drink as much as they want.

### Rule 2. Give the child plenty of food to prevent undernutrition

Food should *never* be withheld during diarrhoea. To prevent undernutrition feeding should be continued during diarrhoea and increased afterwards. Breast-feeding should continue without interruption. Other foods, including animal milk and formula (if normally given) should also be continued (except during the rehydration phase of treatment for children on Plan B or Plan C). The aim is to give as much nutrient-rich food as the child will accept. Guidelines on what types of food to give and on the frequency of feeding are given in section 5.4.

### Rule 3. Watch for signs of dehydration and other problems

Explain to the mother that she should take her child to a health worker if the child does not get better in 3 days or:

- starts to pass many stools;
- has repeated vomiting;
- becomes very thirsty;
- is eating or drinking poorly;
- develops a fever;
- has blood in the stool.

## 5.3 Management of the dehydrated patient

### 5.3.1 General considerations

The main principles of fluid therapy are that any existing deficit of water and electrolytes should be promptly corrected and the **continuing output** of water and electrolytes from the body through stools, vomit, urine, sweat, and insensible losses should be replaced as it occurs by the input of water and electrolytes.

It is useful to consider the fluids administered to a dehydrated patient during the management of acute diarrhoea as meeting the following three essential needs:

- **Correction of the existing water and electrolyte deficit**, as indicated by signs of dehydration. This **treatment of dehydration** (called the rehydration phase) can usually be achieved by giving ORS solution to drink. However, in cases with severe dehydration, frequent and severe vomiting, or another complication that prevents successful oral therapy, intravenous (IV) therapy is needed.
- **Replacement of ongoing abnormal losses of water and electrolytes** due to continuing diarrhoea. This **prevention of further dehydration** (called the maintenance phase) can be achieved using ORS solution.
- **Provision of normal daily fluid requirements**. These should be given as fluids that contain little or no salt (e.g., plain water, breast milk, or correctly prepared milk feeds). Such fluids are particularly important for infants. Owing to their large surface area relative to body weight, and their greater metabolic rate, they normally require 2.5 times more water per kg of body weight than adults. If these water requirements are not met, dehydration with hypernatraemia may occur.

#### **Monitoring during rehydration**

Patients receiving rehydration therapy, either orally or intravenously, should be carefully monitored. They should be reassessed after 1 hour of therapy and then every 1-2 hours to check that the fluid is being administered satisfactorily and the signs of dehydration are disappearing. Particular attention should be paid to:

- the number and volume of stools passed;
- the frequency of vomiting; and
- changes in the signs of dehydration.

After 4-6 hours for infants and 3 hours for older children and adults, a full reassessment of the patient should be made. The patient may be considered to be rehydrated when reassessment according to Table 1 indicates that there are "no signs of dehydration". When rehydration is complete:

- skin turgor is normal;
- thirst has subsided;
- urine is passed; and
- the child becomes quiet (often falling asleep) and is no longer irritable.

If at any time signs of overhydration appear, such as oedematous (puffy) eyelids, stop giving ORS solution or IV fluid, but give breast milk or plain water. When the oedema has gone, give ORS solution according to Plan A.

Any patient who is kept longer than 4-6 hours in a health facility should be offered some food and drink every 3-4 hours as described in Treatment Plan A. Breast-feeding should be continued throughout rehydration therapy or restarted as soon as the child is able to feed.

**5.3.2 ORT for patients with some dehydration** Patients with some dehydration can be managed with oral rehydration therapy (ORT) following **Treatment Plan B**, which is shown in Annex 5 and discussed below.

**Volume of ORS solution required**

ORS solution (see Annex 2) is the treatment of choice for patients with some dehydration. Existing water and electrolyte deficits must be corrected promptly and adequately. The table in Treatment Plan B (Table 2) can be used to estimate the volume of ORS solution required for rehydration. If the patient's weight is known, this should be used to determine the **approximate** volume of solution needed. If the patient's weight is not known, select the approximate volume according to the patient's age. The **exact** amount of solution to be given will depend on the patient's dehydration status, but will usually fall within the range shown. Patients with many or more marked signs of dehydration will require more solution than those with fewer or less marked signs. If a patient wants more ORS solution than the volume shown on the chart, and there are no signs of overhydration, give more.

**Table 2: Guidelines for treating patients with some dehydration**

APPROXIMATE AMOUNT OF ORS SOLUTION TO GIVE IN THE FIRST 4 HOURS:						
Age: <sup>*</sup>	Less than 4 months	4 - 11 months	12 - 23 months	2 - 4 years	5 - 14 years	15 years or older
Weight:	Less than 5 kg	5 - 7.9 kg	8 - 10.9 kg	11 - 15.9 kg	16 - 29.9 kg	30 kg or more
in ml	200 - 400	400 - 600	600 - 800	800 - 1200	1200 - 2200	2200 - 4000
in local measure						

\* Use the patient's age only when you do not know the weight. The approximate amount of ORS required (in ml) can also be calculated by multiplying the patient's weight (in grams) times 0.075.

- If the child wants more ORS than shown, give more.
- Encourage the mother to continue breast-feeding.
- For infants under 6 months who are not breast-fed, also give 100-200 ml clean water during this period.

Notes:

1. The volumes and time shown are guidelines based on usual needs. If necessary, the rate of administration can be increased, or the ORS solution can be given at the same rate for a longer period to achieve rehydration. Similarly, the amount of fluid given should be decreased if hydration is achieved earlier than expected.
2. During the initial stages of therapy, while still dehydrated, adults can consume up to 750 ml per hour, if necessary, and children up to 20 ml per kg body weight per hour.

### Administration of ORS solution

A family member should always be shown how to prepare and give ORS solution. The solution should be given to infants and young children using a clean cup and spoon. Feeding bottles should *not* be used. For babies, a dropper or syringe (without the needle) can be used to put small volumes of solution into the mouth. Children under 2 years of age should be offered a teaspoonful every 1-2 minutes; older children and adults may take frequent sips directly from the cup.

Vomiting often occurs during the first hour or two of administration (especially when children drink the solution too quickly), but usually does not prevent successful oral rehydration. If the patient vomits, wait 5-10 minutes and then start giving ORS solution again but more slowly, for example, a spoonful every 2-3 minutes.

Answers to questions on the use of ORS solution often asked by health workers are presented in Annex 6.

### Assessing the progress of oral rehydration

Check the patient from time to time during the rehydration period as described above (see section 5.3.1). After 4 hours, a full reassessment of the patient should be made, following the assessment chart in Table 1. LOOK and FEEL for all the signs of dehydration. Then decide what treatment to give next:

- If the patient has been passing frequent watery stools and signs indicating **severe dehydration** have appeared, IV therapy should be started following Plan C.
- If the patient still has signs indicating **some dehydration**, continue oral rehydration therapy by repeating Treatment Plan B. Start to offer food, milk, and juice as described in Plan A and continue to reassess the patient regularly.
- If there are **no signs of dehydration**, teach the mother how to treat her child at home with ORS solution and food following Treatment Plan A. Give her enough ORS packets for 2 days (see Annex 4). Also teach her the signs which indicate that she should bring her child back.

### Meeting normal fluid requirements

While treatment to replace the existing water and electrolyte deficit is in progress the patient's **normal daily fluid requirements** must also be met. This can be done in the following ways:

- **Breast-fed infants:** Breast-feeding should be continued, even *during* oral rehydration, as often as the infant desires.
- **Non-breast-fed infants under 6 months of age:** During rehydration with ORS solution, 100-200 ml of plain water should also be given by mouth.

- **Older children and adults:** Throughout rehydration and maintenance therapy they should be offered as much plain water to drink as they wish, *in addition to* ORS solution.

### Interruption of oral rehydration therapy

If the mother and child have to leave before rehydration with ORS solution is completed:

- show the mother how much ORS solution to give to finish the 4-hour treatment at home;
- give her enough ORS packets to complete the 4-hour treatment and to continue oral rehydration for 2 more days, as shown in Plan A (Annex 4);
- show her how to prepare ORS solution; and
- explain to her the three rules in Plan A for treating her child at home:
  1. give the child ORS solution and other fluids until the diarrhoea stops;
  2. encourage the child to eat every 3-4 hours; and
  3. look for signs or symptoms indicating that she should bring her child back to a health worker.

### 5.3.3 IV therapy for patients with severe dehydration

Patients with severe dehydration, extreme fatigue (that interferes with drinking), stupor, coma, or uncontrollable vomiting should be rehydrated intravenously (if possible) following **Treatment Plan C** (Annex 7). If possible, the patient should be admitted to hospital. Guidelines for intravenous rehydration are given in Table 3.

Ringer's Lactate Solution is the preferred IV solution for correcting the fluid and electrolyte deficits of severe dehydration. If it is not available, one of the other IV solutions listed in Annex 2 may be used.

Patients who can drink, even poorly, should be given ORS solution by mouth until the drip is running. In addition, *all* patients should start to receive some ORS solution (about 5 ml/kg/h) when they can drink without difficulty, which is usually within 3-4 hours (for infants) or 1-2 hours (for older patients). This provides some base and potassium, which may not be adequately supplied by the IV fluid.

### Monitoring the progress of IV rehydration

Patients should be reassessed after the first 30 minutes (older patients) or 60 minutes (infants) to make sure that a strong radial pulse is present. Thereafter they should be reassessed every 1-2 hours to see whether hydration is improving. If it is not, the IV drip should be given more rapidly.

After 6 hours for infants, or 3 hours for older patients, when the planned amount of IV fluid has been given, a full reassessment of the hydration status should be made. **LOOK AND FEEL** for all the signs of dehydration.

- If signs of **severe dehydration** are still present, Treatment Plan C should be repeated. However, this is very unusual, occurring only if the patient is passing voluminous watery stools frequently during the rehydration period.
- If the patient is improving but still shows signs of **some dehydration**, give ORS solution for 4 hours in the amount specified in Treatment Plan B.
- If there are **no signs of dehydration**, continue treatment following Treatment Plan A. If possible, observe the patient for at least 6 hours before discharge while the mother gives the child ORS solution, to make sure that she is able to maintain the child's hydration. Remember that the patient will require therapy with ORS solution (or home fluids) as long as the diarrhoea continues, to prevent dehydration from returning. If the child cannot remain at the treatment centre or hospital, teach the mother how to give treatment at home following Treatment Plan A, and give her enough ORS packets for 2 days. Also teach her the signs which indicate that she should bring her child back.

**Table 3: Guidelines for intravenous treatment of patients with severe dehydration**

- Start IV fluids immediately. If the patient can drink, give ORS by mouth while the drip is set up. Give 100 ml/kg Ringer's Lactate Solution (or, if not available, normal saline), divided as follows:

Age	First give 30 ml/kg in:	Then give 70 ml/kg in:
Infants (under 12 months)	1 hour*	5 hours
Older	30 minutes*	2 1/2 hours

\*Repeat once if radial pulse is still very weak or not detectable.

