NATIONAL DIARRHOEAL DISEASES CONTROL PROGRAMME, INDIA

MANAGEMENT OF ACUTE DIARRHOEA

NATIONAL INSTITUTE OF CHOLERA & ENTERIC DISEASES
(INDIAN COUNCIL OF MEDICAL RESEARCH)

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Introduction

Acute diarrhoeal disease is one of the major causes of morbidity and mortality in India, especially among infants and children below 5 years of age. However, no reliable data on diarrhoea-related morbidity and mortality are available as diarrhoeal diseases (except cholera) are not notifiable. Results of a few longitudinal studies conducted in different parts of the country revealed that the children below 5 years may suffer from about 2 episodes of diarrhoea per year. Accordingly, the total episodes of diarrhoea may be estimated to be around 500 million per year in all age groups. Recent studies have also indicated that most of the diarrhoea cases in the community are mild and about 10 per cent of them may have dehydration and only one in 100 patients may require to be treated in health centres and hospitals. Therefore, it may be estimated that about 50-100 million diarrhoea patients may be requiring rehydration therapy of which 5 million may require treatment at the health facilities per year.

The problems of diarrhoeal diseases are further complicated by the fact that over 25 different pathogens may be responsible for the causation of the disease and not much informations are available regarding the ecology and epidemiology of the diseases caused by them.

However, significant new knowledge acquired in the last decade on the etiology, epidemiology, pathogenesis, immunology and treatment of acute diarrhoeas provided a solid basis for an immediate attack on the problem. The most important of the new developments is Oral Rehydration Therapy (ORT)—a simple method of treatment by the oral route—which is safe, economical and effective in all but the most severe cases of diarrhoea. This type of therapy can be delivered by village health workers and can be practised in the house by mothers with some guidance and thus is technologically highly suited for the primary health care approach.

Recognizing the significance of these new developments, the Thirty-first World Health Assembly in May, 1978 called for a concerted attack on diarrhoeal diseases as part of the global commitment to primary health care and to Health for All by the year 2000 A.D. The WHO Diarrhoeal Diseases Control (CDD) Programme was launched shortly thereafter, with the immediate objective of reducing childhood mortality and the long-term objective of reducing morbidity—caused by diarrhoeal diseases.

In view of the recommendations of World Health Assembly, the National Diarrhoeal Diseases Control Programme in India was launched in 1981 with main emphasis on the implementation of short-term objective of reduction of mortality through effective introduction of Oral Rehydration Therapy (ORT) at the most peripheral level. The components of ORT Implementation

Programme include (*i*) production and distribution of ORS packets, (*ii*) training of medical and para-medical health personnel as well as education of mothers and other members of the community, and (*iii*) operational/health services research for identification of suitable strategy for implementation.

The following progress in the implementation of the programme has been made so far:

(*i*) *Production and distribution of ORS packets:* Implementation of ORT at the community level will primarily depend on the availability of the required number of packets of Oral Rehydration Salt (ORS) of the complete WHO formula. The basic ingredients are readily available in the country and a number of firms in the Public and Private sectors have started producing the ORS packets in bulk quantities. The Indian Drugs and Pharmaceuticals Limited (IDPL) has been entrusted with the production of ORS packets in a large scale. IDPL has been producing about 5 million packets annually and the production can be stepped up gradually to 100 million packets per year as required for the Programme. Besides IDPL, the Government Medical Stores, Madras, the Institute of Preventive Medicine, Hyderabad and a number of private firms are also producing packets of ORS, as per WHO recommended formula.

To make an effective impact on reduction of diarrhoea-related mortality, ORT should be made available as close to the house of the patients as possible. It has been proposed to provide the packets to Health Guides/Anganwari Workers at the village level so that ORT is available soon after the onset of diarrhoea. It is proposed that 100 packets of ORS will be supplied to each Health Guide per year by 1990 to tackle diarrhoea cases with mild to moderate degrees of dehydration.

