



Humanitarian Pharmacists

GUIDE



PHARMACEUTICAL RESPONSE TO CHOLERA

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INTRODUCTION

The role of the pharmacist in the management of pharmaceutical inputs (procurement system, storage, distribution) is essential in particular in case of an epidemic.

This guide has been formulated following a cholera epidemic in 2010 in Haiti, so as to serve as a tool for pharmacists in the management of the different aspects of this type of event.

Cholera is an acute intestinal infection stemming from a bacterium, *Vibrio cholerae*. After a short period of incubation (1 to 5 days), the enterotoxin produced by the vibrio provokes abundant watery diarrhoea which can quickly lead to severe dehydration and death in the absence of quick treatment.

1. EPIDÉMIOLGY

1.1. BACKGROUND

For centuries, there have been millions of infections as well as hundreds of thousands of deaths. According to the WHO, the global cholera related cases range between 3 and 5 million cases of infection and between 100 000 and 130 000 deaths per year.

The countries most affected by the disease present a case-fatality rate of less than 5%¹ but this rate can reach 50% in zones of epidemic outbreak without treatment.

The vibrio responsible for the current pandemic in Haiti, the seventh outbreak, is *Vibron. cholerae* O1, El Tor biotype. The beginning of this pandemic goes back to 1961, the year when the vibrio appeared, resulting in an epidemic in the Celebes (Sulawesi), in Indonesia. The disease then spread in Asia, later into Africa in 1970 and in Latin America in 1991.

1.2. AETIOLOGY

The agent responsible for cholera is *Vibrio cholerae*.

The vibrios are incurved gram-negative bacilli, optional aerobies-anaerobies, which are very mobile thanks to a single polar cilium.

More than 200 serogroups of *V. cholerae* exist, but only two serogroups are endemic, the O1 and more rarely the O139. Certain other serogroups can provoke sporadic cases of diarrhoea, but not endemic cholera.



¹ World Health Organization, Weekly epidemiological record, 2010, No 13, 85, 117-128

1.3. RÉSERVOIR OF INFECTION

The bacteria multiply in aquatic environment with an alkaline pH where it often associates with algae and forms part of the normal flora of brackish and estuary waters. Man is the only known warm blooded host of the *V.cholerae*

The vibrio can survive on the surface of food products for 5 days at room temperature and up to 10 days for temperatures ranging between 5°C and 10°C. It also survives under refrigeration, but low temperatures diminish its proliferation.

The bacteria is sensitive to acidity ($\text{pH} \leq 4.5$), dehydrating, heat ($>70^\circ\text{C}$) and radiation by gamma rays.

Other potential reservoirs of infection are certain snails, crustaceans, fish, water plants and brackish water. There is therefore a risk of increase of cholera cases due to rise in sea level and water temperature.

1.4. TRANSMISSION

Vibrio cholerae is found in stool of sick people and in some health/asymptomatic carrier who then constitute one of the infection reservoirs of the disease-causing form of the vibrio.

The patients and the carriers are highly contagious through the vibrio present in their **stool and vomit**. The dose of infection depends on the individual susceptibility: generally, 10^6 bacteria are enough to cause infection. 10^8 bacteria can be present in 1 ml of stool.

The infected persons can transmit the bacteria during 1 to 4 weeks.

The cholera is transmitted by way of faeces-to-mouth through:

1. Contaminated food and water, which are the main modes of transmission.
2. Direct transmission from person to person (dirty hands).
3. Patients and corpses after direct contact with stool and vomit. Consequently, the health centres for cholera treatment can be sources of high contamination if hygiene measures and isolation are not sufficiently practised.

It is worth noting that major and severe epidemics are generally caused by a contaminated water source.

1.5. PATHOGENESIS

Most of the bacteria ingested are destroyed by the acidity of the stomach. That is one reason why a high dose is required for infection to occur (10^8 bacteria).

Bacteria which survive multiply in the walls of the small intestines without penetrating it, and produce an exotoxin, **the enterotoxin**, responsible for the symptoms. The toxin causes a hyper excretion of fluids and chlorides in the intestinal lumen and inhibits the re-absorption of sodium. What is more, the acidosis aggravates vomiting.

The bacillus does not penetrate the intestinal wall. It does not therefore enter the blood and does not cause septicaemia. The incubation period ranges from some hours to 5 days, but commonly between **2 to 3 days**.

1.6. CLINICAL OBSERVATION

After an incubation of between 1 to 4 days, the beginning of the symptoms is brutal and marked by nausea, vomiting, abundant diarrhoea and abdominal cramps. The stool resembles rice-derived solution and contains mucus, epithelial cells and a lot of vibrios.

The loss of water (several litres per day) and electrolytes cause dehydration, circulatory collapse and anuria.

In the absence of treatment, death occurs after between 2 to 5 days in about 50 % of the severe cases.

Cholera often evolves in minor forms (simple enteritis) and there are numerous health carriers of cholera vibrios in endemic areas.

Digestive problems can cause fatigue, thirst, muscular cramps, hypothermia, rapid loss of weight and cardiovascular collapse.

About 80% of infected persons are asymptomatic, i.e. « health carriers » of the bacillus. Of the 20% patients who will develop the disease, 80% will be benign cases or of moderate gravity and 20% of the patients will present sign of severe dehydration.

One should know how to suspect the first cases which will enable to send out an alert, which is extremely important, since if it is not done, it usually leads to severe health consequences, but has severe social, economic and political repercussions.

One should know how to send out the alert: neither too early nor too late.

Some signs which should make one think of cholera are:

- Abundant diarrhoea without any fever
- Watery diarrhoea
- Rapid dehydration
- Death of adult «diarrhoea which kills an adult is cholera ».

Remember that a suspected case of cholera should not be evacuated (this will certainly spread the epidemic) an alert should be sent out if necessary.

For the first case(s) it is necessary to obtain a biological confirmation. A recognized laboratory should therefore carry out the necessary biological tests which will enable to confirm the diagnostics of the *Vibrio cholera* species, of the serogroup (O1) and of the serotype (Inaba), and then eventually verify sensitivity to common antibiotics.

You (if you are used to do that) or the laboratory technician should take samples of stool, vomit or rectal swab, and send them to the nearest laboratory or reference laboratory for confirmation of the cholera suspected diagnosis. As regards transport, the recommended method is the transport on paper (**Annex 1**).

2. PRÉVENTION

The pharmacist plays an important role in the community prevention and he should also protect himself.

2.1. HOW TO PROTECT THE COMMUNITY

Besides sensitization activities, two points are fundamental:

- **There should be more water per inhabitant (for drinking and other uses)**
- **Every inhabitant should have access to a maximum of individual hygienic products, especially soap.**

A "health policy" must be put in place. The fundamental actions are:

- Isolate the patients who are severely affected and disinfect their houses
- Disinfect sources of water using chlorine
- Emphasize the disinfection with chlorine of water for domestic use
- Avoid crowding

Remark: A sick person can remain a carrier for 10 days after having left hospital or cholera health-care centre, he should therefore clean the latrine or toilet after use, he should not eat from the same plates as the other family members and his clothes and linen should be disinfected with chlorine.

It is important to regularly ensure that the population understands the sanitary information and to correct errors. For example, it has been noticed that certain people took the antibiotics as a preventive measure or directly swallowed the Oral Rehydration Substances before eating.

