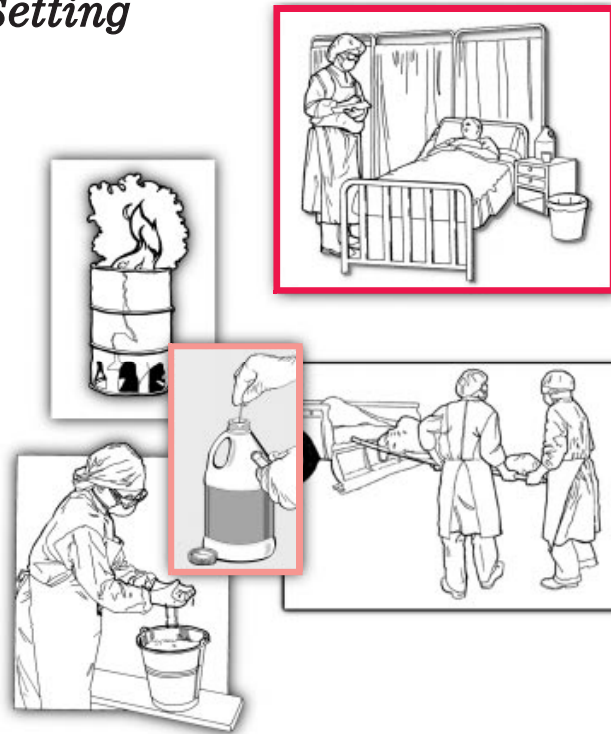


# *Infection Control for Viral Haemorrhagic Fevers in the African Health Care Setting*



**World Health Organization**



**U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES**  
Public Health Service



C. J. Peters, M.D., Chief

Special Pathogens Branch  
Division of Viral and Rickettsial Diseases  
National Center for Infectious Diseases  
Centers for Disease Control and Prevention

Guenael Rodier, M.D., Chief

Epidemiological Surveillance and Epidemic Response  
Division of Emerging and Other Communicable Diseases  
World Health Organization

Developed and written by:

Ethleen Lloyd, M.S., C.H.E.S., Health Communication Specialist  
Special Pathogens Branch (CDC)

Helen Perry, M.A., Educational Design Specialist  
Special Pathogens Branch (CDC)

Layout and design by:

Lilien Yang, M.S., Visiting Fellow  
Special Pathogens Branch (CDC)

Illustrations by:

Willie Richardson, A.A., Visual Information Specialist  
Division of Media and Training Services, Public Health Program Practice Office (CDC)

*The material in this manual is in the public domain. It may be used and reprinted without permission. The source should be acknowledged. Suggested citation: Centers for Disease Control and Prevention and World Health Organization. Infection Control for Viral Haemorrhagic Fevers in the African Health Care Setting. Atlanta, Centers for Disease Control and Prevention, 1998: 1-198.*

## Table of Contents

<b>Introduction</b> . . . . .	1
Viral Haemorrhagic Fevers: An Overview . . . . .	3
How VHF Is Transmitted in the Health Care Setting . . . . .	4
What Is in This Manual . . . . .	5
Who the Manual Is For . . . . .	5
Objectives . . . . .	5
How to Use the Manual . . . . .	6
Glossary for Use with This Manual . . . . .	8
<b>Section 1 Use Standard Precautions with All Patients</b> . . . . .	9
1.1 Use Standard Precautions . . . . .	11
1.2 Establish and Maintain a Minimum Level of Standard Precautions . . . . .	12
1.3 Establish Routine Handwashing . . . . .	12
1.4 Handle and Dispose of Sharp Instruments Safely . . . . .	14
1.5 Disinfect Reusable Needles and Syringes Safely . . . . .	15
1.6 Disinfect Disposable Needles and Syringes That Must Be Reused . . . . .	15
1.7 Use VHF Isolation Precautions . . . . .	16
1.8 Select a VHF Coordinator . . . . .	18
<b>Section 2 Identify Suspected Cases of VHF</b> . . . . .	19
2.1 Use Information from Previous Outbreaks to Suspect a VHF . . . . .	22
2.2 Begin VHF Isolation Precautions . . . . .	25
2.3 Alert Health Facility Staff about Specific Risk for VHF Transmission . . . . .	25

2.4 Report the Suspected Case to the Health Authorities . . . . .	27
2.5 Identify Patient's Contacts and Travel History . . . . .	28

<b>Section 3 Isolate the Patient</b> . . . . .	29
3.1 Select Site for the Isolation Area . . . . .	31
3.2 Plan How to Arrange the Isolation Area . . . . .	32
3.3 Gather Recommended Supplies . . . . .	34
3.3.1 Plan Disinfection for VHF-Contaminated Items . . . . .	34
3.3.2 Gather Supplies for the Patient Area . . . . .	35
3.3.3 Gather Supplies for the Changing Room . . . . .	36
3.3.4 Arrange for Storing of Supplies Outside the Changing Room . . . . .	36
3.4 Set Up Changing Rooms . . . . .	37
3.5 Place Security Barrier Around Isolation Area . . . . .	37
3.6 Consult Family Members about Patient Care . . . . .	39
Check List: Supplies for a Changing Room . . . . .	41
Check List: Supplies for Patient Area . . . . .	42

<b>Section 4 Wear Protective Clothing</b> . . . . .	43
4.1 Specify Who Should Wear Protective Clothing . . . . .	45
4.2 Gather a Supply of Protective Clothing . . . . .	46
4.3 Put On Protective Clothing . . . . .	53
4.4 Take Off Protective Clothing . . . . .	57

<b>Section 5 Disinfect Reusable Supplies and Equipment</b> . . . . .	65
5.1 Prepare Bleach Solutions . . . . .	68
5.2 Prepare Supply of Soapy Water . . . . .	72
5.3 Disinfect Gloved Hands between Patients . . . . .	73
5.4 Disinfect Used Gloves before Reuse . . . . .	74