(*ii*) *Training of health personnel:* Training of health services personnel at all levels and education of mothers and the other members of the community should form an essential and integral part of CDD Programme. Experiences have shown that distribution of ORS at the community did not result in its proper utilization without adequate training of health care delivery personnel and members of the community.

The National Institute of Cholera and Enteric Diseases, Calcutta has been entrusted to organize training courses for Teachers/Trainers in different States. 45 Training Courses have so far been organised in collaboration with the various State Health Departments. Over 2,000 medical personnel have been trained so far. These trained persons are expected to act as Faculty Members for the States for the training of Primary Health Centre doctors as well as paramedical staff.

It is proposed to organize 420 district-level training courses to train 18,000 PHC doctors by 1985. The PHC doctors in turn will train the paramedical staff including the Health Guides.

Operational research studies have clearly demonstrated that about 50 percent cases of diarrhoea in the community can be managed by the Mothers with home-made/home-available fluids and the rest can be treated by the Health Guides with ORS, and only a few may be required to be referred to the health facilities. With the education of mothers for the use of home-available fluids and availability of ORS packets with Health Guides it is expected that diarrhoea-related mortality in children will be reduced considerably.

TREATMENT OF DIARRHOEA

What is Diarrhoea ?

Diarrhoea may be defined as passing of 3 or more *loose* or *watery* stools in a day. Frequent passing of normal stools is not diarrhoea. Breast-fed babies often have softer stools than normal.

Diarrhoea is most common in children, especially those between 6 months and 2 years of age.

What happens during Diarrhoea ?

There is loss of a large amount of water and salts from the body due to diarrhoea and vomiting. This loss leads to what is called as *dehydration*. All the signs and symptoms of diarrhoea result due to dehydration. When dehydration is severe and untreated, it often leads to *death*.

Dehydration occurs *faster* in infants and young children, in hot climates and when accompanied by fever.

How to treat Diarrhoea ?

The important components of treatment of diarrhoea are to (*a*) *prevent* dehydration from occurring, and (*b*) *treat* dehydration quickly if it is present.

(*a*) *Prevention of dehydration:* Since most of the cases of diarrhoea in the community are mild and have no dehydration, they may be treated by mothers at home with home-available fluids, such as salt-sugar solution (sarbat), butter milk (Lassi), rice water (kanji), soup (dal), green cocoanut water, diluted milk, weak tea and/or breast feeding. Every community uses certain fluids for their daily use; they are safe, available at home and acceptable to the people.

(*b*) *Treatment of dehydration:* If there is dehydration, the child should be treated with oral rehydration solution made with oral rehydration salts (ORS) by the Health Guide or at the health centres/hospitals. The Health Guides are provided with packets of ORS and plastic measuring containers for measuring water. With adequate training they should be able to treat the cases having mild dehydration.

The patients with moderate to severe dehydration should be treated at the health centres/hospitals with ORS and/or Intravenous solutions.

Therefore, diarrhoea patients can be treated at *three* levels namely (*i*) at home with home-available fluids by mothers, (*ii*) at the community by Health Guides with ORS, and (*iii*) at health centres/hospitals with ORS and I.V. solutions, if required.

A. At home	*B. At the Village*	*C. Health Centres*
Mothers with available fluids	Health Guides with ORS Packets	Physicians with ORS and/or I.V. fluids

A. **Home treatment**

The success of home treatment would primarily depend on the education of the mothers and the other members of the community on the use of home-available fluids for prevention of dehydration. She should be made to understand that her child looses water and salts with each bout of diarrhoea and vomiting. It may be dangerous unless some fluids and salts are given immediately to the child.

The mother or any other family member who looks after the child should be explained to observe the following rules for home treatment:

1. *Give more fluids to your child*
   — If the child is breast-fed, try to give breast milk more often. If the child is not breast-fed, increase normal milk feed with diluted milk.

   — Give any available fluids at home such as sarbat, lassi, kanji, green cocoanut water, dal, soup, puffed rice-soaked water, etc.