- Reassess the patient every 1-2 hours. If hydration is not improving, give the IV drip more rapidly.
- Also give ORS (about 5 ml/kg/hour) as soon as the patient can drink: usually after 3-4 hours (infants) or 1-2 hours (older patients).
- After 6 hours (infants) or 3 hours (older patients), evaluate the patient using the assessment chart. Then choose the appropriate Plan (A, B or C) to continue treatment.

Note: If Ringer's Lactate Solution is not available, normal saline or one of the other IV solutions listed in Annex 2 may be used.

**What to do if  
IV therapy is  
not available**

If IV therapy is not available at the facility but can be given nearby (i.e., within 30 minutes), the patient should be sent *immediately* for IV treatment. If the patient can drink, the mother should be provided with ORS solution and shown how to give it during the trip.

If IV therapy is not available nearby, health workers who have been trained can administer ORS solution by nasogastric (NG) tube, at the rate of 20 ml/kg body weight per hour for 6 hours (total of 120 ml/kg body weight). If the abdomen becomes swollen, ORS solution should be given more slowly until it is less distended.

If NG treatment is not possible but the patient can drink, ORS solution should be given by mouth, at a rate of 20 ml/kg body weight per hour for 6 hours (total 120 ml/kg body weight). If this rate is too fast, the patient may vomit repeatedly. In such case, ORS solution should be given more slowly until vomiting subsides.

Patients receiving NG or oral therapy should be reassessed every 1-2 hours. If the dehydration is not improving after 3 hours, the child must be taken immediately to the nearest health facility where IV therapy is available. Otherwise, if rehydration is progressing satisfactorily, the child should be reassessed after 6 hours and a decision on further treatment made as described above for patients given IV therapy.

If neither NG nor oral therapy is possible, the child should be taken to a facility where IV or NG therapy is available.

**5.4 Nutritional  
management  
of acute  
diarrhoea**

There is a strong interaction between diarrhoea and under-nutrition: during diarrhoea, decreased food intake, decreased nutrient absorption, and increased nutrient requirements often combine to cause weight loss and failure to grow; the child's nutritional status declines and any pre-existing undernutrition is made worse. In turn, undernutrition contributes to diarrhoea, the illness being more severe, prolonged, and possibly more frequent in undernourished children. This vicious circle can be broken by:

- continuing to give nutrient-rich foods during diarrhoea; and
- increasing food intake after diarrhoea stops.

Food intake should *never* be restricted during or following diarrhoea. Rather, the goal should be to maintain the intake of energy and other nutrients at as high a level as possible. When this is done sufficient nutrients are usually absorbed to support continued growth and weight gain. Continued feeding also speeds the recovery of normal intestinal function, including the ability to digest and absorb various nutrients. In contrast, children whose food is restricted or diluted usually lose weight, have diarrhoea of longer duration, and recover intestinal function more slowly.

### What types of food to give

The choice of food to be given depends on the child's age, food preferences, and pre-illness feeding pattern. *In general, the foods that are suitable for a child with diarrhoea are the same as those that should be given when the child is healthy.* Recommendations regarding specific foods are given below.

**Milk.** Infants who are breast-fed should be allowed to feed as often and as long as they want throughout an episode of diarrhoea, including the period of rehydration. For infants who are not breast-fed, the usual milk feed (or formula) should be given at least every 3 hours, *except* during the 3-6 hour rehydration period. However, if they are under 6 months of age and not yet taking soft food, the usual milk should be diluted with an equal amount of water for 2 days. For children 6 months or older, or who are already taking soft foods, dilution of the milk is not necessary. Special commercial formulas advertised for use in diarrhoea are expensive and unnecessary; they should *not* be routinely recommended.

When these guidelines are followed, clinically significant milk intolerance is rarely a problem. There is no purpose in routinely testing the stools of infants for pH or reducing substances because such tests are over-sensitive, often indicating impaired absorption of lactose when it is not clinically important. To guide dietary management during diarrhoea, it is more appropriate to monitor the child's clinical response (e.g., weight gain, general improvement). Milk intolerance is only important when milk feeding causes a prompt increase in stool volume and a return or worsening of the signs of dehydration, often with loss of weight.

**Other foods.** If the child is at least 6 months of age or already taking soft foods, he or she should be given cereals, vegetables, and other foods, in addition to milk. If the child is over 6 months and such foods are not yet being given, they should be started. Recommended foods should be culturally acceptable, readily available, and have a high content of calories and other nutrients relative to bulk. They should be well-cooked, and mashed or ground to make them easy to digest; fermented foods are also easy to digest. Cereals (or other staples) should be mixed with pulses or vegetables. If possible, 5-10 ml of vegetable oil should be added to each serving<sup>1</sup>. If available, meat, fish, or egg should also be given. Foods that contain potassium, such as bananas, green coconut water, and fresh fruit juice are beneficial.

Avoid foods containing a lot of sugar as they may cause the diarrhoea to worsen. Soups or gruels can be used as recommended home fluids to prevent dehydration, but alone are *not sufficient as foods* because although they are filling, they do not provide enough calories or other nutrients.

<sup>1</sup>Energy-rich foods are important during and following diarrhoea. Most staple foods do not provide sufficient calories per unit weight for infants and young children and should be enriched with fat or oil.

**Amount and frequency of feeds**

Give the child as much food as he or she will accept and offer it every 3 or 4 hours (6 times a day). Frequent, small feedings are tolerated better than less frequent large feedings. Children with diarrhoea are often anorexic and need to be coaxed to eat.

After the diarrhoea stops, continue giving the same energy-rich foods and provide one extra meal each day for at least 2 weeks. If the child is undernourished, extra meals should be given until he or she has regained normal weight-for-height.

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## 6. MANAGEMENT OF ASSOCIATED PROBLEMS

### 6.1 Electrolyte disturbances

- 6.1.1 Hypernatraemia** Some children with diarrhoea, especially young infants, develop **hypernatraemic dehydration**. This usually occurs when they are given drinks that are hypertonic, owing to their content of sugar (e.g., soft drinks and commercial fruit drinks) or salt. These draw water from the child's tissues into the bowel, causing the concentration of sodium in the blood and extracellular fluid to rise. If the solute in the drink is not fully absorbed, the water remains in the bowel, causing the faecal volume to increase.

Children with hypernatraemic dehydration (serum  $\text{Na}^+$   $>150$  mmol/l) are extremely thirsty, and this is out of proportion to their other signs of dehydration. (Puffiness around the eyes is a sign of overhydration, not hypernatraemia.) Their most serious problem, however, is convulsions. These are most likely to occur when the serum sodium concentration exceeds 165 mmol/l. Seizures are much less likely when hypernatraemic dehydration is treated with ORS solution than when IV fluid is used. Treatment with ORS solution usually causes the serum sodium concentration to become normal within 24 hours. The diagnosis of hypernatraemic dehydration can be proved only by measuring blood electrolytes.

- 6.1.2 Hyponatraemia** Patients with diarrhoea who ingest only large amounts of water, or watery drinks that contain very little salt, may present with hyponatraemia (serum  $\text{Na}^+$   $<130$  mmol/l). This is occasionally associated with lethargy and, less often, seizures. ORS solution is safe and effective therapy for hyponatraemia.

- 6.1.3 Hypokalaemia** Inadequate replacement of potassium losses during diarrhoea can lead to potassium depletion and hypokalaemia (serum  $\text{K}^+$   $<3$  mmol/l); this can cause muscle weakness, paralytic ileus, renal impairment, and cardiac arrhythmias. The potassium deficit can be corrected by using ORS solution for rehydration therapy and by feeding during and after diarrhoea foods rich in potassium, such as fruit (e.g., bananas), fresh fruit juices, and green coconut water.

- 6.2 Blood in the stool (dysentery)** Visible blood in a loose or watery stool is indicative of dysentery. The presence of blood can be determined by history or observation of the faeces; laboratory tests are not required.

If there is blood in the stool, assume that the cause is shigellosis and give an oral antibiotic to which *Shigella* in the area are sensitive (see Table 4 and Annex 8). It is reasonable to make such an assumption since dysentery due to other organisms is less frequent and less severe than shigellosis. The child should be seen again after 2 days if he or she was initially dehydrated, is less than 1 year old, the mother still sees blood in the stool, or the child is not getting better. Signs of improvement include the disappearance of fever and of blood in the stool, passage of fewer stools, and improved appetite. If there is no improvement after 2 days, the

antibiotic should be changed to another recommended for *Shigella* in the area. Children whose condition has worsened should be referred to hospital. If there is still no improvement after giving the second antibiotic for 2 days, the child should be referred to hospital.

Treatment for amoebiasis should not be considered unless microscopic examination of fresh faeces shows amoebic trophozoites containing red blood cells, or two different antibiotics have been given for *Shigella* without any clinical improvement (see section 7.1).

### 6.3 Persistent diarrhoea

If diarrhoea with or without blood has lasted for 14 days or more, it is said to be **persistent** (see Annex 8). ORS solution is usually effective for treating dehydration in such patients. However, in a few infants with severe, watery, persistent diarrhoea, glucose absorption is severely impaired and ORS solution is less effective; IV rehydration may be required for such patients.

Children with persistent diarrhoea should be referred for treatment in hospital if they have clinical features indicating that management as outpatients might not be successful. This category includes children presenting with dehydration or severe undernutrition, or who are under 6 months of age. For other children, outpatient therapy based mostly on dietary management should be attempted.

The child's diet should be carefully reviewed and revised as follows:

- Breast-feeding should be continued.
- Animal milk should be diluted with an equal volume of water, or it should be replaced with a fermented milk product, such as yoghurt.
- Other foods should be increased to ensure that the daily intake of energy is at a normal level - i.e., 110 kcal/kg body weight per day. The main foods should be cooked cereal with added vegetable oil (5-10 ml/serving), well-cooked pulses and vegetables, and, if possible, poultry and fish. It is preferable to mix milk and cereal together. Foods that have been sweetened with sugar should not be given, since they are hyperosmolar and may cause increased diarrhoea.
- Food should be well cooked, mashed, or ground, and given 6 times a day.
- If possible, supplementary vitamins and minerals should be given, including folate, vitamin B12, vitamin A, iron, and zinc.

Teach the mother these rules for feeding and tell her to bring her child back after 5 days. If the diarrhoea has not stopped, refer the child to hospital for further examination and treatment. If the

diarrhoea has stopped, tell the mother to continue to give the same foods as the child's regular diet. After one more week, she may gradually resume the usual milk feeds over a period of 7 days.

Patients should be weighed and have their weight plotted on a growth chart (Annex 9). Mothers should be taught to give an extra meal a day for at least one month. Undernourished children should be given extra food until they have achieved normal weight-for-height.

Antibiotics or antiparasitic agents should *not* be given routinely to patients with persistent diarrhoea. They should be used only when a specific enteropathogen has been isolated from the faeces or dysentery is present. The choice of antibiotic should be based on the *in vitro* sensitivity of isolated bacterial pathogens; bloody diarrhoea should be treated for *Shigella*, using an oral antibiotic recommended for *Shigella* in the area (see Table 4 and Annex 8). Treatment should not be given for amoebiasis or giardiasis unless the diagnostic criteria in section 7.1 are met.