2.2. HOW TO PROTECT ONESELF IN EVERYDAY LIFE

- Apply routine hygienic rules : wash hands with soap :
 - after visiting toilets
 - before preparing or handling food
 - before eating
- Disinfect water with chlorine compound (if this is not available boil water for at least 5 minutes)
- Only eat food which has just been cooked
- Not to relieve oneself near sources of water

- Use latrines and ensure they are clean
- Limit contacts between people
- It is possible to eat raw fruits if they are peeled.

Cause of action during severe diarrhoea:

- Rehydrate oneself using Oral Rehydration Substances before going to the health centre
- Go to the health centre as soon as possible
- Not to practice self medication (loperamide)

2.3. PRÉVENTION IN HEALTH-CARE SETTING

Protecting oneself against contamination

- Wash hands with soap before and after taking care of a patient.
- Trim the fingernails, not to wear jewellery during treatments (rings, bracelets etc).
- Go through a chlorinated foot bath before entering and exiting a cholera seclusion room or ward. All clothes used in the seclusion room should remain there and should not be taken out.
- Dip these clothes in a chlorine solution before washing them.

Isolate the cholera affected patients

- The cholera affected patients should be hospitalized away from other patients. A specific place should be set aside 15 - 20 metres away from other health-care buildings. This space can be a tent, but the ground should be cemented for easy cleaning or washing. Effluents should first be disinfected with chlorine before being emptied into the sewerage systems.
- Clothes soiled by the patients should be disinfected before washing; they are extremely contagious.
- The patients' bedding and pails should be disinfected and washed with chlorine.

Precautions to be taken while handling cholera corpses

- Disinfect the corpse with a chlorine solution (2%).
- Put absorbent cotton soaked in a chlorine solution (2%) in the mouth, nose and anus.
- Wash hands with soap after touching the corpse.
- Convince the families not to touch the corpses.

2.4. PRÉVENTION BY VACCINATION

Two oral vaccines are available:

- one is made of a sub-unit B genetic recombinant of the cholera toxin (WC/rBS) associated with dead bacteria of 4 serogroups of *Vibrio cholerae* (Dukoral® produced in Sweden)
- the other is composed of live bacteria attenuated with serogroups O1 and O139, without the sub-unit B of the toxin (Shanchol®) with very limited production.

2.4.1. VACCINE FROM DEAD BACILLUS DUKORAL® TYPE

A dose is composed of the sub-unit B genetic recombinant with 2.5 billion dead bacteria of each of the 4 serogroups of *Vibrio cholerae*. Vaccination consists of absorbing 2 doses of 3ml diluted in a buffered solution, at weekly intervals from the age of 6 years (3 doses at weekly intervals for children between 2 and 5 years). Protection is expected about a week after the administration of the last dose.

According to studies conducted in Bangladesh, Peru and in Sweden, the vaccine offers protection of between 85 and 90 % for the first 6 months after vaccination. The vaccine especially protects against diarrhoea caused by certain *Escherichia coli*.

However in children under 2 years this protection is weak.

2.4.2. VACCINE FROM ATTENUATED BACILLUS OF THE SHANCHOL® TYPE

It is administered in two doses of 1.5 ml at 14 days intervals in persons older than one year and does not require dilution in a buffer solution.

A trial involving 66, 900 participants aged at least 1 year is currently ongoing in the slums of Calcutta in India. A provisional analysis after two years shows that two doses of the vaccine offers an overall protection of 67 % against cholera.

Two strategies seem possible: proactive vaccination and reactive vaccination.

- the proactive vaccination is a vaccine administered in zones which are still safe, but which are under threat of an epidemic breakout. The population is systematically vaccinated.
- the reactive vaccination is a vaccine which is administered in zones already affected. The population is vaccinated after the appearance of the first cases and tries to curb the spread of the epidemic.

Given the efficiency of the recognized classical policies of prevention (improvement of the quality of water and the level of cleaning up, spreading out of centres and services of cholera treatment), vaccination should not disrupt these priority interventions. Doing so may lower the watchfulness, the vigilance as regards respect and practice of the hygienic measures.

Twice, (after the 2004 tsunami in Indonesia and in camps of the displaced persons in Darfur/Sudan in 2004), reactive vaccination of the population was carried out and the results of the efficiency of the vaccine against the spreading of the epidemic were mixed.

3. DISINFECTION

Whatever the product used, organic residues and dust are the main media and supports for micro-organisms. It is therefore necessary to remove them before disinfecting.

We will consider the disinfection of objects, instruments, linen, surfaces and the ground on one hand, and water used for drinking and cooking or preparing food or washing utensils on the other hand.

3.1. CHLORINE COMPOUNDS OR CHLORINE PRODUCING SUBSTANCES

These are products which can be used in common disinfection of drinking water, floors, working surfaces and materials and laboratories. They have bactericidal, antifungal, virucidal properties, according to the concentration and quantity of the product used.

The power of disinfection is expressed in percentage (%) of active chlorine. The concentration of the solutions is expressed in chlorometric degree: 1 degree = about 0.3% of active chlorine.

The concentration of diluted solutions is expressed in percentage (%) or in ppm (part per 1 million): 1 ppm = 1 mg/l = 0.0001%

3.1.1. CALCIUM HYPOCHLORITE (HTH)

It is in form of granules containing 70% of active chlorine (500 g packets are transportable by air).

1 soup spoon of HTH = 15 gm of HTH = 10 gm of active chlorine.

For disinfecting prepare 10 litres of the solution		HTH
corpses, stool, tyres, latrines, vomit	A 2%	20 tablespoons (300 gm HTH) in 10 litres of water
ground, clothes, beds, utensils, plastic, objects	B 0.20%	2 tablespoons (30gms HTH) in 10 litres of water OR 1 litre of solution A then complete with water up to the 10 litre mark (i.e. 9 litres)
hands, skin	C 0.05%	1/2 tablespoon (7.5 gm HTH) in 10 litres of water OR 250 ml of solution A then complete with water up to the 10 litre mark (i.e. 9.75 litres)

- Solution A can be used for 1 week.
- Solutions B and C which are only stable for a day, shall be prepared as per the needs.

Procedures to be followed after contact with the sick

- Clean the ground contaminated by stool or vomit with solution A, 2% chlorine
- Clean the beds, soak the sheets, linen and disinfect the vehicle used to transport the sick with solution B, 0.2% chlorine
- Wash hands with solution C, 0.05% chlorine.

3.1.2. SODIUM HYPOCHLORITE OR LABARRAQUE'S SOLUTION

It is sensitive to heat, UV rays, pH, and organic matter.

- Non inflammable ;
- Irritating to the eyes and skin ;
- Can emit a toxic gas when in contact with an acid ;
- Caustic for living beings and corrosive to metals ;
- At 9.6 % of active chlorine, it is the solution in a bottle (12°) ;
- The concentrated solution at 36 %, in cake form is meant for dilution in 750 ml of water for a correctly labelled bottle of 1 liter.

In France, the law provides that extracts of Labarraque's Solution meant for non professional users should contain maximum concentration of less than 10% active chlorine. But there is no limit established for professional uses in the European Union, France or in the United States... (**Annex 2**)

Advice on the utilization of Labarraque's Solution

- Labarraque's Solution attacks stainless steel and therefore renders instruments unusable.
- The degree of chlorine indicates the concentration of the product and therefore its efficiency. A solution that is too diluted will be inefficient; one that is too concentrated will be corrosive.
- Beware of mixing with other products (acidic products for instance), as there may be risks of emission of dangerous gases (chlorine gas).
- Only store in the workplace less concentrated solutions, more stable than the extracts.

