Annex 9. Water, Hygiene and Sanitation in Cholera Treatment Facilities

Included here are the principles and standards that are recommended for water, hygiene and sanitation activities in cholera treatment facilities. These are summarised in an example for a CTC of 100 beds, 160 patients (see CTC map annex 8.1). Additional detail is given in annex 9 and 13 on chlorine solution preparations, chlorine monitoring and bucket chlorination. However, supplementary information may be needed and consultation should be made with the appropriate documentation (e.g. Public Health Engineering, MSF 2003).

9.1. Principles and Standards

**Water Supply**

**Water Quantity**
- CTC/CTUs – 60 litres/patient/day
- Oral Rehydration Points – 10 litres/patient/day

**Water Quality**
- Water for consumption in a CTC/CTU should be chlorinated to give a residual of:
  - 0.2-0.5 mg/l when pH < 8 or
  - 0.4-1 mg/l when pH is ≥ 8
- Water can only be effectively chlorinated if turbidity is < 5 NTU and up to 20 NTU for minimum periods in times of emergency. Methods to reduce turbidity (physical/chemical), to less than 5 should be sought as soon as possible, but are beyond the scope of this guideline.

**Water Storage**
In principle, the quantity of water stored in a cholera treatment centre should be sufficient for 3 days autonomy.

<table>
<thead>
<tr>
<th>Nb of Patients</th>
<th>Daily Needs</th>
<th>3 Days Storage</th>
<th>Typical Type of Tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>600</td>
<td>1,800</td>
<td>2m³ bladder</td>
</tr>
<tr>
<td>50</td>
<td>3,000</td>
<td>9,000</td>
<td>15m³ bladder</td>
</tr>
<tr>
<td>100</td>
<td>6,000</td>
<td>18,000</td>
<td>15m³ bladder + 5m³ bladder</td>
</tr>
<tr>
<td>200</td>
<td>12,000</td>
<td>36,000</td>
<td>2 x 15m³ bladder + 5m³ bladder</td>
</tr>
</tbody>
</table>

9.2. Chlorine solutions for Disinfection
## Preparation and use of a chlorine solution in health care settings with clean water

<table>
<thead>
<tr>
<th>Concentration solution in % of active chlorine</th>
<th>Preparation (1) with HTH at 65%</th>
<th>Indications</th>
<th>Procedures</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| 0.05%                                         | 0.75 gr for 1 litre 7.5 gr for 1 litre | • washing of hands and skin  
• rinsing dishes  
• washing of new patients on arrival, possibly with a spray | Clean and dry hands, then rub with chlorine solution during 30 seconds. Let dry.                                                                       | 0.05% solution is stable for 24 hours and should be renewed every day. Never mix the solution with a detergent. |
| 0.2%                                          | 3 gr for 1 litre 30 gr for 10 litres | • disinfection of floors  
• spraying of homes of patients (floors, beds, latrines)  
• spraying of beds in CTC  
• foot-sprayer at all entrances  
• disinfection of clothes by soaking for 10 minutes, rinsing and washing afterwards | First sweep the floors and wash with soap and water.  
Then apply the chlorinated solution, leave it in contact for 10 minutes, rinse and let dry. | Rinse, wring and dry the floor cloth after use  
0.2% solution is stable for 24 hours and should be renewed every day  
Never mix the solution with a detergent. |
| 2%                                            | 30 gr for 1 litre 300 gr for 10 litres | • disinfection of vomit and faeces (to be used in excreta buckets)  
• disinfection of corpses.                                                                                                                             | Spray directly the body with the solution, after blocking all orifices and then place the body in body bag. | 2% solution is stable for one week if stored properly.  
Never mix the solution with a detergent. |

For preparation of these chlorine solutions, see annex 10.  
For preparation of safe drinking water, refer to the MSF handbook: Public Health Engineering in emergency situations and annex 15.
Quantity of chlorine generating product per patient per day for all needs (including storage/preparedness): approximately 100g of HTH/patient/day
Therefore, for a minimum of 7 days, supply in a CTC with 100 beds (160 patients) will be 112 kg of HTH (High Test Hypochlorite, 65 – 70%).