A child under 2 years of age should be given approximately 50-100 ml (1/2—1 cup) of fluid after each loose stool and older children should receive twice the amount. Adults should take as much as they want to drink.

2. *Continue feeding the child*

All children above 6 months should be given easily digestable solid food such as boiled rice, porridges, soups, eggs, fish and well-cooked meat during diarrhoea. No child should be starved.

3. If the child does not improve within 12-24 hours, the Health Guide in the village may be consulted and ORS treatment may be started when necessary.

The mothers and the members of the community may be educated by the Health Guide as well as through various mass media such as repeated radio broadcasts, newspapers, posters, community meetings or visit to health centres.

B. **Treatment of Diarrhoea by Health Guides**

Treatment of children with dehydration will involve Oral Rehydration Salt (ORS) solution. A Health Guide with adequate training will be able to treat diarrhoea with mild dehydration. Therefore, he should know how to prepare the Oral Rehydration Salt (ORS) solution.

A Health Guide will be provided with packets of ORS (WHO formula) with the following ingredients:

Ingredients	*Amount*
Glucose	20.0 grams
Sodium chloride	3.5 grams
Sodium bicarbonate	2.5 grams
Potassium chloride	1.5 grams

A packet with the above amount of ingredients is to be mixed in *one litre* of drinking water. A Health Guide is also provided with a plastic measuring container to measure water correctly. This mixture is called ORS solution.

The following steps may be performed to prepare ORS solution:

- Wash the hands properly;
- Measure 1 litre of clean drinking water with the help of the measuring bottle and pour it into a clean container;
- Pour all the powder from one packet into the water and mix well until powder is completely dissolved;
- Taste the solution so you know how it tastes

ORS solution should be made fresh everyday and any solution remaining from the day should be discarded.

The Health Guide should prepare the ORS solution and demonstrate its use to the mothers along with the following instructions:

(*i*) Infants and younger children should be given 2-4 teaspoonful at a time and repeated every 5-10 minutes to avoid vomiting. Older

children and adults may drink as much as they like from a glass or a cup.

(*ii*) The mothers should also give breast milk or other home-available fluid to the infants and children.

(*iii*) The mothers should come quickly to the Health Guide or to the Health Centre if diarrhoea does not improve within 12-24 hours.

The Health Guide should supervise the treatment by the mother and if he detects signs of dehydration (increased thirst, dark urine, irritable condition, sunken eyes and a pinch of skin does not go back quickly) he should refer the child quickly to the Health Centre for further treatment.

C. **Treatment of Diarrhoea at the Health Centres/Hospitals**

1. *Assessment of the Patient*
   History
   Physical examination
   Weighing the patients
   Assessment of dehydration

1.1 *History:* Particular attention should be paid to the duration, frequency, amount and character of stool and vomitus.

1.2 *Physical examination:* A full physical examination should be performed. Particular attention should be given to signs of dehydration as described in Table 1. A few additional points are worth noting:

— Fever is often present in severely dehydrated babies. It is necessary to take rectal temperature as the skin may be cold despite high fever.

— Rapid breathing may be a result of dehydration or a lower respiratory tract infection. If the breathing is rapid *and* deep, this is probably due to acidosis associated with dehydration.

— With severe dehydration hypovolaemic shock may occur. The signs of this include cold sweaty extremities, a rapid feeble pulse, a low or even unrecordable systolic blood pressure (less than 70 mmHg) and peripheral cyanosis.

1.3 *Weighing the patient:* Weighing has two purposes. First, if the patient is a child who has been weighed regularly, or an adult whose normal weight is known, sudden weight loss during the diarrhoeal illness is a useful indication of the presence and extent of dehydration. Secondly, weighing of the patient at intervals during therapy is helpful in assessing the progress of rehydration.

However, treatment should not be delayed because a weighing machine is not readily available. If a weighing machine is available, carefully weigh the patient unclothed or lighly clothed and record the weight.

1.4 *Assessment of dehydration:* No exact "formula" can be given for assessing dehydration. It requires a careful evaluation of the history and the physical examination. In general, the greater the stool and vomit losses are, the more severe the dehydration will be.