Annex 1	Standard Precautions for Hospital Infection Control . . . . .	133
Annex 2	Specific Features of VHFs . . . . .	135
Annex 3	Planning and Setting Up the Isolation Area . . . . .	141
Annex 4	Adapting VHF Isolation Precautions for a Large Number of Patients . . . . .	145
Annex 5	Making Protective Clothing . . . . .	149
Annex 6	Requirements for Purchasing Protective Clothing . . . . .	153
Annex 7	Disinfecting Water for Drinking, Cooking and Cleaning. . . . .	157
Annex 8	Preparing Disinfectant Solutions by Using Other Chlorine Products . . . . .	161
Annex 9	Making Supplies: Sharps Container, Incinerator, and Boot Remover. . . . .	163
Annex 10	Sample Job-Aids and Posters for Use in the Health Facility. . . . .	165
Annex 11	Laboratory Testing for VHFs . . . . .	171
Annex 12	Skin Biopsy on Fatal Cases for Diagnosis of Ebola . . . . .	173
Annex 13	Community Education Materials . . . . .	181
Annex 14	Conducting In-Service Training for VHF Isolation Precautions . . . . .	185
Annex 15	Local Resources for Community Mobilization and Education . . . . .	187
Annex 16	International and Regional Contacts . . . . .	189
References	. . . . .	193
Index	. . . . .	197

---

## Figure List

Figure 1	Epidemiological graph of the Ebola hemorrhagic fever outbreak in Kikwit, 1995— . . . . .	3
Figure 2	An example of a handwashing station — . . . . .	13
Figure 3	Parts of hands that are often missed during handwashing— . . . . .	13
Figure 4	Standard sharps container— . . . . .	14
Figure 5	Using plastic bottle to dispose of used needles — . . . . .	14
Figure 6	Placing the disposable needle and syringe in soapy water— . . . . .	15
Figure 7	An example of VHF Isolation Precautions poster— . . . . .	26
Figure 8	A sample layout of an isolation area — . . . . .	32
Figure 9	A sample layout for a single patient — . . . . .	33
Figure 10	A sample layout for several patients — . . . . .	33
Figure 11	A security barrier and sign — . . . . .	37
Figure 12	An example of a sign-in sheet — . . . . .	38
Figure 13	Inner layer of clothing — . . . . .	46
Figure 14	Thin gloves — . . . . .	46
Figure 15	Using plastic bags as boots — . . . . .	47
Figure 16	Storing boots — . . . . .	47
Figure 17	Gown with ties — . . . . .	48
Figure 18	Wearing a plastic apron— . . . . .	48
Figure 19	Thick gloves — . . . . .	49
Figure 20	Using plastic bags as gloves — . . . . .	49
Figure 21	HEPA-filter mask — . . . . .	50
Figure 22	Surgical mask — . . . . .	51

### Section 3

## Isolate the Patient



This section describes how to:

- Gather supplies to set up an isolation area.
- Make a substitute item from available materials whenever a recommended item is not available.
- Select a site for the VHF isolation area and set up:
  - The patient's room
  - A changing room for health care workers to use when changing clothes
  - A changing room for other health facility staff to use near their work area
  - A family entrance, if necessary
  - A security barrier around the entire isolation area.
- Counsel family members about patient care.



### Section 3

---

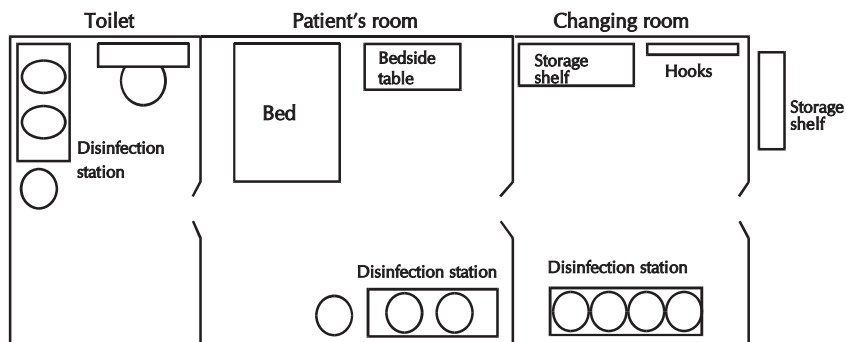


Fig. 9. A sample layout for a single patient

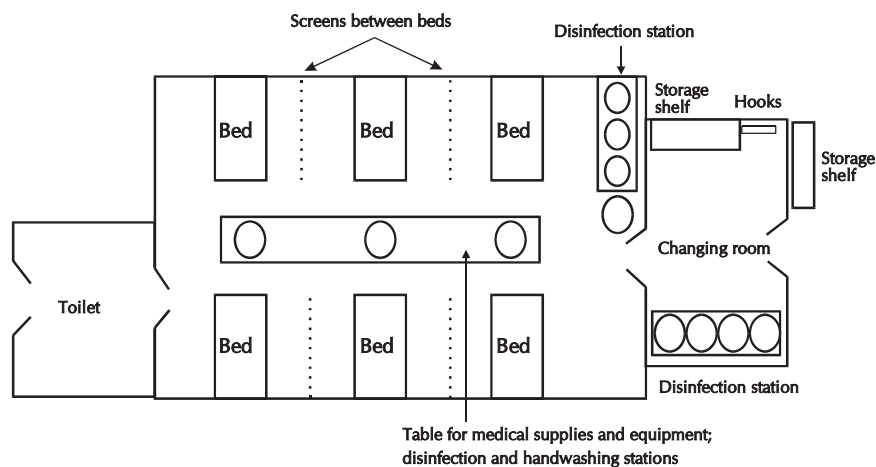


Fig. 10. A sample layout for several patients



### 3.3 Gather Recommended Supplies

Ideally, supplies should be available to begin VHF Isolation Precautions. If a separate emergency supply is *not* available when a VHF case is suspected, use supplies from other services in the health facility.