**Preparation and Storage of Drinking Water and Disinfecting Solutions**
It is advisable that only one person is in charge of preparing the different solutions per shift.

Often 125 litre containers with taps are used in the centres. These should be clearly marked with the solution that it is used for, to avoid accidents.

Different coloured containers can also be used to call attention to the different concentrations.

All containers used should be fitted with a lid and tap for hygienic access to the solutions.

Additional quantities of all the solutions are stored in the neutral area.

**9.3. Hygiene**

**Movement Through the Facility**
- Fence the cholera treatment centre and place a guard at entrance/exit:
  - to indicate the centre (physical barrier)
  - to show people were they are allowed to enter
  - to make sure that not everyone enters the center
  - to control that everybody follows hygiene rules
  - to avoid that animals have access to the centre.
- Patients and caregivers should enter through the patient entrance where their feet/shoes will be disinfected with a 0.2% solution by a sprayer preferably or footbath
- They will then be asked to wash their hands upon entry at the container provided
- The vehicle bringing the patient should be cleaned and disinfected before leaving the centre with 0.05% solution. Advice should also be given to caregivers on how to clean soiled areas of their houses
- Soiled clothes should then be removed in the shower area and patients (via caregivers) provided with 0.05% solution for this initial bathing, and clean gowns provided. Clothes will then be taken to the laundry area for washing in 0.2% solution.
- On moving through the different areas, feet should be sprayed or footbaths used
- Hand-washing is provided in all wards, especially for medical staff before, between and after attending to patients.
- Staff and caregivers should enter through the neutral area with the same process of spraying/footbaths and hand-washing.
- Staff and caregivers should change or put on protective clothing
- Staff should consume food in the staff room, washing hands first.
On leaving the centre, protective clothing should be removed and left in the basket/area provided
Hand-washing should be performed and feet sprayed on exit from the centre

Sprayers and Footbaths
The most important time for spraying of feet is upon entrance and exit from the centre to avoid contamination in and out of the centre. The spraying of all areas is to make staff and visitors aware of the contamination they are potentially bringing into the different areas.

Footbaths are rather inefficient as disinfectants, as they become dirty very quickly. Therefore, spraying is preferred. Footbaths should be trays with material/sponge soaked in 0.2% solution and changed twice per day or when the material appears dirty. Spraying and footbaths can also be important psychological barriers between the outside and the centre.

It is important to note that after chlorine solution preparation, the calcium deposits at the bottom of the container should not be used, particularly in the sprayers, as this will cause blockages. Sprayers adapted to resist strong concentrations of chlorine should be used.

Bathing Areas

- 1 shower room per 50 patients or caregivers / minimum 2 (male/female) in each area of the centre
- Minimum 2 shower rooms (m/f) for staff in neutral area
- Bathing areas should be connected to a grease trap and a soakaway that is contained inside the CTC/CTU.

The patient shower areas should be big enough for a minimum of 2 persons (caregiver and patient). The use of a sprayer may be useful for cleaning patients and initially soaking clothes on arrival. Care must be taken to preserve the dignity of patients during this process.

Hand-washing
Located at all latrines, all tents (patient and administrative), kitchen, mortuary, waste area
Concentration: 0.05% chlorine solution

Hand-washing is one of the most effective ways to prevent the transmission of cholera amongst patients, caregivers and staff. Hygiene rules must be set for working in the kitchen (e.g. for washing hands before preparation or handling of food). All drip trays for hand-washing should be emptied into the soakaways or latrines.
Promotion of Hygiene in the CTC/CTU

Hygiene should be promoted among the staff and caregivers to make them aware of the rules related to hygiene and the dangers of not adhering to them. To ensure this is done, a hygiene promoter should be employed.