Patients with signs and symptoms of dehydration can usually be classified as having *mild, moderate,* or *severe* dehydration. As a guide, if two or more of the signs of severe dehydration (Table 1) are present, the patients should be considered to have severe dehydration. Similarly, two or more signs of moderate dehydration should be considered as sufficient evidence for its presence. Note that thirst may be the only indication of mild dehydration, but this may not be evident in infants. The signs and symptoms that are particularly useful in assessing dehydration and monitoring rehydration in infants, are indicated by an asterik (*) in Table 1. As mentioned above, weighing may be useful in the assessment of dehydration. The best tool for assessing dehydration is keen observation based on experience.

2. *Management of Patients*

2.1 *Basic principles:* Following assessment of the state of dehydration, management of the patient, has two essential parts:

— Fluid therapy, including the treatment of dehydration if it is present.
— Maintenance of nutrition.

2.2 Management of the dehydrated patient.

2.2.1 *General considerations:* The main principle of fluid therapy is that the *output* of water and electrolytes from the body in stools, vomit, urine, sweat, and insensible losses should be matched 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:

(*a*) correction of the existing water and electrolyte deficit as indicated by the presence of signs of dehydration (*rehydration therapy*);

(*b*) replacement of ongoing abnormal losses of water and electrolytes due to continuing diarrhoea, to prevent a recurrence of dehydration (*maintenance therapy*);

(*c*) provision of *normal* daily fluid requirements during rehydration and maintenance therapy.

In utilizing the guidelines that follow, these three essential needs should be considered. It will be seen that rehydration therapy can usually be achieved

orally with ORS solution, except in cases with severe dehydration, uncontrollable vomiting, or other complications that prevent successful oral therapy. In these cases intravenous (I.V.) therapy is needed. ORS solution is also the fluid used for maintenance therapy. However, normal daily fluid requirements must be given as fluids of lower salt concentration: e.g., plain water, breast milk, or diluted milk feeds. This is particularly important in *infants* due to their large surface area per kg. of body weight and their high metabolic rate; under normal conditions they require 2½ times more water per kg than adults.

2.2.2 *Rehydration therapy:* In patient with signs and symptoms of dehydration, the existing water and electrolyte losses must be replaced promptly and adequately. In oral therapy a steady but comfortable rate of ingestion is usually adequate to achieve rehydration. Patients with severe dehydration, with or without hypovolaemic shock, generally require intravenous therapy to achieve complete or near complete rehydration. Guidelines for the rehydration therapy are given in Table 2. The volumes and rates of administration are averages based on usual needs. These should be increased if they are not adequate to achieve rehydration, or decreased if hydration is achieved earlier than expected or if the appearance of puffiness around the eyes suggests overhydration. Once the clinician has gained some experience in rehydration therapy he may not need to adhere to a rigid schedule.

While rehydration therapy (to replace the body's abnormal losses) is in progress, the patient's *normal daily fluid requirements* must also be considered. These can be met in the following ways:

- *Breast-fed infants:* After the first 4 hours of rehydration therapy, or earlier if rehydration is complete, breast feeding should be started and thereafter continued as often as the infant desires, in addition to continuing ORS solution[1].

- *Non-breast-fed infants:* After the first 4 hours of rehydration therapy, or earlier if rehydration is complete, a volume of plain water should be given equal to half the volume of ORS solution already taken by the infant[2]. This plain water should be given over the next 1-2 hours, before continuing ORS solution. This is an *essential* aspect of rehydration therapy in these infants.

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

[1]Some clinicians feel that breast feeding should be delayed beyond 4 hours if rehydration is not complete (i.e., if signs of dehydration are still present). In such cases plain water should be given as described above for non-breast-fed infants until breast feeding is resumed.

[2]Plain water should be clean and preferably boiled and cooled. Sugar should not be added as this may decrease the appetite and interfere with subsequent food intake.