*If a recommended item is not available, or if the quantity is limited, make a substitute item from available materials.* For example, the manual recommends using plastic sheeting to cover mattresses. If plastic sheeting is not available, use plastic cloth normally used to cover kitchen tables. This is usually available in the local market.

#### 3.3.1 Plan Disinfection for VHF-Contaminated Items

Ordinary household bleach, soap and water are useful disinfectants against viruses causing VHF.<sup>6</sup> They are low in cost and commonly available.

**Ordinary Household Bleach:** The viruses causing VHF are very sensitive to bleach solution. This manual describes a low-cost disinfection system using two bleach solutions: a solution of 1:10 and a solution of 1:100. Detailed instructions for preparing the solutions are in Section 5.1.

**Soap and Clean Water:** Scrubbing with soap and water before disinfection removes infectious body fluids and other foreign matter from contaminated items. This makes bleach solutions more effective. Detailed instructions for preparing solutions of soapy water are in Section 5.2.

**Sterilization:** Heat sterilization requires special equipment, such as an autoclave or steam sterilizer. When this equipment is not working or is not available, boiling heat-resilient items in water for 20 minutes will kill VHF viruses.

6 VHF viruses are lipid enveloped, and this feature makes them sensitive to destruction by detergent solutions.

### 3.4 Set Up Changing Rooms

**For patient-care staff:**

One changing room is needed outside the patient isolation area. This area is where health care workers will put on protective clothing to protect them from spills or splashes of infectious body fluids while they are in the patient's room. After leaving the patient's room, they will reenter the changing room and remove the protective clothing. They will hang it for reuse or dispose of it appropriately.

Contaminated clothing and supplies remain in the changing room until cleaning staff trained to use VHF Isolation Precautions take the VHF-contaminated items to the laundry or disposal site.

**For laboratory, cleaning, laundry, and waste disposal staff:**

Set up changing rooms near the work areas for other health facility staff who will handle laboratory specimens and who will clean launder, or dispose of contaminated items. They will also need to wear protective clothing during any contact they have with body fluids or VHF-contaminated items.

The stations in the changing room should be set up so that traffic flow is from the *least to most contaminated* area.

### 3.5 Place Security Barrier Around Isolation Area

**Restrict access to the isolation area:** Place signs around the isolation area clearly stating that access is restricted. Or tie lines or ropes around the isolation area and hang plastic sheets from them.



Fig. 11. A security barrier and sign



**Prepare a list of health facility staff and family members authorized to enter the isolation area:** List the medical, nursing, laboratory, cleaning staff, and, if appropriate, those family members who are trained in the use of VHF Isolation Precautions. If an accidental exposure or incident occurs, the list can help in the prompt identification of possible contacts.

**When there is a large number of patients, station a guard at the entry to the isolation area:** In a large scale outbreak, station a security guard at the door of the patient isolation area outside the changing room. The guard will limit access to authorized health facility staff and family members only. This is critical for maintaining strict isolation and protecting the community.

Provide the guard with the list of authorized persons and a sign-in sheet. The guard can record who comes into the isolation area and note the time of entry and departure.

Date	Name	Service	Time In	Time Out
13.6.98	Dr. Nsango	Infectious Diseases	10:15	11:30
13.6.98	Nurse Bandari	Intensive Care	10:00	11:30
13.6.98	Nurse Ninakazi	Intensive Care	11:00	13:30
13.6.98	Masika	Cleaning	11:10	11:45
13.6.98	Madunda	Family member	11:15	

Fig. 12. An example of a sign-in sheet

Checklist: Supplies for a Changing Room

Storage Outside the Changing Room:

- 1. Shelf or cabinet with lock \_\_\_\_\_
- 2. Supply of clean scrub suits, gowns, aprons, gloves, masks, headcovering, and eyewear \_\_\_\_\_
- 3. Covered shelf for storing disinfected boots \_\_\_\_\_
- 4. Bucket for collecting non-infectious waste \_\_\_\_\_

Inside the Changing Room:

- 1. Hooks, nails, or hangers for hanging reusable gowns, scrub suits \_\_\_\_\_
- 2. Roll of plastic tape \_\_\_\_\_
- 3. Handwashing supplies: bucket or pan, clean water, soap, one-use towels \_\_\_\_\_
- 4. Bucket or pan, 1:100 bleach solution for disinfecting gloved hands \_\_\_\_\_
- 5. Container with soapy water for collecting discarded gloves \_\_\_\_\_
- 6. Container with soapy water for collecting used instruments to be sterilized\* \_\_\_\_\_
- 7. Container with soapy water for collecting reusable gowns, masks, sheets to launder\* \_\_\_\_\_

\*Place outside the changing room if the changing room is too small

If large amounts of waste on floor:

Sprayer, bucket or shallow pan with 1:100 bleach solution for disinfecting boots \_\_\_\_\_