High concentrations or the extracts are extremely dangerous, while the dilutions commonly used are less risky.

The main toxic manifestations are related to the corrosive and caustic nature of the concentrated solutions. When ingested, concentrated solutions cause severe irritation of the digestive canal, causing vomiting, sometimes of blood. In case of ingestion, do not induce vomiting. Ingestion of small quantities of dilutions for common use only causes minor digestive problems which are easily relieved. Inhalation can cause irritation of respiratory mucous.

Preservation

- Preserve at temperature not more than 20°C.
- Labarraque's Solution and its extracts cannot be preserved for long (only some weeks); hypochlorite can be preserve for some months.
- Store the Labarraque's Solution in opaque casks (plastic for instance) glass can also be used.
- Labarraque's Solution should be preserved away from acids, hydrocarbons, metals and organic matter.

Disinfection of drinking, cooking water

This requires a residual concentration of 3 ppm in the preventive times and of 10 ppm during epidemics. For disinfecting water, use 3 drops of Labarraque's Solution at 12° (3.6% of active chlorine) per litre of water.

Disinfection of surfaces and instruments

	%	PPM	POIDS	HTH FOR 10 LITRES
Not very dirty (linen, instruments)	0.10	1000	1.5 g/l	1 table spoon
Dirty (floors, material, furniture)	0.2	2000	3 g/l	2 table spoons
Very dirty (garbage, biological liquids, corpses)	0.5	5000	7 g/l	5 table spoons

Occurs in form of tablets for the disinfection of drinking water and surfaces (with or without detergent).

The fundamental chemical substance is sodium dichloroisocyanurate (NaDCC) which is an organic producer of chlorine. This derivative is more active than hypochlorite, particularly in the presence of organic matter, besides the tablets are neither caustic nor corrosive.

Part of the product is rapidly liberated, hence giving results in 30 minutes, the other part, a compound, enables prolonged action. It acts at a neutral pH and liberates at least 90% of chlorine.

- No transportation problems.
- Can be mixed with anionic detergents.
- Not to be mixed with acidic substances (beware of urine); the mixture causes the release of chlorine. Preservation can last for 5 year in tropical conditions.

Disinfection of water

The product occurs in form of tablets effervescent in water. For it to be effective an allowance of 30 minutes is required before use.

➤ **Aqua tabs**

- 1 cup of 3.5 mg per litre of drinking water
- 1 cup of 33 mg per 10 litres of drinking water

In USA there exists, for emergency cases, the following presentations:

- Aqua tabs 8.5 mg for 1 litre of water
- Aqua tabs 33 mg for 5 litres of water
- Aqua tabs 67 mg for 10 litres
- Aqua tabs 167 mg for 20 litres
- Aqua tabs 1,67 g for 200 litres
- Aqua tabs 8,68 g for 1,000 litres
- Aqua tabs granulated

Remark: The 8.5mg formulation was recorded to destroy cysts of *Giardia*.

Disinfection of surfaces and instruments

The product occurs in form of effervescent tablets, which in water give a disinfectant solution.

	%	PPM	WEIGHT	KLORSEPT 17 KLORKLEEN *
Not very dirty (linen, instruments)	0.10	1000	1.5 g/l	1 cp for 5 l
Dirty (floors, material, furniture)	0.2	2000	3 g/l	1 cp for 1 l
Very dirty (garbage, biological liquids, corpses)	0.5	5000	7 g/l	5 cp for 1 l

* chlorosene with detergent

3.1.4. CHLORINATED LIME

This is a producer of indium chloride, but which only provides 30% of the chlorine action. This producer of chlorine is different from chalk which occurs in form of quick lime, which is corrosive and in form of calcium hydrate (but not hydraulic). This chalk is useful for covering corpses and other decomposing organic materials: 1 Kg of chalk for 10 Kg of the organic materials.

Trichloro isocyanuric acid at 90% chlorine (ATCC) is a product close to chlorosene, but not very soluble. It is used in the maintenance of swimming pools; it was used to maintain the rate of chlorine in huge water reservoirs.

Chloramine T (sodium p- toluenesulfochloramine) liberates 25% of chlorine and acts more slowly (several hours); it is therefore not recommended for this use. On the other hand, being less irritating, chloramine is interesting as an antiseptic for cuts and wounds.

3.2. CRÉSYL (PHÉNOLS)

Cresyl is a veterinary disinfectant of transport materials, livestock stables, approved by the Ministry of Agriculture in France. It is NOT recommended for disinfecting floors and surfaces for human habitation.

Cresyl has bactericidal and antifungal properties, but virucidal properties are not well known. It adulterates proteins and therefore destroys parasites, fungi and bacteria.

Very useful for disinfecting faecal matter

Composition

- Sodium hydroxide
- Phenol
- Cresol
- 3.4 xyleneol

Cresol quickly turns brown in air, which gives this chestnut brown colour to commercial cresyl. Concentrated cresyl is a thick brown liquid. Dilute cresyl is a smooth, fluid and whitish liquid, which is less toxic.

Disadvantages

- Inflammable
- Could be corrosive
- Could be harmful and intoxicating when ingested or inhaled.
- Irritating on the skin and in respiratory canals.
- Less soluble in water
- Incompatible with chlorine = not to mix with the above products
- Cresols are cytoplasmic poisons which reach all cells of the organism and mainly the central nervous system, the liver and kidneys.
- Cresols are caustic.

Preservation

Cresyl should be preserved away from food and drinks, including animal feeds.

Finally, these products are reserved for disinfection of surfaces and objects.

3.3. ANTISEPTIC GEL FOR DISINFECTING HANDS

The formula for antiseptic gel for disinfecting hands (*Source: Formularium Helveticum (FH)*)

- Ethanol 63 % m/m 97.0 g
- Glycerol 85 % 1.0 g
- Glucam E-20 (Haenseler Suisse) 1.5 g
- Carbopol 940 1.0 g
- Triethanolamine 0.4 g (up to neutral pH)

To be dispensed in tubes, valid for 6 months, at temperature of 15-25 °C

4. MANAGEMENT OF CHOLÉRA

4.1. EVALUATION OF THE DEHYDRATION

The first thing to do on arrival of a patient in a cholera health-care centre is the evaluation of the dehydration. This dehydration is classified in 3 stages (WHO).

The symptomatology of the 3 stages is described in table 1.

Table 1 : Evaluation of the state of dehydration

Absence of dehydration	Moderate dehydration	Severe dehydration
<ul style="list-style-type: none">▪ No thirst▪ Normal retraction of the skin when pinched▪ Normal urinating▪ Normal pulse	<ul style="list-style-type: none">▪ Increased thirst▪ Slow retraction of the skin when pinched▪ Reduced urination▪ Dry mouth and tongue▪ Agitation and irritability▪ Eyes sunken into the orbits▪ Babies and infants : reduced tears and depressed fontanel	<ul style="list-style-type: none">▪ Lethargy and lose consciousness▪ No retraction of the skin when pinched▪ Minimal or no urinating▪ Very dry mouth and tongue▪ Disappearing or no pulse▪ Low arterial pressure
=> plan A	=> plan B *	=> plan C

* If there is vomiting = plan C

4.2. REHYDRATION

Strictly speaking, the infection itself does not kill, but the dehydration, which the cholera toxin causes, does.

Rehydration of the patient by intravenous drip (Lactate Ringer) or by oral way (Oral Rehydration Substances (ORS)), according to the gravity of the case, hence give it priority.

The therapeutic diagram is presented in the following algorithm.