The *progress of the rehydration therapy* should be assessed after one hour and then every 1-2 hours. In particular, attention should be given to:

— the number and volume of stools passed;
— the extent of vomiting;
— the presence of, and changes in, the signs of dehydration;
— whether the rehydration fluid (oral or I.V.) is being successfully given and in adequate amounts.

If, during the time period indicated in Table 2, the calculated volume has been given and signs of dehydration are still present, but there has been some improvement, rehydration therapy should be continued at the same rate as long as is necessary.

If the signs of dehydration have become worse or remain unchanged, the rate of administration and the volume of fluid given may need to be increased. If patients receiving ORS solution develop signs of severe dehydration, I.V. therapy should be started as indicated in Table 2.

As soon as the signs of dehydration have gone, but not before, *maintenance therapy* should be started.

2.2.3 *Maintenance therapy:* After the initial fluid and electrolyte deficit has been corrected (i.e., the signs of dehydration have gone), it is important to replace the ongoing abnormal losses of fluid and electrolytes that are associated with continuing diarrhoea—this is *maintenance therapy*. The principle is to match the input to the output[1]. Some guidelines are given in Table 3.

In addition to the replacement of ongoing abnormal losses, the body's *normal daily fluid requirements* must also be considered. These can be met in the following ways:

- *Breast-fed infants:* Breast feeding should be allowed as often as the infant desires, *in addition* to the required volume of ORS solution.
- *Non-breast-fed infants:* The milk normally consumed by the infant can be restarted but should be *diluted with an equal volume of clean plain water* until the diarrhoea stops. Other fluids normally consumed by the infant can also be restarted. The milk and other fluids should be given *in addition* to the required amount of ORS solution and, as a guide, should form about one-third of the total fluid intake (i.e., 2/3 ORS solution : 1/3 milk and other fluids) until the diarrhoea stops.
- *Older children and adults:* Fluids normally consumed can be taken as desired, *in addition* to the required ORS solution.

[1]Measurement of stool and vomit losses is useful for calculating fluid requirements; however, this is usually difficult or impractical and is not essential for successful therapy. If available, a "cholera cot" or diapers and a weighing scale may be useful for calculating stool and urine losses.

Patients with continuing severe *diarrhoea* as defined in Table 3 should be given maintenance therapy in a treatment facility until the diarrhoea becomes mild. If signs of dehydration reappear, and losses cannot be replaced adequately by increasing the volume of ORS given, I.V. therapy should be considered.

Maintenance therapy should continue until the diarrhoea stops.

2.2.4 *Role of drugs in the treatment of acute diarrhoea:* As a rule antimicrobial drugs have *limited* role in the treatment of acute diarrhoea. Specific indications include the following:

1. Cholera (*only* severe cases)
2. Severe shigella dysentery
3. Amoebic dysentery
4. Acute giardiasis

The drugs of choice for treatment of these diseases are given in Table 4. Anti-diarrhoeal agents and other drugs like kaolin, pectin, activated charcoal, opium and diphenoxylate with atropine, steroids, stimulants, antiemetics and purgatives are not indicated in the routine treatment of acute diarrhoeal diseases. Febrile convulsion and hypoglycemia should be treated according to standard procedure. *Antibiotics can never be a substitute for ORS in diarrhoea.*

2.2.5 *Administration of ORS solution:* A family member should always be shown how to prepare and give the ORS solution and should assist in doing so. The solution can be given to infants using a cup and spoon, a cup alone, or, if it is usually used, a feeding bottle. These must be clean; in the case of a feeding bottle, the mother should be shown how to clean it properly. For babies, a dropper or syringe can be used to put small volumes of solution into the mouth.

Alternatively, for babies who cannot drink due to fatigue or drowsiness, but are not in shock, a nasogastric tube can be used to administer ORS solution (average recommended rate of 15 ml/kg body weight per hour). ORS solution can be put into the nasogastric tube using a syringe or a clean, used, intravenous infusion bottle. For babies in shock, this procedure should be used only as emergency measure (e.g., when it is not possible to give I.V. fluids). In such cases, ORS solution should be administered at a rate of 20 ml/kg body weight per hour.