Checklist: Supplies for Patient Area

- 1. 1 bed with clean mattress or sleeping mat and at least a bottom sheet and blanket for each bed \_\_\_\_\_
- 2. Plastic sheeting to cover mattress or sleeping mat \_\_\_\_\_
- 3. 1 thermometer, 1 stethoscope, and 1 blood pressure cuff for each patient or for each patient area \_\_\_\_\_
- 4. 1 puncture-resistant container for collecting non-reusable needles, syringes, and discarded sharp instruments \_\_\_\_\_
- 5. 1 bedside table or shelf \_\_\_\_\_
- 6. 1 large wall clock with a second hand \_\_\_\_\_
- 7. Pan with 1:100 bleach solution or alcohol and one-use towels for disinfecting the thermometer and stethoscope between use with each patient \_\_\_\_\_
- 8. Bucket or pan, 1:100 bleach solution, one-use towels for disinfecting gloved hands between patients \_\_\_\_\_
- 9. Supplies for disinfecting patient excreta (bedpan, urinal, 1:10 bleach solution) \_\_\_\_\_
- 10. Sprayer, 1:100 bleach solution, clear water, and mop for disinfecting spills on floor and walls \_\_\_\_\_
- 11. Container with soapy water for collecting discarded gloves \_\_\_\_\_
- 12. Screens (or sheets hung from ropes or lines) placed between VHF patients' beds \_\_\_\_\_
- 13. Extra supply of gowns and gloves \_\_\_\_\_
- 14. Container for collecting infectious waste to be burned \_\_\_\_\_

## Section 4 Wear Protective Clothing

### 4.1 Specify Who Should Wear Protective Clothing

- All doctors, nurses, and health care workers who provide direct patient care to suspected VHF patients.
- All support staff who clean the isolation room, handle contaminated supplies and equipment, launder reusable supplies, and collect and dispose of infectious waste from VHF patients.
- All laboratory staff who handle patient specimens and body fluids from suspected VHF cases.
- Laboratory support staff who clean and disinfect laboratory equipment used to test VHF specimens.
- Burial teams who remove bodies of deceased VHF patients and prepare them for burial.
- Family members who care for VHF patients.

When a VHF case is suspected in the health facility, the following protective clothing should be worn in the isolation area:

- A scrub suit or inner layer of clothing (an old shirt and trousers brought from home)
- A pair of thin gloves
- Rubber boots or overshoes (only if the floor is soiled)
- A gown or outer layer of clothing (surgical or disposable gown with long sleeves and cuffs)
- A plastic apron worn over both layers of clothes
- A second pair of thin or thick gloves. Wearing a second pair of gloves provides an added measure of safety during patient care and when handling contaminated supplies
- A HEPA-filter (high-efficiency particulate air respirator) or other biosafety mask (or surgical mask if HEPA-filter or other biosafety mask is not available)



## Section 4

- Cotton head covering
- Clear eyeglasses or non-fogging goggles.

**Note:** When protective clothing is not available or is in short supply, adaptations must be made and used.

### 4.2 Gather a Supply of Protective Clothing

Obtain and store the following items outside the changing room or in a storage cabinet inside the changing room.



Fig. 13. Inner layer of clothing

**Scrub suit or inner layer:** Wear a scrub suit or a set of old clothes brought from home (such as a loose-fitting shirt and trousers). Avoid wearing long skirts to prevent contact between clothing and spills of infectious waste on the floor.

**Thin gloves:** These permit fine-motor function when examining or caring for patients. They can be latex, vinyl, or surgical gloves; they do not need to be sterile. The gloves must reach well above the wrist, preferably 10 cm to 15 cm long (4 inches to 6 inches), measuring from the wrist up along the arm.



Fig. 14. Thin gloves

### Wear Protective Clothing

When a supply of commercial plastic aprons is not available, make aprons from plastic sheeting, rubber, or plastic cloth normally used to cover kitchen tables.

The apron should:

- Have hooks or ties that fasten around the neck.
- Have ties at the waist that reach around and tie at the back.
- Be long enough to cover the top of the boots and provide additional protection from spills running inside the boots.

**Thick gloves:** These are worn over an inner pair of thin or latex gloves. They are worn to clean spills, launder reusable protective clothing and patient bedding, handle disposable waste, and conduct autopsies and burial preparations.



Fig. 19. Thick gloves

The gloves can be made of neoprene or thick rubber. They should reach well above the wrist, about 30 cm (12 inches) up the arm. When thick rubber gloves are not available, use normal kitchen gloves as the outer layer of gloves.

If the supply of gloves is limited, wear one pair of gloves. Disinfect them after each contact with the VHF patient or with infectious body fluids and contaminated material. How to disinfect and clean gloves during patient care and for reuse is described in Sections 5.3 and 5.4.

If gloves are not available, use plastic bags to cover the hands.



Fig. 20. Using plastic bags as gloves



### Section 4

If nothing is available to serve as a glove or hand covering, make sure health facility staff wash their hands with soap and water **immediately:**

- After every contact with the VHF patient
- Before leaving the patient's room
- After any contact with infectious body fluids
- After contact with any contaminated material.

How to set up handwashing stations is described in Section 1.3.

**Mask:** Masks protect the health care worker's face from contact with blood or droplets of infectious body fluids. Use masks that cover the mouth and nose. Use a HEPA-filter or other biosafety mask, a surgical mask, or a cotton mask made locally.

**HEPA-filter or biosafety mask:** A HEPA-filter mask filters the air to prevent breathing in small particles and harmful microorganisms. It provides protection from airborne transmission of microorganisms.



Fig. 21. HEPA-filter mask

A HEPA-filter or biosafety mask is lightweight and easy to use. It can be reused by the same health care worker as long as it continues to fit comfortably and the mask does not become contaminated, crushed, or splattered with body fluids.

Do not touch the mask after it has been put on. The mask may become contaminated once it is touched. To avoid the necessity for touching the mask, make sure it fits comfortably before entering the patient's room.

When handling a reused mask, hold it by the strings. Be careful that the outside surface does not touch the health care worker's face.

### 4.3 Put On Protective Clothing

Make sure the changing room (and the changing area for cleaning and other staff) contains a supply of protective clothing. Section 3.4 describes how to set up a changing room.

1. Before entering the changing room, remove jewelry, wallets and other valuables. Store them safely outside the changing room.