- Promotion should concentrate on staff and caregivers in the CTC/CTU, emphasising:
  - How to clean the patient/caregiver’s home that has been soiled with excreta/vomit
  - Hand-washing after dealing with each patient or after handling contaminated items
  - Hand-washing after defecation and before handling or eating food
  - Changing into protective clothing upon entering the area. On leaving, protective clothing should be removed in the CTC/CTU for washing on site and not taken home
  - Only kitchen staff allowed into the kitchen area

- Promotion for patients and caregivers prior to discharge should emphasise:
  - Any neighbour/family member should seek early treatment at the centre upon presenting symptoms (as defined in the case definition used)
  - Washing hands after defecation and before handling food
  - Using the cleanest available water, and hygienic storage of water in the home
  - Eating food hot
  - Other issues related to transmission in the present cholera epidemic

Protective Clothing

Protective clothing should be made available for all staff working in the centre, including boots and overalls that can be easily removed before leaving the centre.

Gloves should also be made available for those manipulating blood, chlorine and the chlorinated solutions.

Gowns or clothes should be made available for patients on hospitalisation after bathing.

Sets of clothing should also be made available for caregivers and visitors to the centre. These should also be kept and washed in the centre.

Food Hygiene

Strict rules should be set for those preparing and serving food including:

- Upon entering the kitchen (each time), hand-washing must be carried out
- Food must be stored so that it is only handled by kitchen staff
- Only kitchen staff is allowed inside the kitchen
- Only kitchen staff is to serve food
- Dishes should be rinsed initially in a 0.05% solution then washed by normal methods
- Food provided by relatives (in CTUs) should be handled following the same hygiene criteria.
LAUNDRY

The laundry area should be located in the area producing the most contaminated waste and should wash soiled materials from the entire centre. This will include: blankets, gowns, protective clothing.

Where sinks are not available, large plastic tubs will need to be made available. Materials should be immersed and disinfected first in 0.2 % chlorine solution for 10 minutes, then washed as usual and hung to dry.

CLEANING THE FACILITY

Floors of the centre should be made of concrete or covered with plastic sheeting for easier cleaning. Squeeze-mops or similar should be used with 0.2 % chlorine solution to disinfect the ward floors up to 4 times per day, depending on the movement through the wards.

Walls around patients, where not solid, can be cleaned as necessary using 0.2 % chlorine solution in a sprayer, taking care to clean preferably when patients are not around. Cholera beds should be sprayed with 0.2 % chlorine solution as appropriate and between each occupancy.

Latrines should be cleaned several times a day with 0.2 % chlorine solution with mops and or/sprayed. This includes the slabs and the walls up to 1 m (or height of splashes). There is no need to pour additional chlorine into the latrine.

9.4. Sanitation

EXCRETA DISPOSAL

Toiletttes/Latrines

1 latrine/20 patients or caregivers in Observation/Screening and Recovery, minimum 2 latrines (male/female);
1 latrine/50 patients in Hospitalisation (most won’t use them), minimum
2 latrines (male/female);
2 latrines minimum (male/female) for staff in Neutral area.

Plastic slabs are useful in an emergency as they are fast to install and easy to clean. Toilets should be independent and not connected to the main sewer system (this helps to contain the vibrio cholera).

Buckets for cholera beds

Since most of the hospitalised patients will not be able to use a latrine, buckets (10-15 litres) should be placed under the hole in the cholera bed and at the bedside for vomit. The bucket can be raised on a block to prevent splashing of the surrounding area. A number of buckets should also be provided for the Observation area. Approximately 1 cm of 2 % chlorine solution should be put into the bucket before placement. The bucket may be emptied into the toilet/latrine.
Note: latrines or toilets connected to a septic tank: chlorine will destroy bacterial activities and therefore the natural decomposition. It is preferable empty the buckets with 2% chlorine solution into a temporary pit.

AMBULANCE/VEHICLE CLEANING

Transport should be cleaned by centre staff with a 0.05 % chlorine solution. Be aware that if the inside of the vehicle is not plastic or similar, there may be effects (chlorine residue) on the material.

Vehicles fitted with anti-mine protection (ballistic blankets) may be sensitive to water and chlorine.

WASTE WATER

The most contaminated waste water will come from the mortuary, showers, laundry and kitchen washing area. It is therefore important to ensure that the waste water from this area is disposed of in soakaways after first going through grease traps (so that the soakaway does not become clogged).