Vomiting is not uncommon during the first hour or two after administration of ORS solution, but it usually does not prevent successful oral rehydration. To reduce vomiting and to improve ORS solution absorption, give it slowly, in sips, at short intervals. If the patient vomits, wait 5-10 minutes then start ORS solution again slowly. Rarely, sustained severe vomiting may prevent the successful administration of ORS solution; when it occurs, I.V. therapy should be used.

2.2.6 *Maintenance of nutrition: Dietetic management:* In the management of acute diarrhoea it is essential to repair whatever nutritional deficit arises and to maintain nutrition during the diarrhoeal illness. This deficit results from reduced food intake due to anorexia and with-holding of food, and from nutrient loss due to vomiting and malabsorption. There is no physiological basis for "resting" the bowel during or following acute diarrhoea. In fact, fasting has been shown to reduce further the ability of the small intestine to absorb a variety of nutrients. Even during acute diarrhoea, 60% of the normal absorption of nutrients occurs. This is particularly true for fats and oils, which can provide a large amount of energy for the quantity eaten. Greater weight gain has been documented in infants given a liberal dietary intake during diarrhoea when compared with others on a more restricted intake.

The resumption of breast feeding and other milk feeds in infants is essential for meeting normal daily fluid requirements and also for the maintenance of adequate nutrition.

In addition, as soon as their appetite returns, all children older than 4-6 months, and all adults, should eat foods that provide adequate calories[1] and are easily digestible[2]. These foods should be started during maintenance therapy—there is *no reason* to delay feeding until the diarrhoea stops. Foods which are rich in potassium (e.g., fruit juices, bananas, cocoanut milk) are useful in view of the losses of body potassium during diarrhoea.

In infants 4-6 months of age or older who have not previously been given semi-solid foods, this is a good time to start feeding such foods and to emphasize their importance in the prevention of future episodes of diarrhoea. In these infants, and in some of those who have lost their appetite during the diarrhoea, considerable effort may be necessary to get them to eat. In such cases frequent small meals should be given. Severely malnourished children may require nutrition rehabilitation in a treatment centre. In these children solid foods may need to be re-introduced into the diet more slowly.

In infants especially, after an episode of diarrhoea one extra meal should be given each day for at least one week after the diarrhoea stops.

2.3 *Intravenous therapy for severe dehydration*

2.3.1 *Technique of administration:* The technique of administration of intravenous fluids can only be taught by practical demonstration by someone with experience. Intravenous therapy should be given only by trained

[1]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 fats and oils or sugar. Dairy products, legumes, fish and eggs are also suitable foods.

[2]Foods with a high fibre content (e.g., coarse fruits and vegetables, fruit and vegetable peels, whole-grain cereals) should be avoided.

persons. Several general points are made here. The needles, tubing, bottles, and fluid used for intravenous therapy must be *sterile.*

Intravenous therapy can be given into any convenient vein. The most accessible veins are generally those in front of the elbow, on the back of the hand, at the ankel, or, in infants, on the side of the scalp. Use of neck veins or incision to locate a vein are usually not necessary and should be avoided if possible. In some cases of severe dehydration, particularly in adults, infusion into two veins may be necessary; one infusion can be removed once rehydration is well in progress.

It is useful to mark intravenous fluid bottles at various levels with the times at which the fluid should have fallen to those levels. This allows easier monitoring of the rate of administration.

2.3.2 *Solutions for intravenous infusion:* A number of solutions are available for I.V. infusion; however, some do not contain appropriate or adequate amounts of the electrolytes required to correct the deficits found in dehydration associated with acute diarrhoea. The following is a brief discussion of the relative suitability of each of these solutions.

Preferred solutions

— *Ringer's Lactate solution* (also called Hartmann's solution for injection) is the best commercially available solution. It supplies adequate concentration of sodium and potassium, and the lactate yields bicarbonate for correction of the acidosis. It can be used in *all age groups* for dehydration due to acute diarrhoea of all causes.