2. Remove street clothes and hang them on a hook. **Put on the scrub suit or set of old clothes.**



Fig. 26. Scrub suit: the first layer of clothing

3. **Enter the changing room.**

4. **Put on rubber boots.**

Put on each boot and tuck the trouser leg inside the boot. If overboots are used, tape the top of the boot to the leg with plastic tape. This will help prevent spills from running inside the boots.



Fig. 27. Putting on boots



5. **Put on the first pair of gloves.**

- Look at your hands for cut or broken skin. If the skin is cut or broken, refrain from direct patient contact.
- Put on one glove at a time. If the scrub suit or set of old clothes has long sleeves, place the edge of each glove *under* the cuff.
- When only one pair of gloves is worn, place the edge of the glove *over* the cuff or gown.
- If gloves are not available, use plastic bags. Put on one layer now. Attach and close the first layer with tape or elastic bands.



Fig. 28. Putting on the first pair of gloves

6. **Put on the outer gown.**

- Pick up the gown from the inside. This is especially important if the gown is being reused.
- Place arms through the armholes.
- Tie the gown in back. Or, ask another health care worker to tie the gown.



Fig. 29. Putting on the outer gown

#### 4.4 Take Off Protective Clothing

The steps for removing protective clothing include disinfection with bleach solutions and washing hands with soap and water. How to set up supplies for disinfection is described in Section 3.3. How to prepare the bleach solutions is described in Section 5.1.

Outer gloves and boots are likely to have the most contact with infectious body fluids during patient care.

Before leaving the patient's room:

1. **Disinfect the outer pair of gloves.**

- Wash the gloved hands in soap and water.
- Dip the gloved hands in 1:100 bleach solution for 1 minute.

2. **Disinfect the apron.** Spray or wipe it with 1:100 bleach solution.

3. **Disinfect the boots.**

Note: The soles of rubber boots are difficult to clean because they are textured. Disinfect them carefully and make sure to reach all surfaces of the textured soles.

- Use a sprayer containing 1:100 bleach solution to spray boots

OR

- Hold the foot over a pan or basin and ask another health worker to pour 1:100 bleach solution over the boots

OR

- Step into a shallow pan containing 1:100 bleach solution and wipe boots on a bleach-drenched cloth.



Fig. 35. Disinfecting the boots



4. **Remove the outer pair of gloves.**

If two pairs of gloves are worn:

- Pull the edge of the glove back over the gloved hand so that the glove turns inside out as it is being pulled back.
- If gloves will be reused, place the glove in a bucket containing soapy water.



Fig. 36. Disinfecting used gloves in soapy water for reuse or disposing of them in waste bucket

- If gloves will *not* be reused, discard them in a bucket for disposal of contaminated waste.
- Remove the other glove in the same way.

If only one pair of gloves is worn:

- Do not remove the gloves now.
- Rinse the gloved hands in 1:100 bleach solution for 1 minute before leaving the patient's room.

After disinfecting the boots and removing the outer gloves, go into the changing room.

8. **Remove the boots.**

- Place a towel that has been soaked in 1:100 bleach solution on the floor for health facility staff to stand on when removing boots.
- Use a boot remover to take off the rubber boots. Avoid touching the boots with bare or gloved hands.

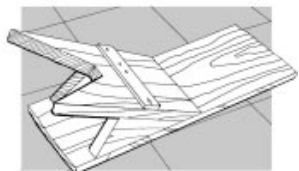


Fig. 43. A boot remover

- Store boots safely until next use. For example, store them in a plastic sack or on a covered shelf.

9. **Remove the inner pair of gloves.**

If gloves will be discarded:

- Remove the first glove with the other gloved hand. Pull the edge of the first glove back over the gloved hand so that the glove turns inside out as it is being pulled back.
- Place the inside-out glove in the palm of the gloved hand.
- Reach inside the glove to a clean area. Pull the glove back over the hand so that only the inside of the glove is exposed and covers the glove held in the palm. Discard the gloves in a bucket for disposal of contaminated waste.
- Wash ungloved hands with soap and water.

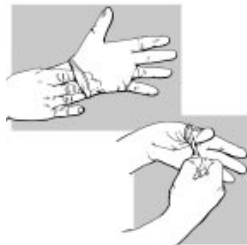


Fig. 44. Removing the inner gloves



If gloves will be reused:

- Reach inside the first glove to a clean area. Pull the glove back over the hand so the glove turns inside out as it is pulled back. Place the glove in a bucket of soapy water.
- Remove the second glove in the same way.
- Place the second glove in soapy water.
- Immediately wash ungloved hands with soap and water.

10. **Remove inner layer of clothes** and dress in street clothes.

- If the inner layer is not soiled, store the clothing for reuse.
- If soiled, place the clothing in the laundry container.
- If personal shower facilities are available, shower before dressing in street clothes.
- If skin has contact with soiled material, follow guidelines for accidental exposure in Section 5.13.
- Put on street clothes.

11. **Wash hands with soap and clean water** before leaving the changing room.



Section 5

---

**Section 5**

**Disinfect Reusable Supplies  
and Equipment**



This section describes how to:

- Prepare disinfectants.
- Clean and disinfect used gloves before reuse.
- Clean and disinfect used medical instruments and supplies.
- Disinfect patient waste and spills of infectious body fluids.
- Disinfect and discard infectious waste and non-reusable supplies.
- Clean and disinfect protective clothing, boots, and patients' sheets.
- Give first aid for accidental exposures.

**To prepare the bleach solutions**

1. Gather the necessary supplies:
  - 1 container that holds 10 measures (for example, 10 litres) to make the base 1:10 bleach solution
  - 1 large or several smaller containers (1 for each station) with covers or lids to hold the 1:100 bleach solutions. These containers should be a different colour than the container holding the 1:10 bleach solution, or they should be clearly labelled "1:100."
  - Chlorine bleach (for example, 1 litre of Javel)
  - Clean water
  - A measuring cup or other container (for example, a bottle that holds 1 litre).