Is the patient dehydrated?

↳ No → No dehydration → ORS → **Plan A**

↳ Yes → Dehydration



What is the degree of dehydration?

↳ Moderate → Vomiting? → No → ORS → **Plan B**

Yes ↓

↳ Severe → Ringer Lactate and Antibiotherapy → **Plan C**

ACTIONS TO BE TAKEN

Plan A: no dehydration or mild dehydration

- Rehydrate with Oral Rehydration Substances (ORS), according to the above modalities.
- Verify and ensure that the patient is not vomiting whatever he/she drinks and that signs of moderate dehydration do not appear.

Plan B : moderate dehydration

- Rehydrate as in plan A
- But if the patient VOMITS or is not able to DRINK: rehydrate by intravenous drip with Ringer Lactate, according to the above modalities.

Plan C : severe dehydration

- Urgently rehydrate by intravenous drip with Ringer Lactate according to the above modalities.
- For plan C, it may be necessary to use several tubes

In most cases it is necessary to insert two tubes of drip so as to give enough Ringer liquid as fast as possible; particularly in children, it may be necessary to resort to ways like the butterfly needle, subcutaneous or intra-bone perfusion.

- Rehydration by intra-peritoneal perfusion is done with a thick needle (18G) drove in the middle of a line between the navel and the left iliac spine ; not more than 70 mg/Kg of weight.

Then, carry out oral rehydration as soon as signs of severe dehydration have disappeared, on condition that the patient does not vomit, can drink and starts passing urine. The absolute necessity is to massively and urgently rehydrate the patient and this should be done within the first thirty minutes.

Table 1: Characteristics of Ringer Lactate and the Oral Rehydration Substances (ORS)

	Lactate Ringer	Oral Rehydration Substances (ORS)
Pharmacotherapeutic class	Solution which modifies the electrolytic balance	Solution which aims at compensating for electrolytic loss
Mode of action	Correction of extracellular dehydration, hypovolemia and metabolic acidosis	Compensation of loss by the electrolytes
	Vascular filling-up and hydroelectrolytic rebalancing	Glucose, Sodium : increase absorption of water
		Prevention of acidosis by citrate
Indications	Severe dehydration	No dehydration
	Moderate dehydration with vomiting	Mild or moderate dehydration (without vomiting)
Form / Presentation	500 ml and 1,000 ml bottles	20.5g ² sachets (for 1 litre of solution)
Composition ²	For 1 litre : Sodium chloride : 600 mg	Glucose : 75 mmol/L (67.4-82.4)
	Potassium chloride : 40 mg	Potassium : 20 mmol/L (18.1-22.1)
	Calcium chloride : 28,84 mg	Sodium : 75 mmol/L (66.8-81.6)

² Scientific rationale for change in the composition of oral rehydration solution. Duggan C, Fontaine O, Pierce NF, Glass RI, Mahalanabis D, Alam NH, Bhan MK, Santosham M. JAMA. 2004 Jun 2;291(21):2628-31.

	Sodium lactate : 310 mg	Citrates : 10 mmol/L (8.9-10.9) Chlorides : 65 mmol/L (58.1-71.1)
Dosage	Less than 15 years : Less than 1 year : phase 1 : 30 ml/kg in 1 hour, phase 2 : 70 ml/kg in 3 hours	If no sign of dehydration : between 500 ml and 2 litres according to the age of the patient (children 2 years - adults)
	More than 1 an : phase 1 : 30 ml/kg in 30 min, phase 2 : 70 ml/kg in 2.5 hours	
	15 years or more : phase 1 : 1 litre in 15 min ; phase 2 : 1 litre in 45 min then 3 litres in 3 hours	If moderate dehydration : between 200 ml and 4 litres according to the age of the patient (new-borns of less than 4 months - adults)
Contra-indications	Congestive cardiac weakness,	Renal weakness, anuria,
	Predominantly extracellular hyper hydration,	Malabsorption of monosaccharides,
	Hyperkaliemy, hypercalcemy,	Rebellious Vomiting,
	Metabolical alcalosis	Metabolical alcalosis, Lose consciousness, going into shock.
Main medicating interactions	Linked to Calcium : digitalis -> disorders of the cardiac rhythm	None that is known
	Linked to Potassium : hyperkaliemant diuretic -> potentially fatal hyperkaliemy	
Side effects	Risk of metabolical alcalosis	Reversible hypernatremy
Remarks	Phase 1 : emergency phase Phase 2 : when the radial pulse is better felt	The solution can be preserved in a refrigerator for 24 hours.

INTRAVENOUS REHYDRATION

The Ringer Lactate solution (or Hartman solution) is the best choice. It contains sodium, potassium and lactate in adequate quantities. The naso-buccal way should not be used if the patient is not conscious.

Dosage

- For patients aged from 15 years and more

For the first 15 minutes, administer 1 litre of the Ringer Lactate very quickly until the radial pulse is re-established.

After 15 minutes,

- If the pulse returns, administer 1 litre in 45 minutes, and another litre in 2-5 hours.
- If the pulse remains undetectable, administer another litre of the Ringer Lactate in 15 minutes.

The administration of the Ringer Lactate IV depends on the degree of consciousness, pulse, skin fold and the volume of body excretions (stool and vomit).

The overall treatment of a dehydrated adult necessitates from 8 to 10 litres of Ringer Lactates and 10 litres of ORS. Use needles of gauge 16G or 18G.

- For patients aged less than 15 years
 - Children of less than 1 year 30 ml/Kg in 60 minutes, 70 ml/kg in 1 to 5 hours (repeat if the radial pulse is undetectable)
 - Children from 1 to 14 years 30 ml/Kg in 30 minutes, 70 ml/kg in 1 to 2½ hours (repeat if the radial pulse is undetectable)

FOLLOW-UP

- Radial pulse
- Look for signs of dehydration every 15 minutes for the first 1 hour, and at least every 2 hours later
- Breathing rate (anticipate and plan for pulmonary oedema)
- Checking of arterial pressure is not necessary unless in cases of shock.

Take stock of the inputs:

- Count the bottles of Ringer Lactate and calculate the quantity in litres
- Count the amount of ORS in litres
- If the patient vomits, wait for 10 minutes then restart the administration of ORS.

And stock of the outputs:

- Evaluate the quantities lost and the appearance, consistency of stool and vomit
- Identify patients with profuse diarrhoea.

Then, check the intravenous drip and correct:

- Passage of the solution outside the vein
- displacement of the catheter
- obstruction of the catheter
- localized infection

Precisions concerning rehydration through intravenous drip:

- If the Ringer Lactate remains the best solution for IV rehydration, it is acceptable to urgently administer a normal salt solution, but this does not correct the acidosis and can aggravate the electrolytic imbalance.
- If the patient is conscious and can drink, he should be given ORS in addition to intravenous rehydration.
- As soon as appears signs of OVER-hydration (oedema with swollen eyelids, hands and feet, breathing difficulties, crackling during chest auscultation), intravenous perfusions should be stopped.

Finally,

- As soon as the patient urinates and no longer vomits, reduce the flow of the perfusion
- As soon as the patient can drink, add oral rehydration to the perfusion
- Stop the perfusion 12 hours as soon as vomiting stops
- Continue with the ORS for 2 days.

ORAL REHYDRATION (OR)

- Quantities of ORS to be administered to the patient during moderate dehydration during the first 4 hours of admission and taking charge.