— *Normal saline* (also called Isotonic or Physiological saline). This solution is often readily available. It will not correct the acidosis and will not replace potassium losses. Sodium bicarbonate or sodium lactate and potassium chloride can be given at the same time, but this requires careful calculation of amounts, and monitoring is difficult. In the Infections Diseases Hospital, Calcutta, I.V. normal saline was used successfully along with simultaneous administration of ORS by mouth.

Unsuitable solutions

— *Plain Glucose and Dextrose solutions* should not be used as they provide only water and sugar. They do not contain electrolytes and thus they do not correct the electrolyte losses or the acidosis.

2.3.3 *Providing I.V. therapy for severe dehydration:* The purpose is to give the patient a large quantity of fluids quickly to replace the large volume of fluid loss which has resulted in severe dehydration.

- Begin intravenous therapy quickly in the amount specified in Table 2.

  If the signs of dehydration and the diarrhoea and vomiting have become worse or remain unchanged, *the rate of administration and the amount of fluid given may need to be increased.*

- While rehydration therapy (to replace the body's abnormal losses) is in progress, the patient's *normal daily fluid requirements* must also be considered. After 6 hours, begin breast-feeding, or for the non-breast-fed infant, give 100-200 ml of *clean* water before continuing OR therapy. (For older children and adults, plain water should be available to patients to drink as they wish, *in addition* to ORS solution.)

- After the first 6 hours (4 hours for older children and adults), ASK, LOOK, and FEEL for the signs of dehydration. At this point complete or near complete rehydration of the severely dehydrated patient should have been achieved. The patient will require continued therapy to prevent dehydration from *recurring* as long as the diarrhoea continues.

TABLE I

ASSESSMENT OF DEHYDRATION AND FLUID DEFICIT

Signs and symptoms	Mild dehydration	Moderate dehydration	Severe dehydration
General appearance and condition —Infants and young children	Thirsty; alert; restless	Thirsty; restless or lethargic but irritable when touched	Drowsy; limp, cold, sweaty cyanotic extremities; may be comatose
—older children and adults	Thirsty; alert; restless	Thirsty; alert; giddiness with postural changes	Usually conscious; apprehensive; cold, sweaty cyanotic extremities; wrinkled skin of fingers and toes; muscle cramps
Radial pulse[1]	Normal rate and volume	Rapid and weak	Rapid, feeble, sometimes impalpable
Respiration	Normal	Deep, may be rapid	Deep and rapid
*Anterior fontanelle[2]	Normal	Sunken	Very Sunken
Systolic blood pressure[3]	Normal	Normal—low	Less than 10, 7 kPa (80 mmHg); may be unrecordable
*Skin elasticity[4]	Pinch retracts immediately	Pinch retracts slowly	Pinch retracts very slowly (>2 seconds)
*Eyes	Normal	Sunken	Deeply sunken
Tears	Present	Absent	Absent
Mucous membrances[5]	Moist	Dry	Very dry
*Urine flow[6]	Normal	Reduced amount and dark	None passed for several hours; empty bladder
%body weight loss	4-5%	6-9%	10% or more
Estimated fluid deficit	40-50 ml per kg	60-90 ml per kg	100-110 ml per kg

*Particularly useful in infants for assessment of dehydration and monitoring of rehydration.
[1]If radial pulse cannot be felt, listen to heart with stethoscope.
[2]Useful in infants until fontanelle closes at 6-18 months of age. After closure there is a slight depression in some children.
[3]Difficult to assess in infants.
[4]Not useful in marasmic malnutrition or obesityl.
[5]Dryness of mouth can be palpated with a clean finger. Mouth may always be dry in a child who habitually breathes by mouth.
[6]A marasmic baby or one receiving hypotonic fluids may pass good urine volumes in the presence of dehydration.