#### 6.4 Severe protein-energy under-nutrition

Severe protein-energy undernutrition is usually easy to recognize. Marasmic children have a typical "skin and bones" appearance, marked wasting, loose wrinkled skin, and irritable, fussy behaviour. Children with kwashiorkor are apathetic and have oedema of the extremities, sparse reddish hair, and flaking skin. If the diagnosis of severe undernutrition is uncertain, it can be confirmed by measuring the mid-upper arm circumference (Annex 10).

Diarrhoea is a serious and often fatal event in children with severe undernutrition. Although the main objectives of treatment are the same as for better nourished children, certain aspects of patient evaluation and management need to be modified or given special attention (see Annex 8).

Assessment of hydration status is difficult because a number of the signs that are normally used are unreliable. Skin turgor is poor in children with marasmus and their eyes are normally sunken. Diminished skin turgor may be masked by oedema in children with kwashiorkor. In both types of patient irritability or apathy makes assessment of the mental state difficult. Signs that remain useful for assessing hydration status include: dry mouth and tongue, and eagerness to drink (signs of some dehydration); very dry mouth and tongue, cool and moist extremities, and weak or absent radial pulse (signs of severe dehydration). In children with severe undernutrition it is often impossible to distinguish reliably between some dehydration and severe dehydration.

Rehydration and nutritional management should take place at a hospital, if possible. Rehydration should be by mouth or NG tube using ORS solution; IV fluid should *not* be used because it easily causes overhydration and heart failure. Rehydration should be done *slowly* over 12-24 hours, giving 70-100 ml of ORS solution per kg body weight. The exact amount is determined by how much

the child will drink and evidence of overhydration (e.g., increasing oedema). Supplemental potassium should be given with food for 2 weeks (see Annex 2). Feeding should begin as soon as possible, usually within 2-3 hours of starting rehydration. Guidelines on nutritional management are provided elsewhere (see "The treatment and management of severe protein-energy malnutrition", WHO, 1981).

### 6.5 Fever

Patients with high fever ( $>39^{\circ}\text{C}$ ) should be treated promptly to bring the temperature down (see Annex 8). This is best done with an antipyretic (e.g., paracetamol) or by bathing or sponging with tepid water and fanning.

Patients with fever ( $38^{\circ}\text{C}$  or above) or a history of fever in the past 5 days, and who live in a *Plasmodium falciparum* malarious area, should also be given an antimalarial or treated according to the policy of the national malaria programme (see Annex 8).

Patients with fever and diarrhoea may have another underlying infection (e.g., pneumonia or otitis media). These infections should be diagnosed and treated in an appropriate manner.

### 6.6 Convulsions

In a patient with diarrhoea and a history of convulsions (seizures, fits) during the illness, the following diagnoses and treatments should be considered:

- **Febrile convulsion:** This usually occurs in infants, especially when their temperature exceeds  $40^{\circ}\text{C}$ . Treat with antipyretics, or tepid sponging and fanning as described above. Consider a diagnosis of meningitis.
- **Severe dehydration:** Manage according to Treatment Plan C.
- **Hypoglycaemia:** This occasionally occurs in undernourished children with diarrhoea, who have inadequate stores of hepatic glycogen. If hypoglycaemia is suspected in a patient with seizures or coma, give 1.0 ml/kg of 50% glucose solution or 2.5 ml/kg of a 20% glucose solution intravenously over 5 minutes. If hypoglycaemia is the cause, recovery of consciousness is usually very rapid. In such cases ORS solution or IV glucose (5%) should be administered until feeding starts, to avoid recurring symptoms.
- **Hypernatraemia or hyponatraemia:** Treat the dehydration with ORS solution, as described in Section 6.1.1 and 6.1.2.

### 6.7 Vitamin A deficiency

Diarrhoea reduces the absorption of and increases the need for vitamin A. In areas where bodily stores of vitamin A are often low, young children with acute or persistent diarrhoea can rapidly develop eye lesions (xerophthalmia) and even become blind. This is a particular problem when diarrhoea occurs during or shortly after measles, or in children who are already undernourished.

In areas where vitamin A deficiency is considered to be a significant public health problem, mothers of children with diarrhoea should be routinely asked about night blindness and the child should be examined for conjunctival lesions (Bitot's spots). If either of these conditions is present, oral vitamin A should be given: 200 000 units at once, again the next day, and after 4 weeks. Children without eye signs who have severe undernutrition or have had measles within the past month should receive a single dose of vitamin A. Infants should receive doses of 100 000 units given according to the same schedules.

Where vitamin A deficiency is a problem, mothers should be taught routinely to give their children foods rich in carotene: these include yellow or orange fruits or vegetables, and dark green leafy vegetables; if possible, eggs, liver, or full-fat milk should also be given.

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## 7. DRUGS AND ANTIMICROBIAL AGENTS

### 7.1 Antimicrobial agents

Approximately 95% of children who visit a health care facility for acute watery diarrhoea can be successfully and optimally treated using only ORT and continued feeding. Antibiotic or antiparasitic therapy should never be given routinely, and certain antimicrobials should never be used, because they are ineffective and may be dangerous (i.e., poorly absorbed sulfonamides, neomycin, halogenated oxyquinolines). The diseases for which antimicrobials should be given are listed below and the agents of choice for their treatment are presented in Table 4:

- **Cases of dysentery (bloody diarrhoea).** These should be treated as suspected shigellosis (see section 6.2).
- **Suspected cases of cholera.** Cholera should be suspected when acute watery diarrhoea causes severe dehydration in a child above 2 years of age (it occurs infrequently below this age) or in an adult in an area where cholera is known to be present. The most important treatment for cholera is the correction of dehydration, which can be accomplished with ORS solution or IV fluid. Antibiotics help by decreasing the volume and duration of diarrhoea, and the period of excretion of *V. cholerae* O1.
- **Symptomatic infection with *Entamoeba histolytica*.** Amoebiasis can cause dysentery, liver abscess, and other systemic complications. Amoebiasis is rare, however, in children under 5 years of age; it occurs most frequently in young adults. Treatment for amoebiasis should be given to young children who continue to have bloody diarrhoea after successive treatment with two antibiotics that are usually effective for *Shigella*, or when motile amoebic trophozoites with ingested erythrocytes are found in a fresh stool sample. The finding of only amoebic cysts is *not* sufficient for a diagnosis of amoebiasis. Children with dysentery should not be routinely treated for amoebiasis.
- **Laboratory-proven, symptomatic infection with *Giardia lamblia*.** Infection with *G. lamblia* occurs very frequently and is usually asymptomatic. Treatment for giardiasis should be given only when (i) the patient has acute diarrhoea and trophozoites of *G. lamblia* are seen in the faeces or small bowel fluid, or (ii) the patient has persistent diarrhoea and cysts or trophozoites of *G. lamblia* are seen in the faeces or small bowel fluid. Patients with acute diarrhoea and only giardial cysts in the faeces should *not* be treated.

When diarrhoea is associated with another acute infection (e.g., pneumonia, otitis media, malaria), that infection also requires specific therapy.

**Table 4: Antimicrobial agents used in the treatment of specific causes of diarrhoea**

Cause	Antibiotic(s) of choice <sup>1</sup>	Alternative(s) <sup>1</sup>
Cholera <sup>2,3</sup>	<p><b>Tetracycline</b></p> <p>Children: 12.5 mg/kg 4 times a day x 3 days</p> <p>Adults: 500 mg 4 times a day x 3 days</p> <p style="text-align: center;">or</p> <p><b>Doxycycline</b></p> <p>Adults : 300 mg once</p>	<p><b>Furazolidone</b></p> <p>Children: 1.25 mg/kg 4 times a day x 3 days</p> <p>Adults: 100 mg 4 times a day x 3 days</p> <p style="text-align: center;">or</p> <p><b>Trimethoprim (TMP)-Sulfamethoxazole (SMX)<sup>4</sup></b></p> <p>Children: TMP 5 mg/kg and SMX 25 mg/kg twice a day x 3 days</p> <p>Adults: TMP 160 mg and SMX 800 mg twice a day x 3 days</p>
Shigella dysentery <sup>2</sup>	<p><b>Trimethoprim (TMP)-Sulfamethoxazole (SMX)</b></p> <p>Children: TMP 5 mg/kg and SMX 25 mg/kg twice a day x 5 days</p> <p>Adults: TMP 160 mg and SMX 800 mg twice a day x 5 days</p>	<p><b>Nalidixic Acid</b></p> <p>Children: 15 mg/kg 4 times a day x 5 days</p> <p>Adults: 1 g 3 times a day x 5 days</p> <p style="text-align: center;">or</p> <p><b>Ampicillin</b></p> <p>Children: 25 mg/kg 4 times a day x 5 days</p> <p>Adults : 1 g 4 times a day x 5 days</p>
Amoebiasis	<p><b>Metronidazole</b></p> <p>Children: 10 mg/kg 3 times a day x 5 days (10 days for severe disease)</p> <p>Adults: 750 mg 3 times a day x 5 days (10 days for severe disease)</p>	<p>In very severe cases:</p> <p>Dehydroemetine hydrochloride by deep, intramuscular injection, 1-1.5 mg/kg daily (maximum 90 mg) for up to 5 days, depending on response (all ages)</p>
Giardiasis	<p><b>Metronidazole<sup>5</sup></b></p> <p>Children: 5 mg/kg 3 times a day x 5 days</p> <p>Adults: 250 mg 3 times a day x 5 days</p>	<p><b>Quinacrine</b></p> <p>Children: 2.5 mg/kg 3 times a day x 5 days</p> <p>Adults: 100 mg 3 times a day x 5 days</p>

<sup>1</sup> All doses shown are for oral administration unless otherwise indicated. If drugs are not available in liquid form for use in young children, it may be necessary to approximate the doses given in this table.

<sup>2</sup> The choice of antibiotic will depend on the frequency of resistance to antibiotics in the area.

<sup>3</sup> Antibiotic therapy is not essential for successful treatment, but it shortens the duration of illness and the period of excretion of organisms in severe cases.

<sup>4</sup> Other alternatives are erythromycin and chloramphenicol.

<sup>5</sup> Tinidazole and ornidazole can also be used in accordance with the manufacturers' recommendations.

## 7.2 "Anti-diarrhoeal" drugs

These agents, though commonly used, *have no practical benefit and are NEVER indicated for the treatment of acute diarrhoea in children*. Their use wastes family resources and may delay appropriate treatment with fluids and food. Products in this category include:

**Adsorbents** (e.g., smectite, attapulgit, kaolin, activated charcoal, cholestyramine). These drugs are promoted for the treatment of diarrhoea on the basis of their ability to bind and inactivate bacterial toxins or other substances that cause diarrhoea. However, they have not been shown to be of value in the routine treatment of acute diarrhoea in children.

**Antimotility drugs** (e.g., tincture of opium, camphorated tincture of opium, paregoric, codeine, diphenoxylate with atropine, loperamide hydrochloride). These opiate or opiate-like drugs and other inhibitors of intestinal motility may provide transient pain relief and some may have modest antisecretory properties. However, they may also slow peristalsis, do not appreciably decrease the volume of stool, can contribute to paralytic ileus, and may delay the elimination of the causative organisms. Sedation may occur at usual therapeutic doses and fatal central nervous system toxicity has been reported for some agents.