Age	< 4 months	4 - 11 months	12 - 24 months	2 - 4 years	5 - 14 years	> 14 years
Weight (in Kg)	< 5	5 – 7	8 - 10	11 -15	16 -29	≥ 30
Volume (in ml)	200 - 400	400 - 600	600 - 800	800 - 1200	1200 - 2200	2200 - 4000

The approximate quantities of the ORS (in ml) can also be calculated by multiplying the weight of the patient in kg per 75 : 75 ml / kg in 4 hours

- Here are the quantities of ORS to be administered to the patient without dehydration so as to maintain hydration until the stoppage of diarrhoea :

Age	< 24 months	From 2 to 10 years	> 10 years
Volume after each liquid stool (in ml)	50 to 100	100 to 200	as desired
Maximum volume per day (in ml)	500	1000	2000

Precisions concerning oral rehydration (OR)

It is useless to give ORS for purposes of prevention.

The oral rehydration solutes can equally be prepared at home:

- In a litre of clean water : 1 tea spoonful of salt + 4 table spoons of sugar
(i.e. 3.5 g of kitchen salt + 2.5 g of Sodium bicarbonate + 1.5g of Potassium chloride + 40 g of table sugar (saccharose))
- It is possible to use rice, carrot or guava leaves cooking water.
- Compensate loss of potassium by eating bananas or by drinking coconut milk.

Remark : In the cholera health-care centres, patients' beds are designed with an opening for the passage of stool. A pail containing 2% chlorine solution is placed under the bed for the stool and another beside the patient for the vomit.

4.3. MEDICATION

4.3.1. ANTIBIOTICS

Antibiotics (Table 2 below) are not very effective against the disease (due to the toxin while antibiotics act on the bacillus), but reduce the duration of excretion of the vibrio in the stool, shorten the duration of diarrhoea, hence a shorter stay in the cholera health-care centre. They thus affect the dynamics of the epidemic by reducing the quantity of vibrio produced by the contaminant patients, they lower the intensity of transmission.

Erythromycin and Doxycycline are the most prescribed first-line-treatment drugs. However, there are other possible alternatives (Table 3 below) which could be useful in case of lack of the first-line-treatment drugs.

4.3.2. ZINC SUPPLÉMENTS

Oral administration of zinc significantly reduces the intensity and duration of diarrhoea among children. Dosage: from 10 to 20 mg of zinc taken orally per day.

4.3.3. OTHERS

All antispasmodics, antidiarrhoea, antinauseant medications are either useless or harmful.

Table 2 : Erythromycin and Doxycycline :

	Erythromycin	Doxycycline
Class	Antibacterial	Antibacterial
Therapeutic family	Macrolides	Cyclines
Mode of action	Inhibition of the synthesis of bacterial proteins, by bonding to the 50 S part of the ribosome and by stopping the translocation of peptides	Inhibition of the synthesis of bacterial proteins
		Increase of sebaceous secretion, anti-inflammatory effects, action on plasmodium (prophylaxy)
Indications	Children between 1 and 8 years and pregnant women	Children from 9 years and adults
Mode of administration	oral	oral
Forms / presentation	Tablets : 250 mg and 500 mg	Tablets : 100 mg
	Oral suspensions : 250 mg/5 ml	
Dosage (see details in table 3)	12,5 mg/kg, 4 times/day for 3 days	Children between 9 and 14 years : 6mg/kg in single dose
		Children older than 14 years and adults : 300mg in single dose
Contra-indications	Allergy to Erythromycin	Allergy to tetracyclines
	Treatment with ergot of rye alkaloids	Children under 8 years (risk of permanent pigmentation of teeth and hypoplasia of the dental enamel)
		Pregnant of breastfeeding women (risk of malformation of teeth among the new-borns)
		Simultaneous ingestion of cations (Ca^{2+} , Mg^{2+} , Al^{3+} , $\text{Fe}^{2+}/\text{Fe}^{3+}$) (for example in milk) as there is formation of

		complex insoluble substances with Doxycycline
Side effects	Digestive manifestation (nausea, diarrhoea, vomiting)	Gastro-intestinal troubles, nausea, epigastralgies, diarrhoea, anorexia
	Rare manifestations of skin allergies	Allergic reactions (Quincke's Oedema, urticaria, rash, itchiness...)
	Rare cases of hepatic attacks	Photosensitive effects

Table 3 : Indications of antibiotics

Classification of patients	First line of treatment	Second line of treatment
Adults (except pregnant women)	Doxycyclin : 300 mg in a single dose	Azithromycin: 1 g in a single dose Tetracyclin : 500 mg 4 times/day for 3 days Ciprofloxacin : 1 g in single dose Erythromycin : 500 mg 4 times/day for 3 days
Pregnant women	Erythromycin : 12.5 mg/kg /day i.e. 500mg 4 times/day for 3 days	Azithromycin : 1g in a single dose
Children ≥ 12 months	Erythromycin : 12.5 mg/kg i.e. 500 mg 4 times/day for 3 days	Doxycyclin : 6 mg/kg in single dose Azithromycin : 20 mg/kg in single dose Ciprofloxacin : 20 mg/kg in single dose Tetracyclin : 12.5 mg/kg 4 times/day for 3 days
Children < 12 months and other patients incapable of swallowing pills and/or tablets	Oral suspension of Erythromycin : 20 mg/kg/day for 3 days	Oral suspension of doxycyclin : between 2 and 4mg/kg in single dose Oral suspension of Azithromycin : 20 mg/kg in single dose Oral suspension of Ciprofloxacin : 20 mg/kg in single dose Oral suspension of Tetracycline : 12,5 mg/kg 4 times per day for 3 days

5. PHARMACEUTICAL PROCÉDURES

The regulatory authority tasked with the formulation and enforcement of the Pharmaceutical Rules must put in place procedures for the fight against the epidemic (**Annex 4**).

5.1. STORAGE/ DISTRIBUTION

According to procedures, pharmacists should:

- 1- Provide the relevant authorities (institutional, town, district, central) with weekly usage reports.
- 2- Have a place for storage, enough human resources, equipments and materials.
- 3- Ensure that the recipient medical institutions are approved by the Ministry of Health and respect the rules of storage and dispensing/distribution.
- 4- Discuss plans for distribution with the Ministry of Health to avoid duplications of services at the central, departmental, community levels
- 5- Provide the Department of Pharmacy of the Ministry and the District Department of Health with a list of recipient medical institutions.
- 6- Provide a distribution report per department

Each pharmaceutical procurement framework must therefore make a weekly follow-up of the consumption in the health institutions and must know the epidemiologic data of the area so as to be able to anticipate the deliveries and ensure the good usage of the drugs.

5.2. PROCUREMENT CIRCUIT IN A CHOLERA HEALTH-CARE CENTRE

A circuit is put in place for the treatment and care of patients (by providing and differentiating patients under oral or intravenous rehydration), storage room for the products, outdoor room for the personnel to rest in, the kitchen etc. Prevention, hygiene, sorting garbage and security are fundamental in this circuit. The Entry and Exit in a Cholera Health-Care Centre are never the same. For hygiene and prevention, washing, cleaning and the linen-room are put in place. **(Annexes 5 and 6)**

In order to avoid contamination of vehicles and store staff during delivery of products it is advisable to determine the loading/offloading zone (footbaths).

Good coordination between the Cholera Health-Care Centre and the circuits of procurement is fundamental for determining the needs and to avoid stock outs or overstocks.