TABLE 2

GUIDELINES FOR REHYDRATION THERAPY

Degree of dehydration	Age group	Type of fluid	Volume of fluid	Time of administration
Mild	All	ORS Solution	50 ml/kg	Within 4 hours
Moderate	All	ORS Solution	100 ml/kg[1]	Within 4 hours
Severe	Infants	I.V.[2] Ringer's Lactate	30 ml/kg	Within 1 hour
		Followed by		
		I.V.[2] Ringer's Lactate	40 ml/kg	Within next 2 hours
		Followed by		
		ORS Solution	40 ml/kg	Within next 3 hours
	Older children and adults	I.V.[2] Ringer's Lactate	110 ml/kg	Within 4 hours; initially as fast as possible until radial pulse is palpable

[1]During the initial stages of therapy, adults can usually consume up to 750 ml per hour and children up to 300 ml per hour.

[2]If Ringer's Lactate is not available, one of the other I.V. solutions listed in section 2.3.2 may be used in the same volumes as shown above (except for 1/2 Strength Darrow's Solution, for which the volumes shown above should be increased by 50%).

TABLE 3

GUIDELINES FOR MAINTENANCE THERAPY

Amount of diarrhoea	Kind of fluid	Route and place of administration	Amount of fluid
Mild diarrhoea (not more than one stool every 2 hours or longer, or less than 5 ml stool per kg per hour)	ORS	By mouth: at treatment facility	100 ml/kg body weight per day until diarrhoea stops[1]
Severe diarrhoea (more than one stool every 2 hours, or more than 5 ml of stool per kg per hour)	ORS	By mouth: at treatment facility	Replace stool losses volume for volume; if not measurable give 10-15 ml/kg body weight per hour
Severe diarrhoea with *recurrence* of signs of *dehydration*	Treat as for Severe Dehydration in Table 2		

[1]In infants, as an alternative, mothers can be advised to give 10 ml/kg body weight for each diarrhoea stool. In older children and adults, thirst is an adequate guide for fluid needs; they can be told to drink as much as they want to satisfy their thirst.

TABLE 4

ANTIMICROBIALS USED IN THE TREATMENT OF SPECIFIC CASES OF ACUTE DIARRHOEA

Clinical Diagnosis of cause	Dose(s) of Choice[1]	Alternative[1]
Suspect Cholera[2, 3]	**Tetracycline** *Children*—50 mg/kg/day in 4 divided doses x 3 days *Adults*—500 mg 4 times a day × 3 days	**Furazolidone** *Children*—5 mg/kg/day in 4 divided doses x 3 days *Adults*—100 mg 4 times a day × 3 days
Shigella dysentery[2, 4]	Ampicillin—100 mg/kg/day *OR* **Trimethoprim** (TMP)—**Sulfamethoxazole** (SMX) *Children*—TMP 10 mg/kg/day and SMX 50 mg/kg/day in 2 divided doses × 5 days *Adults*—TMP 160 mg and SMX 800 mg twice daily × 5 days	**Nalidixic Acid** 55 mg/kg/day in 4 divided doses × 5 days (all ages) Tetracycline—50 mg/kg/day in 4 divided doses × 5 days (all ages)
Acute intestinal amoebiasis	**Metronidazole**[5] *Children*—30 mg/kg/day × 5-10 days *Adults*—750 mg 3 times a day × 5-10 days	In very servere cases: *Dehydroemetine hydrochloride* by deep intramuscular injection, 1-1.5 mg/kg (maximum 90 mg) for up to 5 days depending on response (all ages)
Acture giardiasis	**Metronidazole**[5] *Children*—15 mg/kg/day × 5 days *Adults*—250 mg 3 times a day × 5 days	

[1]All doses given are for oral administration unless otherwise indicated.

[2]Decision on selection of antibiotic for treatment should take into account frequency of resistance to antibiotics in the area.

[3]Antibiotic therapy not essential for successful therapy but shortens duration of illness and excretion of organisms in severe cases.

[4]Antibiotic therapy especially required in infants with persistent high fever.

[5]Tinidazole and ornidazole can also be used in accordance with the manufacturers' recommendations.

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