If possible, the CTC should be located on a slight incline, so that rainfall can be easily drained from the area. Drains should be constructed around the outside of each of the structures in the centre to canalise rainfall and drain out of the CTC/CTU. While rainwater run-off may contain some contamination, it is considered to be of low risk. It is not usually feasible to dispose of all water from a rainfall event and therefore arrangements must be made to collect rainwater from the CTC and drain out where possible, to an existing drainage system.

VECTOR CONTROL

Where vector transmitted diseases exist and are of concern in the area of the cholera epidemic, implementing appropriate vector control measures is recommended. This may include:

- general hygiene measures (e.g. cleanliness, washing and exposure of bedding to direct sunlight)
- source reduction in terms of prevention of breeding or elimination of breeding sites (e.g. effective excreta disposal, solid waste management, waste water management)
- other methods may include, spraying residual insecticide, fly traps etc.

In areas where malaria is a problem, bed nets are often recommended in medical structures. However, in a CTC/CTU the use of bed nets is not appropriate because of the access that medical staff need to have to the patient. Therefore other methods must be sought.

Indoors residual spraying is often recommended, but the material to be sprayed (e.g. concrete, plastic, tent), must be compatible with the insecticide.
9.5. Waste Management

**Segregation and Storage**

There will be different types of waste produced in the CTC/CTU which need to be disposed of correctly in order to reduce both transmission of vibrio cholera, and other diseases related to medical waste (e.g. hepatitis B, tetanus, HIV). Waste can be divided for segregation and disposal purposes into 3 categories:

- **Softs**: cottons, gauze, plastics, syringes, paper (waste – contaminated or uncontaminated that can be burned)
- **Organic**: food residues, human tissue (waste that cannot be burned)
- **Sharps**: needles, lancets, ampoules, glass (waste that can cause injury and transmit disease if not disposed of appropriately)

There should therefore be three different types of containers assigned and labeled for the different waste:

- **Softs and organic waste** can be disposed in a waste bin with a lid that is washable.
- **Sharps Waste**: should be disposed in a puncture-proof plastic container. The lid, with a V shaped opening is glued (e.g. empty tablet plastic container). The container, once full, is disposed directly into the pit and replaced by a new one.

Safety boxes can also be used to collect sharps and syringes with needles (no need to separate). The safety box, when full, should be incinerated on top of a grill, placed on the sharp pit to allow all remaining metals and ashes to fall through into the pit. Safety boxes should not be incinerated into a drum burner.

**Waste Zone**

A waste area is planned within the CTC and comprises of:

- a drum burner (with a dry area to store the bins) – to burn softs
- an organic pit (with a lid to prevent flies/mosquitoes) – for organic waste and the ash produced from the burner
- a sharps pit to receive the containers collecting the needles, lancets, ampoules etc.

The pit ideally should be lined so that it is fully enclosed. If safety boxes are used, a grill should be placed on the top of the pit.

Unless the CTC is located within the grounds of a medical structure whose staff wishes to continue using the waste zone, upon closure of the CTC, the organics pit should be backfilled and the sharps filled with concrete or similar to encapsulate the sharps and to protect the future users of the land.

9.6. Mortuary

The mortuary should be located alongside the waste zone.

A closed tent (plastic, material) should be for corpses to prevent access to the body.

The mortuary structure should enable effective cleaning inside, with drainage canals that flow into a soakaway pit (body fluids are likely to be highly contaminated).

It should have an entrance from inside the CTC and an exit to allow collection of the body.

If a CTU does not have the possibility to build up a Morgue, rapid burial should be promoted. The body will be prepared following the same criteria:

- The body should be moved as soon as possible to the mortuary as fluids will start to evacuate the body.
- Disinfection of the body should be done inside the mortuary, with 2% chlorine solution.
- All orifices should be plugged with cotton soaked in the 2% chlorine solution as soon as possible.
- Where body bags are available, they should be used to transport the body for burial. If not available, the body can be wrapped in a cloth sheet soaked in 2% chlorine.
- Where many bodies must be stored, quicklime (calcium oxide, CaO) can be used to dry up and neutralise liquids and reduce the odours produced.