5.3. MANAGEMENT TOOLS

In order to collect and manage data of availability of inputs of all health actors involved in the response to the cholera epidemic, it is indispensable to know the allotments and distribution of the available medicines so as to be able to anticipate future consumption and avoid stock-outs.

Save for the establishment of a buffer inventory, the following tools should be put in place **(annex 7)** to be able to give this information to the relevant authorities and partners :

- Inventory of available stocks / Mapping
- Follow-up of weekly and monthly consumption
- Follow-up of orders
- Mapping of active health centres in the treatment of cholera
- Evaluation of the ratio of the patient/inputs consumption so as to have rational management of the procurement
- Procurement file in the pharmacy
- Evaluation of buffer/security stock according to the progress of the epidemic
- Eventually putting in place of an emergency stock according to the health centre and policy context (personnel blocked for several days)

5.4. EVALUATION OF ORDERS FOR CHOLERA INPUTS

Ringer Lactate

Evaluation of the quantity of Ringer Lactate is essential. According to WHO, one should count between 7 and 8 litres of Ringer Lactate per patient and according to Médecins Sans Frontières, 8 to 10 litres + (10 litres of ORS). One should consider counting solutes per litre and not per sachets to avoid errors.

Beside, the management of Ringer Lactate requires very good logistics, at the storage, loading, unloading and transportation, due to its quantity and weight.

It is necessary to stock-up in the outlying warehouses so as to avoid stock outs.

Example of evaluation : (cf Annex 8)

Basing on an epidemic of 400,000 cases, 20% of the patients, i.e. 80,000 patients will present severe dehydration.

If one considers 8 litres on average, 640,000 litres of Ringer Lactate will be required for the treatment of severe dehydration.

Besides, one should anticipate wastages of the Ringer for example inclusion of moderate rehydration cases by IV or mis-diagnosis of the level of dehydration, one should therefore plan for 300,000 litres more of Ringer Lactate, i.e. 940,000 litres in total.

Other inputs

The proportion of catheters ordered should be approximately 100 catheters of 18G, 300 catheters of 22G.

It is no necessary to put as many catheters and tubes/pipes as sacs, since these are not changed every time: count 3 catheters and tubes per patient per day.

Provision of hygiene material

Cf. Annex 8 Cholera Accessory Kit : « CAK »

Typical Order for 15 patients under IV:

N°	PRODUCTS	QUANTITY
MEDICINES		
1	Doxycyclin 100 mg	100 cp
2	Erythromycin 500mg/250mg	500 cp
3	1g/10ml Potassium Chloride	3 ampules
4	Erythromycin 250mg/5ml	5 bottles
5	Oral Rehydration Substances	1000 sachets
6	Ringer Lactate (500 ml)/1000 ml + connectors	200 litres + connectors
EXTERNAL USES		
7	Polyvidone iodine 100 ml	2 bottles
8	Soap	10 cakes
MATERIALS		
9	Adhesive tape	12 rolls
10	Strips of gauze	10 pieces
11	Non sterile gauze	200 (1 box)
12	Disposable gown	40
13	Catheter IV 18 G (green)	50
14	Catheter IV 20 G (pink)	50
15	Catheter IV 22 G (blue)	50
16	Catheter IV 24 G (yellow)	50
17	Cotton 500gr	1
18	Disposable sheet (laminated)	40
19	Butterfly needle 21 G	50
20	Butterfly needle 23 G	50
21	Clean gloves 8, 7 ½	40 (1 box)
22	Mask	1 box 100
23	Body bag	25 to be also distributed in the community
24	SYRINGE 5 cc	100 (1 box)
25	Syringe 10 cc	100 (1 box)
26	Nasogastric tube #10	2
27	Nasogastric tube #16	2

6. MONITORING

The pharmacy branch should participate in the monitoring of the epidemic. Investigation of a cholera epidemic is fundamental in guiding its management so as to:

- Check/stop the progression of the epidemic
- Prevent new outbreaks
- Evaluate the quality of surveillance
- Improve knowledge about the epidemic
- Teach methods of management of the epidemic

In order to analyse an epidemic, one should therefore define:

- causative agent (what ?),
- determine the aggravating factors (why ?),
- localize the source (where ?),
- and determine the mode of transmission (how ?)

The beginning of a cholera epidemic is characteristic when one finds major diarrhoea episodes among adults.

Thus the criteria of TPP (Time-Place-Population) enables a good analysis of the terrain and the definition of strategies to adopt in terms of prevention.

One can thus create a file for individual data collection and define the number of cases, the rate of attacks specific to a group of population and define individuals and risky places.

One should consider several tools:

- Rate of Attacks (RA) : Expected number of cases which enable evaluation of needs
RA= ((total number of cases) / (population)) x 100
- Threshold of alert or Epidemic threshold (**Annex 9**): used to confirm the emergence of an epidemic so as to put in place control measures, such as standardized patient management.
- Weekly monitoring tools

It is essential to put in place weekly follow-up of patients for purposes of monitoring the alert thresholds together with focused consumption. This will especially enable to identify problems related to management, localized epidemiology, misappropriation, overstocking, and duplication of similar orders by NGOs and health-care Institutions, stock out, as well as facilitate feedback.

7. ANNEXES

7.1. SAMPLING AND TRANSPORTATION OF THE SPECIMENS

Collect samples

Either using a swab dipped in stool or paper flake/piece of blotting paper dipped in stool or vomit.

Prepare

Dip the swab in Carry Blair or put it in a tube containing some drops of physiological saline solution. Close the tubes well.

OR

Put pieces of paper in a closed plastic bag (sealed) in warmth, then this bag in a second closed bag in warmth.

Send

Send the tubes to the laboratory in a double packing.

Send the double bag in a reinforced envelop.

7.2. FRENCH RECOMMENDATIONS FOR LABARRAQUE'S SOLUTION

Labarraque's solution has been marketed since 2001:

- In bottles or cans of 2.6% active chlorine solution ready for use. It can be preserved at least for a year.
- in berlingot (refillable dose) of 250 ml of 9.6% concentrated active chlorine solution to be diluted at 1 volume of solution to 3 volumes of water so as to obtain 1 litre of solution usable at 2.6% active chlorine. To be diluted as soon as possible, in any case within the 3 months following the manufacture date on the package.

Dilution :

Labarraque's solution should be diluted with cold or warm water. For all practical purposes, in order to obtain a solution of (about) 2% active chlorine, one can:

- dilute the 9.6% concentrated active chlorine solution: 1 volume of the solution to 4 volumes of water (i.e. 250 ml de solution + 1 litre of water = 1250 ml of the solution, at a little more than 2%) ;
- dilute the usable solution of 2.6% active chlorine: 1 volume of solution to ¼ of water (i.e. 1 litre of solution + 250 ml of water = 1250 ml de solution, at a little more than 2%).

In the same way, one can obtain a 0.5% active chlorine solution or there about by diluting the usable 2.6 % active chlorine solution at a ratio of 1 volume of solution to 4 volumes of water (i.e. 1 litre of solution + 4 litres of water) = 5 litres de solution, at a little more than 0.5%).

Labarraque's Solution :

- must be stored away from light, heat and children;
- must not be mixed with another product. Chemical reaction between products will reduce their efficiency. Mixing with an acidic product (toilet descaler, for example) causes an emission of a toxic gas: chlorine.

For better disinfectant action, the surface should be cleaned, rinsed before applying Labarraque's Solution.

7.3. MOST FREQUENT ERRORS DURING DISINFECTION

1. *Mix Labarraque's Solution and other detergent or descaler products.*

There is risk of chemical reaction with emission of chlorine, a very toxic gas. Labarraque's Solution must not be mixed with other products.