**Antisecretory drugs** (e.g., chlorpromazine, bismuth subsalicylate). Chlorpromazine should not be used, since the dose required to produce an antisecretory effect often causes excessive sedation. Bismuth subsalicylate decreases the number of diarrhoea stools and subjective complaints in adults with travellers' diarrhoea. However, its efficacy in the treatment of acute diarrhoea in children has not been established. There is concern that an effective dose for children might be impractical or toxic.

**Combinations of drugs.** A large number of products are available that combine adsorbents, antimicrobials, antimotility drugs, and other agents. Manufacturers may claim that these formulations are appropriate for various diarrhoeal diseases; however, the combinations are often irrational and their cost and side-effects are substantially higher than for individual drugs. They have *no place* in the treatment of diarrhoea in children.

## 7.3 Other drugs

**Antiemetics.** These include drugs such as promethazine and chlorpromazine. They cause sedation which can interfere with ORT. Antiemetics should *never* be given to children with diarrhoea.

**Cardiac stimulants.** Shock in acute diarrhoeal disease is caused by dehydration and hypovolaemia. Correct treatment is based on rapid IV infusion of a balanced electrolyte solution. The use of cardiac stimulants and vasoactive drugs (e.g., adrenaline, nicotinamide) is never indicated.

**Blood or plasma.** Blood, plasma, or synthetic plasma expanders are never indicated for patients with dehydration and hypovolaemia due to diarrhoea. Treatment should be based on oral or IV replacement of water and electrolytes.

**Steroids.** Steroids are never indicated; they can cause serious side-effects.

**Purgatives.** These can make diarrhoea and dehydration worse; they should never be used.

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## 8. PREVENTION OF DIARRHOEA

Proper treatment of diarrhoeal diseases is highly effective in preventing death from dehydration, but has no impact on the incidence of diarrhoea. Health staff working in treatment facilities are well placed to teach family members and motivate them to adopt preventive measures. Mothers of children being treated for diarrhoea are likely to be particularly receptive to such messages. At every appropriate opportunity, the following points should be discussed.

### 8.1 Breast-feeding

During the first 4-6 months of life, infants should be *exclusively* breast-fed. This means that the healthy baby should receive breast milk and *no other fluids* such as water, juice, or formula. Exclusively breast-fed babies are much less likely to get diarrhoea or to die from it than babies who are not breast-fed or are partially breast-fed. Breast-feeding also protects against the risk of allergy early in life, may aid in child spacing and provides protection against infections other than diarrhoea (e.g., pneumonia). Breast-feeding should be continued until at least 12 months of age. The best way to establish the practice is to put the baby to the breast immediately after birth.

Eight advantages of breast-feeding are listed in Table 5. Some or all of them should be explained to mothers in a simple manner.

**Table 5: Advantages of breast-feeding**

1. Breast-feeding is clean: it does not require the use of bottles, teats, water, and formula which are easily contaminated with bacteria that can cause diarrhoea.
2. Breast milk has immunological properties that protect the infant from infection, and especially from diarrhoea; these are not present in animal milk or formula.
3. The composition of breast milk is always ideal for the infant; formula or cow's milk may be too dilute (which reduces its nutritional value) or too concentrated (so that it does not provide sufficient water).
4. Breast milk is a complete food: it provides *all* the nutrients and water needed by a healthy infant during the first 4-6 months of life.
5. Breast-feeding is cheap: there are none of the expenses associated with feeding breast-milk substitutes, e.g., the costs of fuel, utensils, and special formulas, and of the mother's time in formula preparation.
6. Breast-feeding helps with birth spacing: mothers who breast-feed usually have a longer period of infertility after giving birth than mothers who do not breast-feed.
7. Milk intolerance rarely occurs in infants who take only breast milk.
8. Breast-feeding immediately after delivery encourages the "bonding" of the mother to her infant, which has important emotional benefits for both and helps to secure the child's place within the family.

If breast-feeding is not possible, cow's milk or milk formula should be given with a cup and a spoon. Feeding bottles and teats should *not* be used because they are very difficult to clean and can carry the organisms that cause diarrhoea. Careful instructions should be given on the correct preparation of milk formula, which should be done, if possible, using water that has been boiled briefly before use.

## 8.2 Improved weaning practices

Weaning foods should be started when the child is 4-6 months old to satisfy his or her increasing nutritional requirements. Weaning may be delayed until 6 months if the child is growing satisfactorily; however, if there is little or no weight gain, weaning foods should be added by 4 months. Good weaning practices involve selecting nutritious foods and using hygienic practices when preparing them. The choice of weaning foods will depend on local patterns of diet and agriculture, as well as existing beliefs and practices. In addition to breast milk (or animal milk), infants should be fed soft mashed foods (e.g., cereals) to which vegetable oil (5-10 ml/serving) has been added. Other foods, such as well-cooked pulses and vegetables, should also be given as the diet is expanded (see sections 5.2, 5.4). When possible, eggs, meat, fish, and fruit should be added.

Good weaning practices also involve adopting behaviours that will help to prevent the contamination of food:

- Wash hands before preparing weaning food and before feeding the child.
- Prepare food in a clean place.
- Wash uncooked food in clean water before feeding it to the child.
- Cook or boil food well when preparing it.
- If possible, prepare weaning foods immediately before they will be eaten.
- Cover foods that are being kept. Keep foods in a cool place (refrigerate, if possible).
- If cooked food is prepared more than 2 hours in advance of feeding, and is not refrigerated, reheat it until it is thoroughly hot before giving it to the child.
- Feed the child with a clean spoon.

To encourage exclusive breast-feeding and proper weaning practices, health workers should be instructed in the regular use of growth charts to monitor the weight of children. Before a diarrhoea patient leaves a health facility his or her weight should be taken and recorded on a growth chart (Annex 9).

**8.3 Use of safe water**

The risk of diarrhoea can be reduced by using the cleanest available water and protecting it from contamination. Families should:

- Collect water from the cleanest available source.
- Not allow bathing, washing, and defecation near the source. Latrines should be located more than 10 metres away and downhill.
- Keep animals away from protected water sources.
- Collect and store water in clean containers; empty and rinse out the containers each week; keep the storage container covered and do not allow children or animals to drink from it; remove water with a long-handled dipper which is kept especially for that purpose.
- If fuel is available, boil water used for making food or drinks for young children. Water needs only to be brought to the boil (vigorous boiling is unnecessary and wastes fuel).

The **quantity** of water available to families has as much impact on the incidence of diarrhoeal diseases as the **quality** of the water. This is because larger quantities of water result in improved hygiene. If two water sources are available, the highest quality water should be used for drinking and preparing food.

**8.4 Hand-washing**

All diarrhoeal disease agents can be spread by hands that have been contaminated by faecal material. The risk of diarrhoea is substantially reduced when family members practice regular hand-washing. All family members should wash their hands thoroughly after defecation, after cleaning a child who has defecated, after disposing of a child's stool, before preparing food, and before eating. Good hand-washing requires the use of soap or a local substitute, and a sufficient amount of water.

**8.5 Use of latrines and proper disposal of stools**

An unsanitary environment is a major factor contributing to the spread of diarrhoeal agents. Because the pathogens that cause diarrhoea are excreted in the stools of an infected person, proper disposal of faeces can help to interrupt the transmission of infection. Faecal matter can contaminate water where children play, where mothers wash clothes, and where they collect water for home use. Every family needs access to a clean, functioning latrine. If one is not available, the family should defecate in a designated place and bury the faeces immediately. Stools of young children are especially likely to contain diarrhoeal pathogens; they should be collected soon after defecation and disposed of in a latrine or buried.

**8.6 Measles immunization**

Measles immunization can substantially reduce the incidence and severity of diarrhoeal diseases. Every infant should be immunized for measles at the recommended age.

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## ANNEX 1

## IMPORTANT MICROBIAL CAUSES OF ACUTE DIARRHOEA IN INFANTS AND YOUNG CHILDREN

AGENT	INCIDENCE	PATHOGENESIS	COMMENTS
<p><b>Viruses</b></p> <p>1. Rotavirus</p>	<p>Rotavirus is responsible for up to 25% of diarrhoea episodes in children aged 6-24 months visiting treatment facilities, but for only 5-10% of cases in the same age group in the community. Prevalent worldwide. Rotavirus is spread by faecal/oral transmission or possibly by airborne droplets. Peak incidence of disease is in cold or dry seasons.</p>	<p>Rotavirus causes patchy damage to the epithelium of the small intestine, resulting in the blunting of the villi. There is some reduction in the activity of lactase and other disaccharidases, resulting in reduced absorption of carbohydrates, but this is usually of no clinical significance. The intestinal morphology and absorptive capacity return to normal within 2-3 weeks.</p>	<p>Rotavirus causes watery diarrhoea with vomiting and fever. Illness ranges from asymptomatic infection (mainly in neonates and adults) to acute dehydrating diarrhoea that may lead to death. Four serotypes of rotavirus are epidemiologically important.</p>
<p><b>Bacteria</b></p> <p>2. <i>Escherichia coli</i></p> <p>a. enterotoxigenic <i>E. coli</i> (ETEC)</p>	<p><i>E. coli</i> cause up to one quarter of all diarrhoeas in developing countries. Transmission usually occurs through contaminated food (especially weaning foods) and water.</p> <p>ETEC are major cause of dehydrating diarrhoea in children and adults in developing countries, especially during the warm, wet season.</p>	<p>Two important virulence factors of ETEC are: (1) colonization factors that allow ETEC to adhere to enterocytes of the small bowel, and (2) enterotoxins. ETEC produce heat-labile (LT) and/or heat-stable (ST) enterotoxins which cause secretion of fluid and electrolytes, resulting in watery diarrhoea. ETEC do not destroy the brush border or invade the mucosa.</p>	<p>Five groups of <i>E. coli</i> are recognized: enterotoxigenic, enteropathogenic, enteroadherent, enteroinvasive, and enterohaemorrhagic.</p> <p>ETEC are the most common cause of diarrhoea in travellers from developed to developing countries. The diarrhoea is self-limited.</p>
<p>b. enteropathogenic <i>E. coli</i> (EPEC)</p>	<p>In some urban areas, up to 30% of acute diarrhoea cases in young infants are attributed to EPEC.</p>	<p>The mechanism of EPEC diarrhoea is not yet clear. Enteroadherence and production of a cytotoxin may be important.</p>	<p>The disease is usually self-limited, but can be severe (fatal) or result in persistent diarrhoea, particularly in bottle-fed infants under 6 months of age.</p>
<p>c. enteroadherent <i>E. coli</i> (EAEC)</p>	<p>EAEC have been found in a number of countries.</p>	<p>EAEC adhere tightly to the small intestinal mucosa and produce typical morphological changes; the mechanism by which they cause diarrhoea is not clear but a cytotoxin may play a role. Some strains belong to EPEC serotypes.</p>	<p>EAEC cause watery diarrhoea in young children, which may become persistent.</p>
<p>d. enteroinvasive <i>E. coli</i> (EIEC)</p>	<p>EIEC causes sporadic foodborne cases and outbreaks of diarrhoea in all ages worldwide.</p>	<p>EIEC is similar to <i>Shigella</i> both biochemically and serologically. Like <i>Shigella</i>, it penetrates and multiplies within the colonic epithelial cells. Polymorphonuclear leukocytes are usually present in stools.</p>	<p>EIEC causes symptoms which are similar to those of dysentery due to <i>Shigella</i>.</p>