The following table summarises the water, hygiene and sanitation needs of any cholera control facility and gives the example of a 100 bed (160 patient) CTC.

### 9.7. Table of Water, Hygiene and Sanitation Needs in a 100 Beds CTC (160 patients)

30 patients in Observation, 100 patients in Hospitalisation, 30 patients in Recovery, 1 caregiver/patient (160)

<table>
<thead>
<tr>
<th>Facilities</th>
<th>Patient Area 1</th>
<th>Patient Area 2</th>
<th>Patient Area 3</th>
<th>Neutral Area</th>
<th>Mortuary</th>
<th>Waste Zone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Containers for drinking water</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>(typically 125 l container)</td>
<td>(1/tent)</td>
<td>(1/tent)</td>
<td>(1/tent)</td>
<td>(1/tent for staff)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Containers of ORS</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>(typically 125 l container)</td>
<td>(1/tent)</td>
<td>(1/tent)</td>
<td>(1/tent)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taps (supplying drinking water)</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>(at showers)</td>
<td>(at laundry, shower)</td>
<td>(at showers)</td>
<td>(at kitchen)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>28.8 m³</td>
</tr>
<tr>
<td>(typically in bladders)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2 x 15m²)</td>
</tr>
<tr>
<td><strong>Bathing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Showers</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>(Minimum 2, 1 for male, 1 for female)</td>
<td></td>
<td></td>
<td></td>
<td>(for staff)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hygiene</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Containers for hand washing</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>with 0.05% chlorine solution</td>
<td>(entrance area + 1/tent)</td>
<td>(entrance area + 1/tent)</td>
<td>(entrance area + 1/tent)</td>
<td>(latrine, dish rinsing, 2 in chlorine prep. area)</td>
<td>(outside tent)</td>
<td>(for bin rinsing)</td>
<td></td>
</tr>
<tr>
<td>(typically 125 l container)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Containers for 0.2% chlorine solution</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>(typically 125 l container)</td>
<td>(chlorine solution area)</td>
<td></td>
<td></td>
<td>(chlorine prep. area)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilities</td>
<td>Patient Area 1</td>
<td>Patient Area 2</td>
<td>Patient Area 3</td>
<td>Neutral Area</td>
<td>Mortuary</td>
<td>Waste Zone</td>
<td>Total</td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>--------------</td>
<td>----------</td>
<td>------------</td>
<td>-------</td>
</tr>
<tr>
<td>Sprayers for 0.2% chlorine solution</td>
<td>1 (entrance)</td>
<td>1 (entrance)</td>
<td>1 (exit)</td>
<td>1 (entrance)</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Containers for 2% chlorine solution (typically 125 l container)</td>
<td></td>
<td></td>
<td></td>
<td>2 (Preparation area)</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Excreta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 (inside tent)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Latrines (Minimum 2, 1 for male, 1 for female)</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Feces bucket</td>
<td>5</td>
<td>100</td>
<td>5</td>
<td>10 extra</td>
<td></td>
<td></td>
<td>120</td>
</tr>
<tr>
<td>Vomit buckets</td>
<td>5</td>
<td>100</td>
<td>5</td>
<td>10 extra</td>
<td></td>
<td></td>
<td>120</td>
</tr>
<tr>
<td>Solid Waste</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Softs bin</td>
<td>2 (1/tent)</td>
<td>5 (1/tent)</td>
<td>2 (1/tent)</td>
<td>2 (1/tent)</td>
<td>1 (1/tent)</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Organic bin</td>
<td>2 (1/tent)</td>
<td>5 (1/tent)</td>
<td>2 (1/tent)</td>
<td>2 (staff tent, kitchen)</td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Sharp container</td>
<td>5 (1/tent)</td>
<td>2 (1/tent)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Drum Burner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Organic pit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Sharp pit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Waste Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rainwater drainage (connected to external drain)</td>
<td>Around all tents</td>
<td>Around all tents</td>
<td>Around all tents</td>
<td>Around all tents, structures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grease trap and soakaway</td>
<td>1 shower</td>
<td>3 shower, laundry, kitchen</td>
<td>1 shower,</td>
<td>1 shower,</td>
<td></td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>