→ **Using Labarraque's Solution alone.**

2. *Not considering the degree of chlorine (°Cl) while using Labarraque's Solution.*

The degree of chlorine indicates the concentration of the product and therefore its efficiency. A solution which is too diluted will be sera inefficient, a solution which is too concentrated will be corrosive.

→ **Generally, commercial Labarraque's Solution is at 12°Cl.**

3. *Preserving Labarraque's Solution in light and/or in sunlight.*

Labarraque's Solution loses its chlorine (hence its efficiency) when it is exposed to light or heat.

→ **Storing Labarraque's Solution in closed opaque casks in a ventilated place.**

4. *Under dose or overdose of the disinfectant products.*

There is a risk of inefficiency in case of overdose or under dose, toxicity in case of overdose.

→ **Respect the directions for use of the disinfectants.**

5. *Complete the bottles of antiseptics and disinfectants without emptying them.*

The old antiseptic or disinfectant solutions can become culture media.

→ **Before filling a bottle, dispose of the old solution and wash the bottle.**

6. *Disinfect the instruments by boiling them in alcohol.*

Fire is a symbol of purification and alcohol is a disinfectant, but this rapid procedure is not sufficiently efficient.

→ **Instruments should be sterilized, if not, leave them long (15 minutes) in a high-level disinfectant.**

7.4. EXEMPLE OF HAÏTI 2010

A humanitarian and health response was defined by the Ministry of Public Health and Population (MPHP) and the « Health Cluster », and highest on the agenda were :

- On one hand the promotion of health in order to prevent or limit the epidemic ;
- On the other hand a strategy for reinforcing health-care institutions, so as to reduce the mortality rate.

This policy was characterized by :

- Creation of Posts of Oral Rehydration (POR) : stations enabling to sort out patients according to their level of dehydration and to treat simple forms of cholera.
- Creation of Cholera Treatment Units (CTU) in existing hospitals and health centres to treat moderate and severe cases.
- Creation of a network of referral Cholera Treatment Units (CTU).

A Cholera Treatment Centre (CTC) or a Cholera Treatment Unit (CTU) should not be installed near a water source used by the public like a school.

A technical committee was put in place at the central, departmental and at the communal levels. This committee constituted of different health professionals is implemented at the central, departmental and at the communal levels.

It should be borne in mind that any organization wishing to import cholera medico-pharmaceutical inputs into Haiti should meet the following criteria:

Have a certificate of accreditation of distribution issued by the Ministry of Public Health and Population (MPHP):

- 1- Carry out registration of any private or government warehouse of pharmaceutical products to the "DPM/MT"
- 2- Procure on the local market as a matter of priority
- 3- Respect the rules of the Ministry of Public Health and Population as regards importation, reception, storage, distribution and use of the pharmaceutical products and medical equipment
- 4- Respect the law regarding importation.

Email of the centre:

Hotlines for referral of patients:

Central number :

Example of emergency order:

Part A : To be filled by the applicant:

Department :.....

Commune :.....

Name of the Institution :.....

Address :

Medical Director :.....

Contact person :.....

E-mail :.....

Telephone

Number of beds :.....

Number of occupied beds :

Rate of bed occupancy :

Number of patients under ORS :

Number of patients under IV :

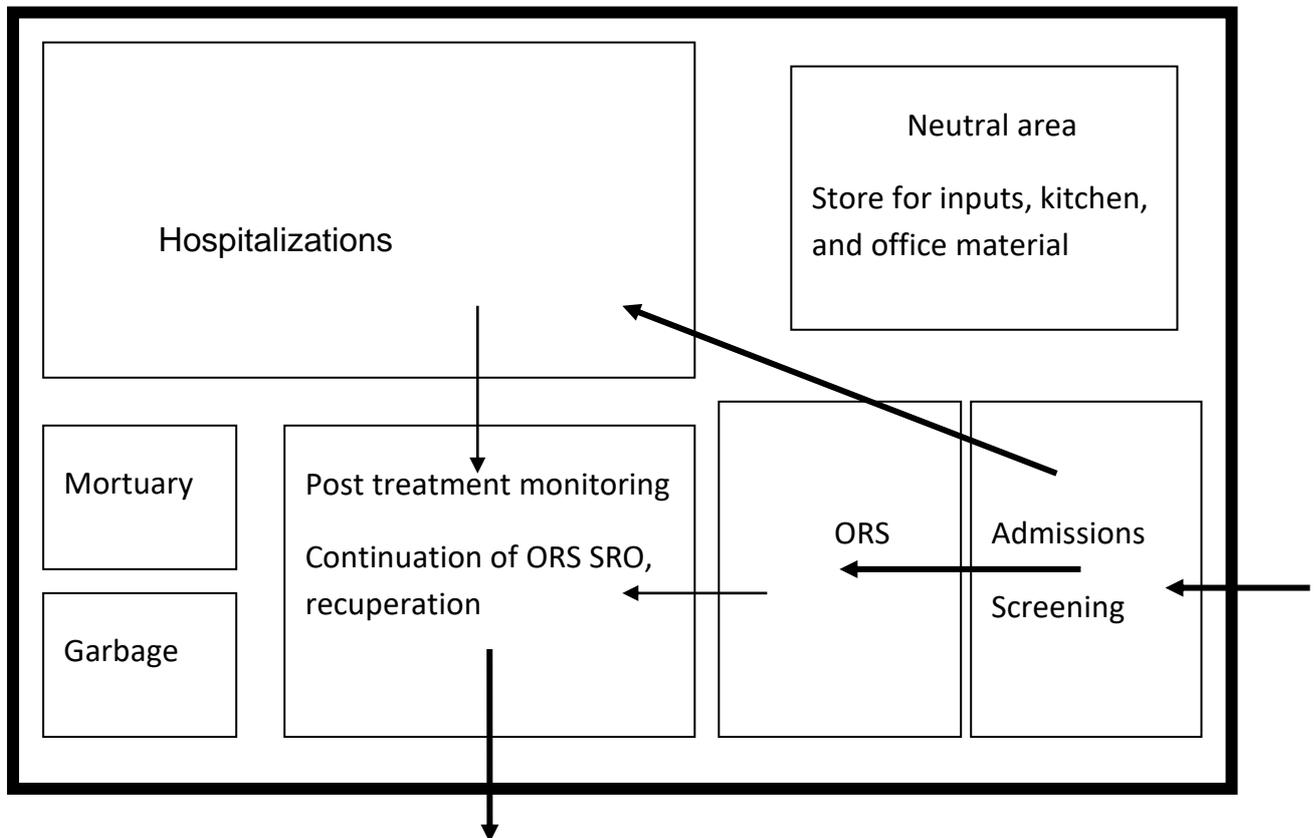
Date of last delivery :

- 1- Must be either an NGO authorized by the MPHP, or a health-care institution authorized by its department to have a CTC/CTU
- 2- Corresponds to the actual number of beds available in the institution
- 3- Rate of occupancy = total number of occupied beds / number of beds x 100

7.5. ILLUSTRATIVE LIST OF PERSONNEL REQUIRED FOR A CTC WITH 300 BEDS – (MSF)

	Day	Night	Replacement	Total
Coordinator of the centre	1			1
Administrator	1			1
Doctor	3	1	1	5
Nurses	15	15	15	45
Nursing aid	15	15	15	45
Pharmacist	1		1	2
Head of logistics	1			1
Person in charge of water	1		1	2
Stocks Manager	1	1	1	3
Guard	6	6	6	18
Cook	1		1	2
Assistant cook	4		4	8
Person in charge of linen store	2	2	2	6
Cleaner/sweeper	3	2	2	7
Person in charge of chlorination	1	1	1	3
Health Educator	1		1	2
Water transport	2	2	2	6
Other transport	2	2	2	6
Total	62	47	56	165