AGENT	INCIDENCE	PATHOGENESIS	COMMENTS
<p>e. enterohaemorrhagic <i>E. coli</i> (EHEC)</p>	<p>EHEC causes sporadic haemorrhagic colitis in North America and some other areas. Improperly cooked meat serves as a vehicle of transmission; occasionally, direct person-to-person transmission may occur. EHEC is probably not an important pathogen in developing countries.</p>	<p>EHEC produces a cytotoxin which may be responsible for oedema and diffuse bleeding in the colon, as well as the haemolytic-uraemic syndrome that sometimes develops in children.</p>	<p>Illness is characterized by acute onset of cramps, absent or low-grade fever, and watery diarrhoea that may rapidly become bloody.</p>
<p>3. <i>Shigella</i></p>	<p><i>Shigella</i> cause 10-15% of acute diarrhoeas in children under 5 years and are the most common cause of dysentery in children. Spread is often by person-to-person contact since the infectious dose is low (10 to 100 organisms). Foodborne and waterborne transmission also occurs. Peak incidence is in warmer seasons.</p>	<p><i>Shigella</i> invade and multiply within colonic epithelial cells, causing cell death and mucosal ulcers. <i>Shigella</i> seldom invade the bloodstream. The virulence factors include: a smooth lipopolysaccharide cell-wall antigen that may contribute to invasiveness and a toxin (Shiga toxin) which is cytotoxic, neurotoxic, and perhaps also causes watery diarrhoea.</p>	<p><i>Shigella</i> are subdivided into 4 serogroups: <i>S. flexneri</i>—the most common serogroup in developing countries; <i>S. sonnei</i>—the most common in developed countries; <i>S. dysenteriae</i> type 1 — which causes epidemics of severe disease with high mortality; <i>S. boydii</i> is less common. <i>Shigella</i> infection may cause fever and watery diarrhoea, or dysentery with fever, abdominal cramps, and tenesmus, and frequent small, bloody, mucoid stools with many leukocytes. Antibiotic resistance is frequent. Shigellosis is particularly severe in malnourished and non-breast-fed infants.</p>
<p>4. <i>Campylobacter jejuni</i></p>	<p><i>C. jejuni</i> causes 5-15% of diarrhoeas in infants worldwide. In developing countries the peak incidence occurs below the age of 12 months. Humans are infected through direct contact with infected animals or their faeces, by consumption of contaminated food and water, and, occasionally, direct person-to-person spread.</p>	<p><i>C. jejuni</i> probably produces diarrhoea by invasion of the ileum and the large intestine. Two types of toxin are produced: a cytotoxin and a heat-labile enterotoxin.</p>	<p>Diarrhoea may be watery but in one-third of cases dysenteric stools with blood and mucus appear after a day or two. Vomiting is not common and fever is usually low.</p>
<p>5. <i>Vibrio cholerae</i> O1</p>	<p>Cholera is endemic in many countries of Africa and Asia. In endemic areas, it may account for 5-10% of hospitalized patients with diarrhoea in all age groups. However, it occurs most often in children 2-9 years of age, and many cases are severe. In newly affected areas, young adults are most often infected. Both contaminated water and food can transmit cholera; person-to-person spread is much less common.</p>	<p><i>V. cholerae</i> adheres to and multiplies on the mucosa of the small intestine where it produces an enterotoxin which causes the diarrhoea. Cholera toxin is closely related to the heat-labile toxin (LT) of ETEC.</p>	<p><i>V. cholerae</i> O1 has two biotypes (El Tor and classical) and two serotypes (Ogawa, Inaba). Biotyping and serotyping are not important for treatment and control.</p> <p>The El Tor biotype is responsible for the current pandemic. During the last few years, outbreaks due to tetracycline-resistant strains of <i>V. cholerae</i> have occurred in a few countries. Diarrhoea may be mild or very severe with profuse watery stools. Dehydration, shock, and death can occur in a few hours in fulminant cases.</p>

AGENT	INCIDENCE	PATHOGENESIS	COMMENTS
6. <i>Salmonella</i> (non-typhoid)	<p><i>Salmonella</i> are an uncommon cause of gastroenteritis in young children in most developing countries. In transitional economies 10% or more of diarrhoeas in children in urban areas can be due to salmonella infection. Infection most commonly results from the ingestion of contaminated animal products, especially poultry, meat, eggs, and milk.</p>	<p><i>Salmonella</i> invade the ileal epithelium. An enterotoxin causes watery diarrhoea. When mucosal damage occurs, diarrhoea may be bloody.</p>	<p>There are over 2000 serotypes, about 6-10 of which account for most episodes of salmonella gastroenteritis in man. <i>Salmonella</i> usually cause acute watery diarrhoea with nausea, cramps, and fever. <i>Salmonella</i> may also cause an exudative diarrhoea with leukocytes in the stool, and occasionally dysentery. Strains resistant to ampicillin, chloramphenicol, and cotrimoxazole are now found worldwide.</p>
Protozoa			
7. <i>Giardia lamblia</i>	<p><i>G. lamblia</i> has a worldwide distribution, the prevalence of infection in young children approaching 100% in some areas. Children aged 1-5 years are most commonly infected. <i>Giardia</i> infections are foodborne, water-borne, or spread by the faecal-oral route; the latter occurs particularly in children living in crowded circumstances or attending day-care centres.</p>	<p><i>G. lamblia</i> infects the small bowel; the pathogenic mechanism is unclear. Flattening of the intestinal epithelium is seen in severe cases.</p>	<p>Can cause acute or persistent diarrhoea, sometimes malabsorption, with fatty stools and often abdominal pain and bloating. However, the vast majority of infections are asymptomatic. This makes it very difficult to determine when <i>Giardia</i> is actually the cause of a diarrhoeal episode.</p>
8. <i>Entamoeba histolytica</i>	<p>Prevalence rates of <i>E. histolytica</i> infection vary widely but its distribution is worldwide. The incidence of disease increases with age; most episodes are in adult males.</p>	<p><i>E. histolytica</i> invades the mucosa of the large intestine, where it is thought to elaborate neurohumoral substances that cause intestinal secretion and damage, resulting in an inflammatory type of diarrhoea.</p>	<p>About 90% of infections are asymptomatic and are caused by strains of <i>E. histolytica</i> that are non-pathogenic; they should not be treated. The diagnosis of invasive disease normally requires identification of haematophagous trophozoites in faeces or colonic ulcers. Symptomatic amoebiasis ranges from persistent mild diarrhoea to fulminant dysentery to liver abscess.</p>
9. <i>Cryptosporidium</i>	<p>In developing countries, cryptosporidia may account for 5-15% of childhood diarrhoeas. Cryptosporidia are transmitted by the faecal-oral route.</p>	<p>Cryptosporidia attach to the microvillous surface of enterocytes where they cause malabsorption owing to the resulting mucosal damage.</p>	<p>Illness is characterized by acute watery diarrhoea. Cryptosporidia are a common cause of watery diarrhoea in immunosuppressed patients, particularly those with acquired immune deficiency syndrome (AIDS).</p>

## ANNEX 2

**REHYDRATION SOLUTIONS:  
COMPOSITION AND PHYSIOLOGICAL CONSIDERATIONS**

**1. ORS solution**

The formula for Oral Rehydration Salts (ORS) recommended by WHO and UNICEF is given in Table A. The quantities shown are for the preparation of one litre of ORS solution and the concentrations of the components of this solution are shown in Table B.

When properly prepared and administered, ORS solution provides adequate quantities of electrolytes to correct the deficits associated with acute diarrhoea. The presence of potassium in the solution is important in view of the large potassium losses associated with acute diarrhoea, especially in infants. The function of the citrate or bicarbonate is to correct the base-deficit acidosis. The absorption of sodium and water in the small intestine is directly related to the absorption of glucose. This is true irrespective of the cause of the diarrhoea and forms the physiological basis of oral rehydration therapy using ORS solution.

**Table A: Composition by weight of Oral Rehydration Salts (ORS)**

(The quantities shown are for preparation of one litre of ORS solution)

Ingredient	grams/l
Sodium chloride	3.5
Trisodium citrate, dihydrate <sup>1</sup>	2.9
Potassium chloride	1.5
Glucose, anhydrous <sup>2</sup>	20.0

<sup>1</sup> Can be replaced by sodium hydrogen carbonate (sodium bicarbonate) 2.5 g/l.

<sup>2</sup> Can be replaced by glucose, monohydrate 22.0 g, or sucrose 40.0 g.

**Table B. Molar concentration of components of ORS solution**

Component	mmol/l of water	
	ORS-Citrate	ORS-Bicarbonate
Sodium	90	90
Potassium	20	20
Chloride	80	80
Citrate	10	-
Bicarbonate	-	30
Glucose	111	111

2. **Oral potassium supplementation** The concentration of potassium in ORS is sufficient to replace the potassium losses in most patients with acute diarrhoea. However, patients with severe undernutrition have a substantial potassium deficit *before* diarrhoea starts, which should also be corrected. They should receive additional potassium by mouth.
- A convenient solution, containing 1 mmol of potassium per ml of solution, can be prepared by dissolving 7.5 g of potassium chloride in 100 ml of water. Give 4 ml of this solution per kg of body weight each day for 2 weeks, in divided doses mixed with food.
3. **Solutions for intravenous infusion** A number of solutions are available for IV infusion; however, most of them do not contain optimal amounts of all the electrolytes required to correct the deficits associated with acute diarrhoea. Early provision of ORS solution and early resumption of feeding help to ensure adequate electrolyte replacement. Table C shows the composition of the different IV fluids that can be used. The relative suitability of each solution is discussed briefly below:
- Preferred solution**
- **Ringer's Lactate Solution** (also called Hartmann's Solution for Injection) is the best commercially-available solution. It supplies an adequate concentration of sodium and sufficient lactate (which is metabolized to bicarbonate) for the correction of acidosis. The concentration of potassium is low and there is no glucose to prevent hypoglycaemia. It can be used in all age groups for the treatment of dehydration secondary to acute diarrhoea of all causes.
- Acceptable solutions**
- **Normal saline** (also called isotonic or physiological saline) is often available. It does not contain a base to correct acidosis and does not replace potassium losses. Sodium bicarbonate or sodium lactate (20-30 mmol/l) and potassium chloride (5-15 mmol/l) can be added to the solution, but it will be necessary to have a supply of the appropriate sterile solutions.
  - **Half-strength Darrow's Solution** (also called lactated potassic saline) contains less sodium chloride than is needed to correct efficiently the sodium deficit in cases with severe dehydration.
  - **Half normal saline with 5% dextrose**, like normal saline, does not correct acidosis or replace potassium losses. It also contains less sodium chloride than is needed for optimal correction of dehydration.
- Unsuitable solution**
- **Plain glucose (dextrose) solution** should not be used since it does not contain electrolytes and thus does not correct the electrolyte losses or the acidosis. It does not effectively correct hypovolaemia.