2. To prepare the containers for mixing the bleach solutions, determine where to mark the measurements for "9 parts" and "1 part" on each container.

- Pour 9 measures of water into the container. Mark a line where "9 parts" has filled the container. For example, use a nail to scratch a line on a metal or plastic bucket.
- Add 1 measure of water to the first 9 parts. Using a nail, mark a line at the point where the total volume has filled the container.

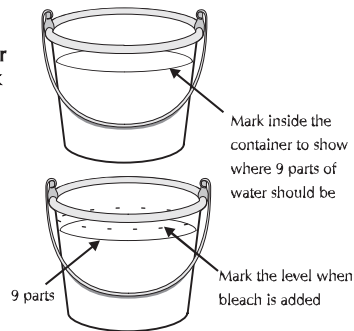


Fig. 45. Marking container for mixing 1:10 bleach solutions

3. To prepare 1:10 bleach solution:
  - Fill the marked container with water up to the mark for 9 parts.
  - Then pour the ordinary household bleach into the container up to the top mark.



4. To prepare 1:100 bleach solution:
  - Measure and pour 9 parts of water into the large container. Then measure and pour 1 part of 1:10 bleach solution into the water to make 1:100 bleach solution.

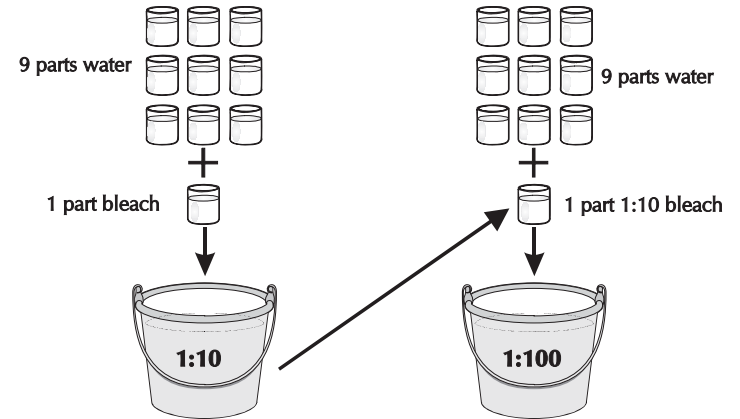


Fig. 46. Preparing bleach solutions

- Distribute a container to each station.
- Fill the container at each station in the isolation area with the 1:100 bleach solution as shown in Section 3.2.
- Place the remaining 1:10 bleach solution in the isolation area to disinfect spills and excreta.
- When there is a large outbreak, make larger quantities of bleach solutions. Prepare the disinfectants daily and distribute them as described in Section 3.
- **Remove the disinfectants everyday or whenever the solutions become cloudy or bloody.** Replace the solution with a fresh supply. Safe disposal of bleach solutions is described in Section 6.1.

### 5.3 Disinfect Gloved Hands between Patients

Health care workers should change outer gloves between each patient.

If there are not enough gloves to allow health care workers to change to a new pair of outer gloves after examining or treating each patient, disinfect gloved hands in 1:100 bleach solution after working with each patient.

#### **To disinfect gloved hands:**

1. Place a bucket of 1:100 bleach solution in the isolation room.
2. If gloved hands are visibly soiled, wash them first in soap and water.
3. Dip the gloved hands into the 1:100 bleach solution for 1 minute.
4. Dry the gloved hands with a one-use (or paper) towel, or let the gloved hands air-dry.
5. If a bleach solution is not available, wash gloved hands with soap and water.
6. After several rinses in bleach solution, the gloves may become sticky and will need to be changed.
7. If gloves will be reused, place gloves in a bucket of soapy water. See Section 5.4 for instructions about washing used gloves.

If gloves are not going to be reused, discard them in the container for disposable infectious waste.



### 5.4 Disinfect Used Gloves before Reuse

Reusing gloves is *not* recommended. If it is necessary to reuse gloves because the supply in the health facility is limited, clean and disinfect them. Also check them for holes.

When cleaning staff handle contaminated supplies, make sure they wear the same protective clothing as health care workers. They should wear thick gloves as the second pair of gloves.

#### **To clean and disinfect gloves for reuse:**

1. Take the bucket with soaking gloves to the VHF laundry area. Carefully move the gloves to a bucket with fresh soapy water.
2. Gently rub the gloves to remove visible soiling and cover with water.
3. Soak them overnight.
4. Wearing at least an apron and thick gloves, rinse the gloves in clean water. To check for holes, fill each glove with rinse water. If any water squirts out, there is a hole in the glove. Discard any gloves with holes.
5. Air-dry the remaining gloves.
6. If available, put talcum powder in dry gloves.
7. Return clean gloves to the storage shelf in the entry to the isolation area.



Fig. 49. Checking gloves for holes

### 5.8 Disinfect Spills of Infectious Body Fluids

Place a bucket containing 1:100 bleach solution in the isolation area.

#### To disinfect spills of infectious body fluids:

1. Use a cup or dipper to pour bleach solution on spills. Cover the spill completely with 1:100 bleach solution. If the spill is heavy or dense, cover with 1:10 bleach solution. Take care to prevent drops or splashes of the contaminated body fluid from reaching anyone when pouring bleach solution on the spill.
2. Soak the spill for at least 15 minutes.
3. Remove the disinfected blood or spilled material with a cloth soaked with 1:100 bleach solution.
4. Discard any waste in the container for collecting disposable infectious waste or in the isolated latrine or toilet.
5. Wash area as usual with soap and clean water.