7.6. TYPICAL PLAN OF A CHOLERA TREATMENT CENTRE (CTC)



Timetable: The CTC will be open 24/7

Location: Near where there is maximum number of sick people (in camps or slums)

7.7. TYPICAL ORDER FORM FOR 50 TO 100 CHOLERA CASES

<ol style="list-style-type: none"> 1. Make an inventory every end of the week of all cholera inputs. 2. When the inventory of an input is under the minimum required stock, an order should be made 3. The quantity to be ordered = Maximum stock – Inventory 	<ul style="list-style-type: none"> • When the stock is at maximum, it enables manage 100 cholera cases (of which 40 severe ones). • Under the minimum stock, less than 50 cases (of which 20 severe ones) <p>→ this is the threshold for triggering</p>
--	---

CTU :	Date of order :	Date of delivery :
Name of person in charge of CTU :	Name of pharmacist in charge :	

		Invent.	Mini stock	Maxi stock	Quantity to be ordered
A- TABLETS	Doxycyclin 100 mg		100	200	
	Erythromycin 500 mg		50	100	
	Erythromycin 250 mg		50	100	
	Zinc Sulfate 20mg		30	60	
B- ORAL SOLUTIONS	Erythromycin 250mg/5ml		3	6	
	ORS (sachets)		500	1000	
C- MASSIVE SOLUTES	Ringer lactate (1L)		200	400	
	Ringer lactate (0.5L)		30	60	
D- EXT. USAGE	Alcohol 70° or Chlorhexidine 5%		1	2	
E- MEDICAL EQUIPMENT	Adhesive tape (Roll)		6	12	
	Gauze bandage 8cm (Roll)		3	6	

	Invent.	Mini stock	Maxi stock	Quantity to be ordered
		25	50	
		25	50	
		25	50	
		25	50	
		50	100	
		1	2	
		2	4	
		200	400	
		300	600	
		200	200	
		2	4	
		25	50	
		30	60	
		50	100	
		25	50	
		2	4	
		2	4	
		5	5	
		5	5	
		5	5	
F- MATERIAL		5	10	
		5	10	

		Invent.	Mini stock	Maxi stock	Quantity to be ordered
	Adult body bag		5	10	
G- WASH	Sodium Hypochlorite (can 5l)		2	4	
	Calcium Hypochlorite (1kg)		10	20	
	Soap (cake)		15	30	
	Aqua tabs 33 mg (1 cp for 4-5L)		100	200	
	Aqua tabs 3,5 mg (1cp for 1 litre)		100	300	
H – Others according to needs)	Blankets				
	Tumblers				
	Housekeeping Gloves				
	Jerry can				
	Hygiene Kit				
	Bed with a hole for passing				
	Pail with cover				
	Pail without cover				
	Spray can				
	Plastic Apron				
I-Food	Emergency food				
	“MRE” (Food WFP)				

7.8. «PAH » CHOLERA ACCESSORIES KIT « CAK »

PAH put together a kit to cater for the supply of material linked to the hygiene of the CTU and storage of inputs.

CAK « Cholera Accessories Kit »		
Function	Article	Qty
Articles for the stay of patients	Benches	2
	Plastic tumblers	10
	Toilet paper	10
	Pails	8
Materials for storage of pharmaceutical products	Stillage for stocking huge volumes	2
	Baskets for putting away small ones	4
Hygiene articles for CTU cleaners	Brooms	1
	Broom- mops	2
	Basins	2
	Boots (pair)	2
	Housekeeping gloves (pair)	10
	Pocket solar lamps	2
	Washing powder for linen	5
	Washing powder for floor	2
	Dustbin bags (100L) – roll	2
	Pails with tap	1



7.9. EVALUATION OF THE NUMBER OF EXPECTED PATIENTS

Example of calculation of number expected and beds required		
Location	Camps	Endemic areas
Population	30,000	120,000
Rate of attack	5% to 8%	0.2 %
Expected Peak	3 to 4 weeks	5 to 6 weeks
Number of cases during the peak	30%	10-30%
Proportion of severe cases	20%	20%
Duration of stay	2 days	3 days

The rate of attack within the populations at high risk (camps) is a lot higher than in open environments.

Planning for a CTC in a high density area with 30,000 persons

Rate of attack = 5% = $30\,000 \times 0.05 = 1,500$ expected cases
 Cases taken care of = 75% = $1500 \times 0.75 = 1,125$ cases
 Peak (1 week)* = 30% = $1125 \times 0.3 = 338$ cases /week (* week 3 or 4)
 Peak per day = $338 / 7$ days = 48 hospitalizations per day
 Average duration = 2 days = $48 \times 2 = 96$ beds occupied

Therefore a CTC with 96 beds (+ a station for OR)

Planning for a CTC within an area with less density with 90 000 persons (town, village)

Rate of attack = 1 % = $90,000 \times 0.01 = 900$ expected cases
 Cases taken care of = 75% = $900 \times 0.75 = 675$ cases
 Peak (1 week)* = 20% = $675 \times 0.2 = 135$ cases /week (* week 6 to 10)
 Peak per day = $135 / 7$ days = 20 hospitalizations per day
 Average duration = 3 days = $20 \times 3 = 60$ beds occupied

Therefore a CTC with 60 beds (+ station for OR)

7.10. THRESHOLD FOR EPIDEMIC ALERT

The threshold of alert s used for:

- Send out an early warning and laboratory investigations
- Evaluate the level of preparedness to respond to the epidemic
- Put in place a vaccination campaign if necessary

In order to raise the alert, one should observe either:

- An increase of acute watery diarrhea cases within a short time (1 to 2 days)
- A sudden increase in the number of cases or deaths (> 3 deaths) occurring outside the health institution within the community.

In a non endemic area: a confirmed case

In an endemic area: more than double the normal number of cases per week for two weeks

One should therefore alert the Ministry of Health and the WHO or the focal points within respective departments at the Departmental Directorate of Public Health.

7.11. MANAGEMENT OF BODIES

1. Use of gloves and a plastic apron while handling bodies and wash hands afterwards.
2. Disinfect the body with a **2% chlorine** solution
3. The openings of the body should be sealed with cotton soaked in a **2% chlorine** solution
4. Close the mouth with bandage
5. Envelop the body in a special bag, seal the bag and disinfect the outside of the bag with a **2% chlorine** solution
6. When the bag is not available, envelop the body in linen soaked in a **2% chlorine** solution.
7. Avoid burial ceremonies and bury the body within the shortest time possible.
8. Avoid direct contact between the body and the family: the body can be given to the family in a sealed bag, so that it can be interred as soon as possible according to the traditions and customs of the community.
9. Means of transport must pass by disinfection with a **0.2% chlorine** solution after delivery of the body.
10. In case there is need to keep and manage several bodies, Chlorine oxide (CaO) can be used to dry and neutralize the liquids within the bodies, hence reduce the smell.
11. If possible while interring the body, cover it with lime before covering with earth.

See also: Management of fatal bodies during catastrophies on

http://new.paho.org/disasters/index.php?option=com_content&task=view&id=1423&Itemid=1

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