The technique of administering IV fluid can be taught only by practical demonstration by someone with experience. IV therapy should be given only by trained persons. Several important points are:

- The needles, tubing, bottles, and fluid used *must be sterile*. Needles should not be reused unless specifically designed for this purpose, and then *only* after thorough cleaning and resterilization.
- IV therapy can be given into any convenient vein. The most accessible veins are those in front of the elbow or, in infants, on the side of the scalp. Incision to locate a vein is not necessary and should be avoided. In cases requiring rapid resuscitation, or when another vein cannot be located, a needle may be introduced into the femoral vein, held firmly in place, and removed as soon as sufficient fluid has run in to increase the blood volume and thus reveal veins elsewhere. The femoral vein is located just medial to the femoral artery, which can be easily identified by its pulsation. In some cases of very severe dehydration, particularly in adults, simultaneous infusion into two veins may be necessary; one infusion can be stopped once rehydration is well under way.

- It is useful to put marks on the IV fluid bottles showing the times at which the fluid should have fallen to the specified levels. This allows easier monitoring of the rate of administration.

**Table C. Ionic composition of intravenous infusion solutions**

Solution	Cations - mmol/litre		Anions - mmol/litre	
	Na <sup>+</sup>	K <sup>+</sup>	Cl <sup>-</sup>	Lactate <sup>1</sup>
Ringer's Lactate	130	4	109	28
Normal saline (0.9% NaCl)	154	0	154	0
Half-strength Darrow's Solution <sup>2</sup>	61	18	52	27
Half normal saline (0.45% NaCl)	77	0	77	0
Glucose (dextrose) solutions	0	0	0	0

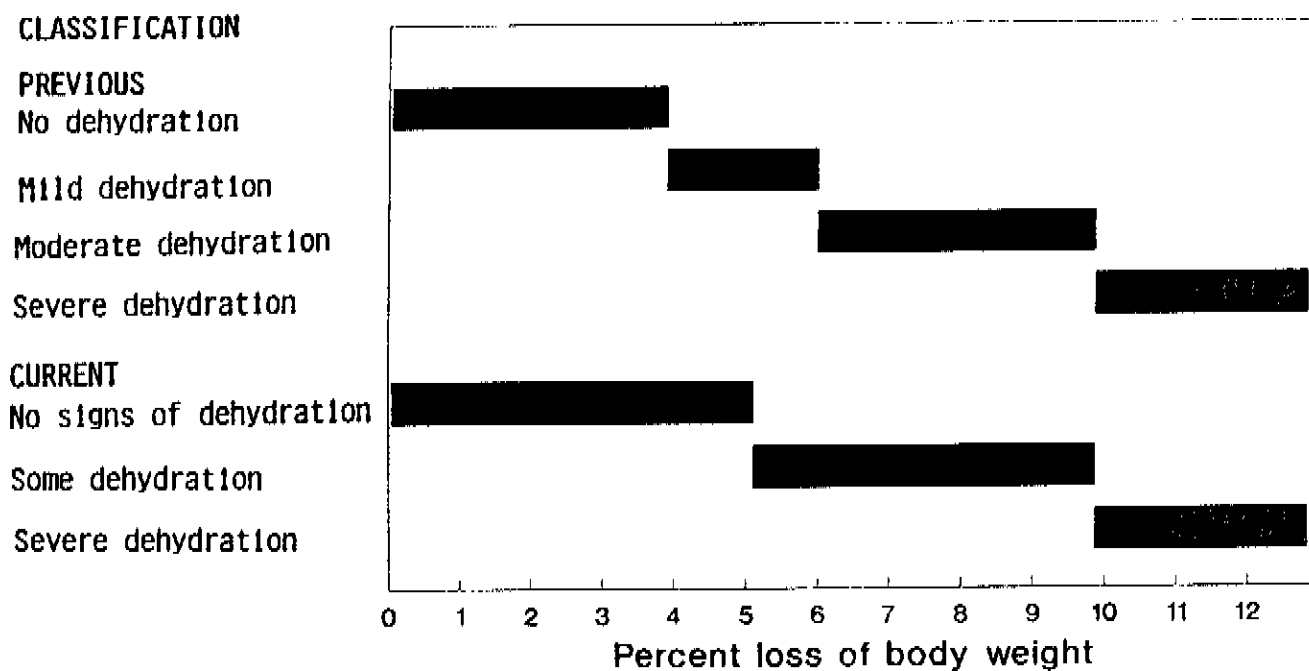
<sup>1</sup>Lactate is converted to bicarbonate, which is required for the correction of acidosis.

<sup>2</sup>Ionic composition after dilution of full-strength Darrow's Solution with an equal volume of 5% or 10% glucose solution.

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ANNEX 3

COMPARISON OF PREVIOUS AND CURRENT CLASSIFICATIONS OF DEHYDRATION STATUS



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## ANNEX 4

## TREATMENT PLAN A TO TREAT DIARRHOEA AT HOME

### USE THIS PLAN TO TEACH THE MOTHER TO:

- Continue to treat at home her child's current episode of diarrhoea.
- Give early treatment for future episodes of diarrhoea.

### EXPLAIN THE THREE RULES FOR TREATING DIARRHOEA AT HOME:

- 1. GIVE THE CHILD MORE FLUIDS THAN USUAL TO PREVENT DEHYDRATION:**
  - Use a recommended home fluid, such as a cereal gruel. If this is not possible, give plain water. Use ORS solution for children described in the box below.
  - Give as much of these fluids as the child will take. Use the amounts shown below for ORS as a guide.
  - Continue giving these fluids until the diarrhoea stops.
- 2. GIVE THE CHILD PLENTY OF FOOD TO PREVENT UNDERNUTRITION:**
  - Continue to breast-feed frequently.
  - If the child is not breast-fed, give the usual milk. If the child is less than 6 months old and not yet taking solid food, dilute milk or formula with an equal amount of water for 2 days.
  - If the child is 6 months or older, or already taking solid food:
    - Also give cereal or another starchy food mixed, if possible, with pulses, vegetables, and meat or fish. Add 1 or 2 teaspoonfuls of vegetable oil to each serving.
    - Give fresh fruit juice or mashed banana to provide potassium.
    - Give freshly prepared foods. Cook and mash or grind food well.
    - Encourage the child to eat; offer food at least 6 times a day.
    - Give the same foods after diarrhoea stops, and give an extra meal each day for two weeks.
- 3. TAKE THE CHILD TO THE HEALTH WORKER IF THE CHILD DOES NOT GET BETTER IN 3 DAYS OR DEVELOPS ANY OF THE FOLLOWING:**
  - Many watery stools
  - Repeated vomiting
  - Marked thirst
  - Eating or drinking poorly
  - Fever
  - Blood in the stool

### CHILDREN SHOULD BE GIVEN ORS SOLUTION AT HOME, IF:

- They have been on Treatment Plan B or C
- They cannot return to the health worker if the diarrhoea gets worse.
- It is national policy to give ORS to all children who see a health worker for diarrhoea

### IF THE CHILD WILL BE GIVEN ORS SOLUTION AT HOME, SHOW THE MOTHER HOW MUCH ORS TO GIVE AFTER EACH LOOSE STOOL AND GIVE HER ENOUGH PACKETS FOR 2 DAYS:

Age	Amount of ORS to give after each loose stool	Amount of ORS to provide for use at home
Less than 24 months	50-100 ml	500 ml/day
2 up to 10 years	100-200 ml	1000 ml/day
10 years or more	As much as wanted	2000 ml/day

- Describe and show the amount to be given after each stool using a local measure.

### SHOW THE MOTHER HOW TO MIX ORS.

#### SHOW HER HOW TO GIVE ORS:

- Give a teaspoonful every 1-2 minutes for a child under 2 years
- Give frequent sips from a cup for an older child.
- If the child vomits, wait 10 minutes. Then give the solution more slowly (for example, a spoonful every 2-3 minutes)
- If diarrhoea continues after the ORS packets are used up, tell the mother to give other fluids as described in the first rule above or return for more ORS.

## ANNEX 5

## TREATMENT PLAN B TO TREAT DEHYDRATION

### APPROXIMATE AMOUNT OF ORS SOLUTION TO GIVE IN THE FIRST 4 HOURS:

Age: *	Less than 4 months	4 - 11 months	12 - 23 months	2 - 4 years	5 - 14 years	15 years or older
Weight:	Less than 5 kg	5 - 7.9 kg	8 - 10.9 kg	11 - 15.9 kg	16 - 29.9 kg	30 kg or more
in ml	200-400	400-600	600-800	800-1200	1200-2200	2200-4000
in local measure						

\* Use the patient's age only when you do not know the weight. The approximate amount of ORS required (in ml) can also be calculated by multiplying the patient's weight (in grams) times 0.075.

- If the child wants more ORS than shown, give more.
- Encourage the mother to continue breast-feeding.
- For infants under 6 months who are not breast-fed, also give 100-200 ml clean water during this period.

### OBSERVE THE CHILD CAREFULLY AND HELP THE MOTHER GIVE ORS SOLUTION:

- Show her how much solution to give her child.
- Show her how to give it - a teaspoonful every 1-2 minutes for a child under 2 years, frequent sips from a cup for an older child.
- Check from time to time to see if there are problems.
- If the child vomits, wait 10 minutes and then continue giving ORS, but more slowly, for example, a spoonful every 2-3 minutes.
- If the child's eyelids become puffy, stop ORS and give plain water or breast milk. Give ORS according to Plan A when the puffiness is gone.

### AFTER 4 HOURS, REASSESS THE CHILD USING THE ASSESSMENT CHART. THEN SELECT PLAN A, B, OR C TO CONTINUE TREATMENT.

- If there are **no signs of dehydration**, shift to Plan A. When dehydration has been corrected, the child usually passes urine and may also be tired and fall asleep.
- If signs indicating **some dehydration** are still present, repeat Plan B, but start to offer food, milk and juice as described in Plan A.
- If signs indicating **severe dehydration** have appeared, shift to Plan C.

### IF THE MOTHER MUST LEAVE BEFORE COMPLETING TREATMENT PLAN B:

- Show her how much ORS to give to finish the 4-hour treatment at home.
- Give her enough ORS packets to complete rehydration, and for 2 more days as shown in Plan A.
- Show her how to prepare ORS solution.
- Explain to her the three rules in Plan A for treating her child at home:
  - to give ORS or other fluids until diarrhoea stops
  - to feed the child
  - to bring the child back to the health worker, if necessary.

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## ANNEX 6

ANSWERS TO QUESTIONS ON ORAL REHYDRATION THERAPY  
OFTEN ASKED BY HEALTH WORKERS**1. How was the composition of ORS solution selected?**

For optimal absorption of orally administered electrolytes in water, certain conditions must be met:

- The solution should have an osmolality similar to, or less than that of plasma, i.e., about 300 mOsm/l or less.
- The concentration of glucose should be about 20 grams (111 mmol) per litre in order to achieve maximum sodium and water absorption. A higher concentration can make the solution hypertonic and cause osmotic diarrhoea. With a lower concentration, insufficient sodium and water may be absorbed.
- The sodium concentration in the solution should be sufficient to correct existing deficits and replace ongoing losses of salt.
- The molar ratio of the glucose to sodium concentrations in the solution should be at least 1:1.