Fig. 50. Disinfecting a spill on the floor



#### To clean the walls or other surfaces:

Surfaces such as tabletops, sinks, walls and floors are not generally involved in disease transmission. However, in a VHF patient's room, if walls are visibly soiled with blood or other body fluids, clean them as follows:<sup>10</sup>



Fig. 51. Disinfecting a spill on the wall

1. Use a sprayer or mop to wash the walls with 1:100 bleach solution. Rinse the mop in a fresh supply of 1:100 bleach solution. (If using a sprayer, apply the spray close to the surface to minimize splashing and aerosols.)
2. Wash the wall as usual with soap and clean water to remove visible soil.
3. Discard any waste in container for collecting infectious waste or in the isolated latrine or toilet.

### 5.9 Disinfect Infectious Waste and Non-Reusable Supplies for Burning

Place a bucket or other container containing 1:100 bleach solution in the patient's room. Use it to collect infectious waste, contaminated items, and non-reusable supplies that will be burned.

How to carry out safe waste disposal is described in Section 6.

10 Favero, MS, and Bond, WW. Sterilization, disinfection, and antisepsis in the hospital. In: Murray PR ed. Manual of Clinical Microbiology. Washington, D.C.: American Society for Microbiology. pp. 183-200, 1991

**Mattresses:**

If a mattress is heavily soiled, remove it from the isolation area to the outdoors and burn it. Make sure health facility staff wear protective clothing and gloves when touching and carrying the soiled mattress.

If mattresses must be reused:

1. Pour 1:10 bleach solution directly on the mattress. Let the solution soak through completely to the other side.
2. Flood the soiled area with soapy water and rinse with clean water.
3. Let the mattress dry in the sun for several days.
4. Turn the mattress often so it dries on both sides.

**5.13 Give First Aid for Accidental Exposures**

**Accidental needlestick injury:** Assume any needlestick injury is a suspected contact for VHF whether or not a break in the skin can be seen. If an accidental needlestick injury occurs, treat the exposure site.

1. Immerse the exposed site in 70% alcohol for 20 to 30 seconds, and wash with soap and clean water.
2. Flush the site in running water for 20 to 30 seconds.
3. If needed, cover with a dressing.
4. Report the incident to a supervisor or the physician-in-charge.

The purpose of notifying the physician-in-charge is:

- To identify what caused the problem
- To take corrective action to solve the problem and prevent accidental transmission
- To provide appropriate care for the possible case of VHF.



Remind the health facility staff that accidents do happen even when every precaution to prevent them has been taken. Reassure health facility staff that reporting the accidental exposure will have no negative consequences. Explain that reporting the accidental exposure is essential for protecting themselves, their families, other health workers and patients.

**Accidental contact with infectious body fluids:** An accidental contact can occur if there is unprotected contact between infectious body fluids and broken skin or the mouth, nose or eye. For example, vomit may run under a glove, a patient might cough blood which runs into the health care worker's eye, or coughed blood may run underneath a health care worker's mask and get into the mouth. Treat any accidental contact as a suspected contact with VHF. As soon as the contact occurs:

1. Flush the area in the most appropriate manner with soap and clean water. If a splash occurs in the eye, flush it with clean water.
2. Leave the isolation area and remove the protective clothing as recommended.
3. Take a shower and put on street clothes.
4. Report the exposure to a supervisor or the physician-in-charge. Complete the necessary forms.

**Follow up accidental exposures:**

1. Monitor the condition of the health facility staff. Take a measured temperature two times per day.
2. If a fever occurs – temperature is 38.5°C (101°F) or higher – the health facility staff should not do patient care activities. Treat as a suspected case of VHF if the health facility staff's signs and symptoms meet the case definition (Please see page 23 and Annex 4).

## Section 6 Dispose of Waste Safely

Direct, unprotected contact during disposal of infectious waste can result in accidental transmission of VHF. For this reason, all contaminated waste produced in the care of the VHF patient must be disposed of safely. All non-reusable items should be destroyed so they cannot be used again. Burning should be carried out at least daily.

### 6.1 What Needs Disposal

When VHF is suspected, disinfect and dispose of:

- Infectious blood and other body fluids such as urine, faeces, and vomitus
- Disposable needles and syringes and disposable or non-reusable protective clothing
- Treatment materials and dressings
- Non-reusable gloves
- Laboratory supplies and biological samples
- Used disinfectants.

**Recommended Disposal Methods:** Liquid waste, including patient excreta, can be disposed of in an isolated latrine or toilet set aside for VHF cases. Burning is the recommended method for disposal of other VHF-contaminated waste. A safe and inexpensive disposal system can be made by using an incinerator or a pit for burning.

- A latrine or toilet that joins the patient's isolation room can be used to receive the disinfected bedpan contents from the VHF patient. The latrine or toilet should be isolated. Access should be restricted to health facility staff trained to work in the VHF isolation area. Isolating the patient area is described in Section 3.5.



## Section 6

- Incinerators are containers with holes for ventilation to allow air to enter and exit the container. This allows the fire to reach temperatures high enough to completely destroy all biological materials. Use flammable fuel (such as diesel fuel) to speed the burning process and keep the temperatures high.

Incineration is recommended for disposal of:

- Needles and syringes
- Used treatment materials and dressings
- Non-reusable protective clothing
- Laboratory supplies.

- When an incinerator is not available, burn waste in a pit. Use fuel to accelerate the burning and ensure that all waste is completely destroyed.

Use a pit to dispose of:

- Disinfected body fluids such as urine, faeces, and vomitus when no designated latrine or toilet is available.
- Used disinfectants. If it is not possible to dispose of used disinfectants in a latrine or toilet, burn the used disinfectant together with flammable items (disposable gowns or masks, for example). Burning with the flammable items will help keep the temperature of the fire hot enough to boil off the liquids.

**Note:** All staff who are likely to handle infectious material should know and use VHF Isolation Precautions. Reinforce with all health facility staff the importance of handling infectious waste safely.