Other considerations:

- Potassium losses from acute diarrhoea are highest in infants and deficits can be particularly high in infants who are malnourished. The potassium concentration should be about 20 mmol per litre.
- A citrate concentration of 10 mmol per litre or a bicarbonate concentration of 30 mmol per litre is satisfactory for correcting base deficit acidosis due to diarrhoea. The use of trisodium citrate, dihydrate, is preferred because it has a longer shelf life.

**2. Is sucrose (table sugar) an efficient substitute for glucose in ORS?**

Sucrose (table sugar) can be substituted for glucose in ORS. To provide the same amount of glucose, the sucrose concentration in grams per litre should be twice that of glucose, i.e., 40 g/l. Sucrose is hydrolysed in the intestine to glucose and fructose, but only glucose efficiently stimulates sodium absorption. When used in young children, sucrose ORS solution has sometimes been associated with increased vomiting.

**3. If a patient has been vomiting and continues to vomit when he receives ORS solution, will this prevent successful oral rehydration?**

It has been observed many times that most patients who vomit while receiving oral rehydration therapy do so mainly during the first few hours of treatment. However, vomiting is not usually an obstacle to effective oral rehydration since most of the ORS solution taken is absorbed. During the first few hours of therapy observation of the abdomen may be useful since vomiting often follows abdominal distention. If the abdomen becomes distended, the ORS solution should be given more slowly.

**4. Can oral therapy alone successfully rehydrate patients with dehydration?**

Oral therapy alone has been found efficacious in treating dehydration as long as there is no shock and the patient is not purging at a very high rate (i.e., more than 15 ml stool per kg per hour). Although severely dehydrated cases who are not in shock can often be completely rehydrated with oral therapy alone, it is preferable to give them IV fluid initially.

## 5. When is oral therapy ineffective?

The vast majority of cases with diarrhoeal dehydration can be treated successfully with ORS solution; however, ORT may not succeed in a small proportion of cases. This proportion varies according to the experience of the nurse or physician taking care of the case. Conditions where ORT may not be effective include:

- **High rate of purging:** Patients with watery diarrhoea who purge at a very high rate (more than 15 ml stool per kg per hour) generally cannot drink sufficient fluid to replace continuing stool losses. It is usually necessary to treat such cases with IV fluid until the rate of stool loss decreases.
- **Persistent vomiting:** Vomiting frequently accompanies diarrhoea, but it is not a contraindication for ORT. Up to 3 episodes of vomiting per hour usually do not interfere with effective ORT since most of the fluid taken is retained. Occasionally, however, a child may have intractable vomiting which may prevent effective oral rehydration. If the signs of dehydration do not improve despite repeated attempts to give ORT, IV fluid should be given until the vomiting subsides.
- **Severe dehydration:** In patients with severe dehydration, IV therapy is preferred. If this is not possible, ORS solution should be given by nasogastric tube. If this also is not possible, and the patient can drink, ORS solution should be given by mouth. Following initial IV rehydration, oral fluid administration should begin, provided that the dehydration status has improved and the patient can drink.
- **Glucose malabsorption:** Rarely, and especially in undernourished patients, significant glucose malabsorption may occur during acute diarrhoea. The use of ORS solution in such patients results in a marked increase in watery diarrhoea with large amounts of glucose in the stools. The patient is very thirsty and signs of dehydration do not improve, or become worse. When ORS solution is discontinued, the stool volume decreases. If this occurs, IV fluid should be used for 12-24 hours, after which ORS solution can again be tried.
- **Incorrect preparation or administration of ORS solution:** If the ORS solution has been incorrectly prepared (it is either too concentrated or too dilute) or is incorrectly administered (too little is given; it is given too rapidly, leading to vomiting) it will not be optimally effective.
- **Abdominal distention and ileus:** If the abdomen is becoming distended, ORS solution should be given more slowly and the abdomen observed and examined. If abdominal distention increases or there is paralytic ileus, fluid should be given intravenously. Signs of paralytic ileus may follow the use of antimotility drugs or result from hypokalaemia, or both. Bowel obstruction or another surgical problem is an infrequent cause.

## 6. Is oral rehydration slower than parenteral rehydration?

When the patient can take oral rehydration it usually takes no more time to achieve rehydration by this route than when fluid is given intravenously. After 4 hours of oral therapy most patients are well on the way to complete hydration. The use of oral rehydration and the consequent reduction in the use of IV therapy also avoids certain complications (e.g., sepsis, venous thrombosis) associated with the use of IV therapy.

## 7. Will ill, exhausted, dehydrated infants drink ORS solution?

Even when they have fever and malaise, almost all infants with diarrhoea and dehydration who are not in shock will eagerly drink ORS solution; this is particularly true if one uses a cup and spoon. When a small amount of the solution is put into the infant's mouth, the infant will swallow it; after a few spoonfuls it is usually well accepted.

If an infant refuses to drink ORS solution, one should reassess the patient to be sure that the diagnosis of dehydration is correct and that there is not an underlying surgical or medical condition.

**8. Is oral rehydration with ORS solution effective in infantile diarrhoea caused by diverse etiological agents, including: rotavirus, enterotoxigenic Escherichia coli, enteropathogenic E. coli, Shigella, Salmonella, and Campylobacter?**

Oral therapy has been successful in more than 95% of cases of infantile diarrhoea, due to any etiology, treated in hospital and at treatment centres. Although rotavirus infection is associated with patchy damage to the intestinal mucosa, oral therapy is nevertheless as efficacious as in any other type of acute diarrhoea.

**9. Given that the sodium concentration in infant diarrhoeal stools is approximately 50 mmol/l, is ORS solution, which contains 90 mmol/l of sodium, safe for infants or can it lead to hyponatraemia?**

The ORS solution recommended by WHO and UNICEF has been shown to be highly effective and safe in neonates, infants, children, and adults with dehydration from acute diarrhoea due to diverse causes despite their different stool sodium concentrations. The *net* deficit of water and sodium in an untreated episode of acute diarrhoea is not determined by the sodium concentration of stool alone. Other factors, including the volume and composition of ingested fluids, the urine volume and composition, and the fluids lost through vomiting, the skin, and the lungs, modify the net losses so that dehydration associated with acute diarrhoea is isotonic in the overwhelming majority of cases, irrespective of their etiology. Hence, the recommended composition of ORS solution is the optimum for **rehydration** therapy. For **maintenance** therapy, ORS solution is also safe and effective in infants if it is given in amounts that match continuing diarrhoeal losses and is accompanied by unrestricted breast-feeding or an adequate intake of plain water and other fluids. ORS solution should *not* be given after the diarrhoea has stopped and rehydration is complete.

**10. Why is ORS solution better for the treatment of dehydration than a simple solution containing sugar and salt?**

Properly prepared ORS solution contains an appropriate amount of sodium to correct the body sodium deficit and adequate glucose to ensure rapid absorption of the sodium. In addition, it provides adequate potassium to replace the potassium losses associated with all acute diarrhoeas, and citrate or bicarbonate to correct the base-deficit acidosis. These two components are not present in solutions that contain only sugar and salt.

Treatment of dehydration with a sugar-salt solution is definitely preferable to no therapy. However, when conditions permit, it should be replaced as soon as possible by the four-ingredient ORS solution.

**11. What is wrong with treating dehydration with tea, rice water, or carrot soup?**

Tea, rice water, carrot soup, and other liquids that are readily available in the home do not contain enough of the salts needed for adequate treatment of dehydration. These drinks are nevertheless useful and should be given early in the course of diarrhoea *before* there are signs of dehydration and during recovery *after* dehydration has been corrected.

**12. Can ORS solution be used to treat diarrhoea cases with hypernatraemic dehydration?**

ORS solution can safely be used to treat diarrhoea cases with hypernatraemic dehydration. In fact, ORS solution is more effective in the treatment of these cases than IV therapy and is associated with fewer complications.

**13. What is the mother's role in the oral rehydration of her infant?**

The mother should actively participate in the care of her infant by preparing and giving the ORS solution, giving other feeds, cleaning the baby, etc. Her active involvement helps to create a bond of mutual cooperation and accomplishment between the health worker and the mother, which will make the mother more receptive to advice on home therapy and preventive measures.

**14. Should one use sterile water for preparing ORS solution?**

A lack of pure water is not a contraindication to mixing ORS solution for oral rehydration. The patient needs to have his or her fluid and electrolyte losses replaced to prevent shock and death. The fluid prepared with drinking water from the normal supply probably does not expose the patient to an increased risk of more severe diarrhoea. However, it is best to boil and cool the water before use. To minimize bacterial contamination, fresh ORS solution should be made every day, covered, and stored in a cool place.

**15. Should the ORS formula be regarded and promoted as a food or as a drug?**

ORS should be considered a drug. Mixed properly and given correctly, ORS solution is safe and highly efficacious. Like any potent drug, ORS solution incorrectly prepared or over-administered may cause harm, and if too little is given it will be ineffective.

**16. If one feeds a patient who has diarrhoea, won't the diarrhoea get worse?**

There is no evidence that feeding during diarrhoea makes diarrhoea worse or that starvation ("resting the bowel") makes diarrhoea better. Breast-feeding should be continued throughout an episode of diarrhoea. Formula or animal milk and energy-rich soft or solid foods appropriate for the child's age should also be continued, except during the brief period of rehydration for children who become dehydrated. Extra food -- at least one extra meal each day for at least 2 weeks -- should be given after the diarrhoea has stopped.

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ANNEX 7

# TREATMENT PLAN C TO TREAT SEVERE DEHYDRATION QUICKLY

FOLLOW THE ARROWS. IF ANSWER IS "YES", GO ACROSS. IF "NO", GO DOWN

START HERE

Can you give intravenous (IV) fluids immediately?

YES →

- Start IV fluids immediately. If the patient can drink, give ORS by mouth while the drip is set up. Give 100 ml/kg Ringer's Lactate Solution (or, if not available, normal saline), divided as follows:

Age	First give 30 ml/kg in:	Then give 70 ml/kg in:
Infants (under 12 months)	1 hour *	5 hours
Older	30 minutes *	2 1/2 hours

\* Repeat once if radial pulse is still very weak or not detectable.

- Reassess the patient every 1-2 hours. If hydration is not improving, give the IV drip more rapidly.
- Also give ORS (about 5 ml/kg/hour) as soon as the patient can drink: usually after 3-4 hours (infants) or 1-2 hours (older patients).
- After 6 hours (infants) or 3 hours (older patients), evaluate the patient using the assessment chart. Then choose the appropriate Plan (A, B or C) to continue treatment.

NO ↓

Is IV treatment available nearby, (within 30 minutes)?

YES →

- Send the patient immediately for IV treatment.
- If the patient can drink, provide the mother with ORS solution and show her how to give it during the trip.

NO ↓

Are you trained to use a naso-gastric (NG) tube for rehydration?

YES →

- Start rehydration by tube with ORS solution: Give 20 ml/kg/hour for 6 hours (total of 120 ml/kg).
- Reassess the patient every 1-2 hours:
  - If there is repeated vomiting or increasing abdominal distension, give the fluid more slowly.
  - If hydration is not improving after 3 hours, send the patient for IV therapy.
- After 6 hours, reassess the patient and choose the appropriate Treatment Plan

NO ↓

Can the patient drink?

YES →

- Start rehydration by mouth with ORS solution, giving 20 ml/kg/hour for 6 hours (total of 120 ml/kg).
- Reassess the patient every 1-2 hours:
  - If there is repeated vomiting, give the fluid more slowly.
  - If hydration is not improving after 3 hours, send the patient for IV therapy.
- After 6 hours, reassess the patient and choose the appropriate Treatment Plan

NO ↓

**URGENT** Send the patient for IV or NG treatment

**NOTES:**

- If possible, observe the patient at least 6 hours after rehydration to be sure the mother can maintain hydration giving ORS solution by mouth.
- If the patient is above 2 years and there is cholera in your area, give an appropriate oral antibiotic after the patient is afebrile.

## ANNEX 8

## MANAGEMENT OF ASSOCIATED PROBLEMS

## FOR OTHER PROBLEMS

**ASK ABOUT BLOOD IN THE STOOL****IF BLOOD IS PRESENT:**

- Treat for 5 days with an oral antibiotic recommended for *Shigella* in your area.
- Teach the mother to feed the child as described in Plan A.
- See the child again after 2 days if:
  - under 1 year of age
  - initially dehydrated
  - there is still blood in the stool
  - not getting better
- If the stool is still bloody after 2 days, change to a second oral antibiotic recommended for *Shigella* in your area. Give it for 5 days.

**ASK WHEN THIS EPISODE OF DIARRHOEA BEGAN****IF DIARRHOEA HAS LASTED AT LEAST 14 DAYS:**

- Refer to hospital if:
  - the child is under 6 months old
  - dehydration is present. (Refer the child after treatment of dehydration.)
- Otherwise, teach the mother to feed her child as in Plan A, except:
  - dilute any animal milk with an equal volume of water or replace it with a fermented milk product, such as yoghurt.
  - Assure full energy intake by giving 6 meals a day of thick cereal and added oil, mixed with vegetables, pulses, meat, or fish.
- Tell the mother to bring the child back after 5 days:
  - if diarrhoea has not stopped, refer to hospital.
  - if diarrhoea has stopped, tell the mother to:
    - use the same foods for the child's regular diet.
    - after 1 more week, gradually resume the usual animal milk.
    - give an extra meal each day for at least 1 month.

**LOOK FOR SEVERE UNDERNUTRITION****IF THE CHILD HAS SEVERE UNDERNUTRITION:**

- Do not attempt rehydration; refer to hospital for management.
- Provide the mother with ORS solution and show her how to give 5 ml/kg/hr during the trip.

**ASK ABOUT FEVER AND TAKE TEMPERATURE****IF TEMPERATURE IS 39° C OR GREATER:**

- Give paracetamol.

**IF THERE IS FALCIPARUM MALARIA IN THE AREA,** and the child has any fever (38° or above) or history of fever in the past 5 days:

- Give an antimalarial (or manage according to your malaria programme recommendation).

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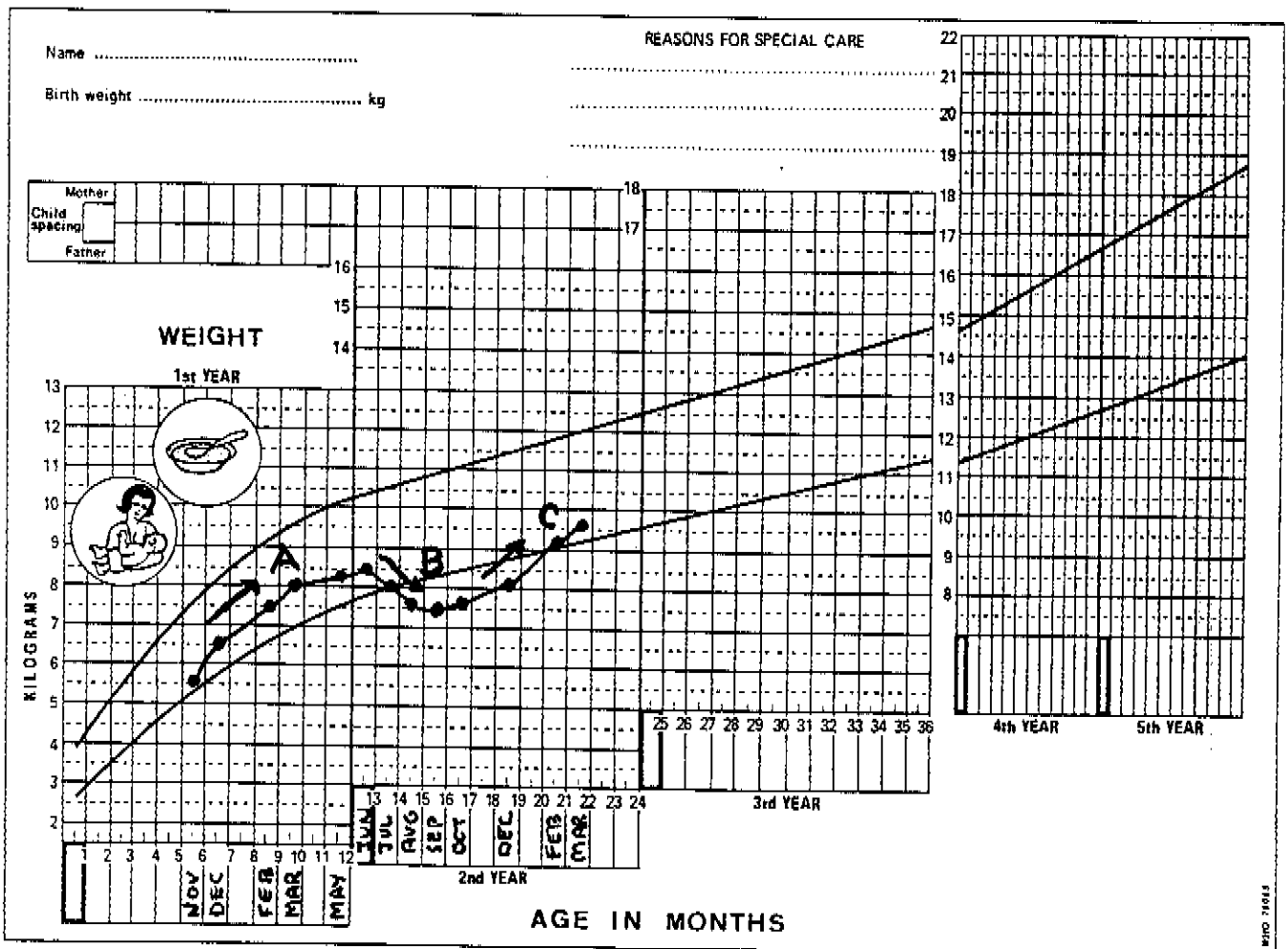
ANNEX 9

GROWTH CHART

Below is an example of a growth chart that can be used for plotting the changes in body weight of an infant or young child. As maintenance of good nutrition is important in the prevention of diarrhoea, an episode of diarrhoea is an excellent time to start using a growth chart, if one is not already being used.

The infant or young child should be weighed at regular intervals and the weight entered on the chart in the vertical column corresponding to the child's age. The value of a growth chart is not to determine the nutritional status of a child at a particular time. Rather, its principal use is to monitor **growth over time** by measuring changes in weight (an example of a child's growth curve is shown on the chart below). If the direction of the line joining successive weights is upwards and parallel to the solid lines (arrows A and C on chart), the child is growing satisfactorily. A downward or horizontal direction of the line (arrow B on chart) is a sign of inadequate nutrition and/or illness. These patterns are especially helpful in the first year of life; in older children slight fluctuations in growth normally occur without signalling danger.

The curved lines that run across the chart show the **shape** of normal growth curves. The growth curves of most healthy children will lie between these lines or above the upper line. If a child's weight is much below the lower reference line there is some reason for concern. However, even in this case, it is the direction of the child's growth curve that is most important.



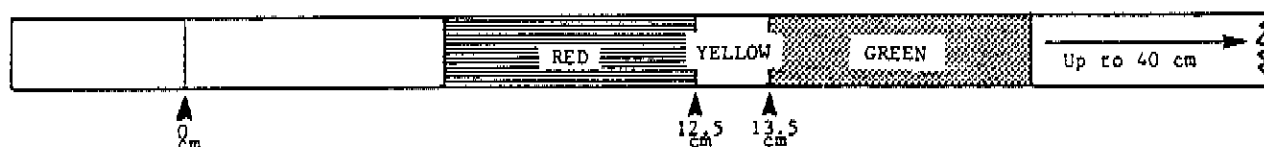
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## ANNEX 10

## HOW TO DETERMINE IF A CHILD IS UNDERNOURISHED

The upper arm has a bone, muscles and fat. When babies are about 1 year old, they have quite a lot of fat under the skin of their arms. When the child is 5 years old, there is much less fat and more muscle. The distance around the upper arm remains almost the same between the ages of 1 and 5 years. If a child is undernourished, this distance is reduced, and his or her arm becomes thin. This is due to a reduction in muscles and fat. By placing a special measuring strip around the upper arm one can find out whether a child between the ages of 1 and 5 is undernourished or not.

This measuring strip is called a tri-coloured arm strip and looks like this:



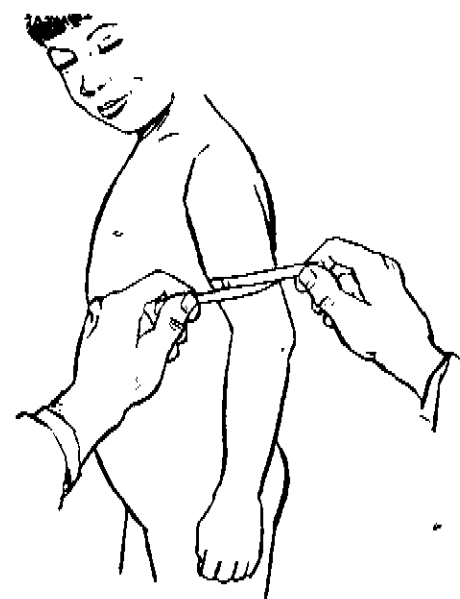
You can make one from a string or strip of material that does not stretch, being careful to mark it accurately.

To use the strip:

Put it around the mid upper arm of the child and see which colour is touched by the 0 cm mark on the strip.

- If the *green* part is touched, the child is well nourished.
- If the *yellow* part is touched, the child is moderately undernourished.
- If the *red* part is touched, the child is severely undernourished.

This method of measuring the arm is useful because the health worker can identify undernutrition in a child without using a scale or knowing the child's age. However, since it only shows large changes in a child's nutritional status, it is not suitable for determining whether the child is improving or becoming worse.



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