#### 6.4 Select Site for Burning VHF-Contaminated Waste

Select a burning site on the health facility grounds. It should be located away from the normal traffic flow. To help maintain security and prevent unauthorized access, the site should not be in public view or in an area where it will attract a crowd. The ash from the burning is not infectious, and it can be placed in a pit and buried.

#### 6.5 Use Incinerator to Burn VHF-Contaminated Waste

If an incinerator is available on the health facility's grounds, and it can be set aside for VHF-contaminated waste, use diesel fuel during burning to make sure all the waste is completely destroyed.

If no incinerator is available, make one from an empty 220-litre (55-gallon) oil or fuel drum.

1. Gather the following supplies:

- 220-litre (55-gallon) drum
- Chisel or other sharp instrument (an awl, for example) to cut metal
- Hammer
- 0.5 mm or 1.0 mm metal wire
- The piece cut out from the top of the drum or a wire screen or grill about 1 cm thick
- Metal rods or bars 4 cm or 5 cm x 2 cm.



Fig. 54. A 220-litre drum

2. Cut open the drum by removing the top in one piece. Save the top cutaway piece.
3. Hammer the edges of the drum so they are not sharp.
4. Cut three half-moon openings just below the open end of the drum.



#### Section 6

5. Turn the drum and put the open end on the ground. The bottom of the drum is now the top.
6. Cut four holes on the sides of the drum. These holes are for threading the two metal rods through the drum so that they form an X or cross inside the drum. The crossed rods will support a platform used for holding the infectious material to be burned.

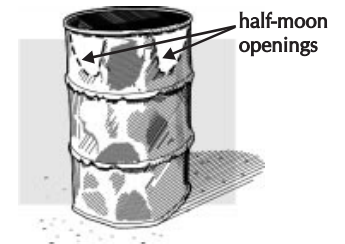


Fig. 55. Turn the drum and put the open end on the ground

To cut the holes for the rods: Just above the half moon openings (about one-third of the height of the drum), cut a hole the same size as the diameter of the metal rod. Directly across from the hole, on the other side of the drum, cut a second hole so that a rod can be threaded through the two holes. Repeat the steps and make two more holes on opposite sides of the drum. Thread each rod through the holes to make an X or cross.

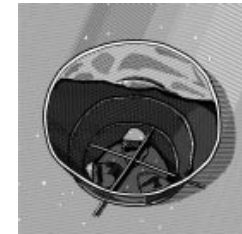


Fig. 56. Place the rods across the drum

7. Use the top piece of the drum that was cut away in step 2 to make the platform. It will rest on the crossed rods and hold the infectious material to be burned. The platform also lets air come in from the bottom of the drum so that the temperatures at the bottom are high enough to completely burn the material.  
  
To make the platform: Punch holes in the cutaway top piece of the drum. Make enough holes so it looks like a sieve. Save the platform to use in Step 10.
8. Pierce a series of holes (about 0.5 cm in diameter) on the sides of the drum and above the crossed rods to improve the draw of the fire.

### **6.7 Take Steps to Ensure Security of Burning Site**

Maintain the security of the burning site to limit access to contaminated items. This is important since children could be tempted to pick up the interesting waste materials and use them for toys. Dogs, cats, and other animals may carry items beyond the health facility boundaries.

Tie a rope around the disposal area. Hang warning signs from the rope that tell people this is a dangerous area. Also station a guard to prevent unauthorized access to the disposal area.

Never leave unburned waste in the incinerator or the pit.



## Section 7 Use Safe Burial Practices

There is risk of transmission in the health facility when a VHF patient dies because the bodies and body fluids of deceased VHF patients remain contagious for several days after death. Family and community members are also at risk if burial practices involve touching and washing the body.

### 7.1 Prepare the Body Safely

Burial should take place as soon as possible after the body is prepared in the health facility. Health facility staff should:

- Prepare the body safely.
- Be aware of the family's cultural practices and religious beliefs. Help the family understand why some practices cannot be done because they place the family or others at risk for exposure.
- Counsel the family about why special steps need to be taken to protect the family and community from illness. If the body is prepared without giving information and support to the family and the community, they may not want to bring other family members to the health facility in the future. They may think that if the patient dies, the body will not be returned to them.
- Identify a family member who has influence with the rest of the family and who can make sure family members avoid dangerous practices such as washing or touching the body.

To prepare the body in the health facility:

1. Wear protective clothing as recommended for staff in the patient isolation area. Use thick rubber gloves as the second pair (or outer layer) of gloves.
2. Spray the body and the area around it with 1:10 bleach solution.
3. Place the body in a "body bag" (mortuary sack) and close it securely. Spray the body bag with 1:10 bleach solution.



## Section 7

4. If body bags are not available, wrap the body in two thickness of cotton cloth and soak with 1:10 bleach solution. Then wrap the body in plastic sheeting. Seal the wrapping with plastic tape. Spray the body bag as in Step 3. Place the body in a coffin if one is available.
5. Transport the body to the burial site as soon as possible. Assign a health officer or health facility staff person to accompany the body to ensure that the safety precautions remain secure during the journey.

### 7.2 Transport the Body Safely

VHF Isolation Precautions should remain in force when the body is being transported to the burial site.

1. Plan to take the shortest route possible for security purposes and to limit any possibility of disease transmission through accidental contact.
2. Any health facility staff who must touch or carry the body during transport should wear the same protective clothing as is worn in the isolation area. **Note: The driver does not need to wear protective clothing if there is no contact with the body.**
3. Take a closed container or sprayer with 1:10 bleach solution in the event of any accidental contact with the body or infectious body fluids. Also use it to clean up spills in the transport vehicle.

### 7.3 Prepare Burial Site

1. The grave should be at least 2 meters deep.
2. Explain to the family that viewing the body is not possible. Help them to understand the reason for limiting the burial ceremony to family only.