

# Management of Solid Waste Potentially Contaminated with the Ebola Virus

For Waste Workers and Cleaners  
December 2014



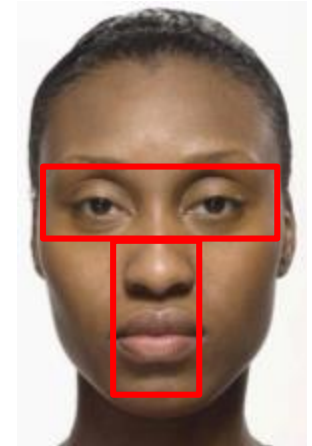
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**Prof Dr Babacar NDOYE**

- 1. How you can get Ebola**
- 2. Segregation**
- 3. Collection**
- 4. Transport and Storage**
- 5. Treatment**
- 6. Disposal**
- 7. Protocols**
- 8. Cleaning and Disinfection**
- 9. Hand Hygiene**
- 10. Personal Protection Equipment**
  - PPE for waste workers**
  - Key practices**
  - PPE: gloves**
  - Donning PPE**
  - Removing PPE**

## ❖ How you can get Ebola

- Through eyes, nose, mouth



- Wounds or cuts in the skin even if not visible



❖ Direct contact with fluids from live or dead infected patients



❖ Indirect

- From contaminated surfaces and devices such as needles, gloves, and healthcare waste with fluids
- Hands (with and without gloves) can transfer the virus into the eyes, nose, mouth or skin cut
  - Hand hygiene is important!
  - Eye goggles and face masks are also important!

## ❖ Who is at risk from Ebola-contaminated waste?

- Medical and Laboratory Staff
- Waste Handlers
- Cleaning Staff
- Ambulance drivers, health aides helping sick patients
- Individuals handling Ebola-contaminated waste in communities



# Parts of a Medical Waste Management System

Waste Segregation  
Collection and Handling  
Transport  
Storage  
Treatment  
Final Disposal

## FOR NON-EBOLA FACILITIES

❖ Segregation into at least **three** categories:

- Sharps waste



Puncture-resistant containers

- Non-sharp infectious waste

Color-coded bags  
 $\geq 75$  microns or double bags



- Regular (non-infectious) waste



GENERAL WASTE

- ❖ **All waste** in red zone should be treated as potentially infectious waste
- ❖ Segregation into two categories:

- **Sharps waste**



Puncture-resistant containers

- **Non-sharp infectious waste**

Color-coded bags  
 $\geq 75$  microns or double bags

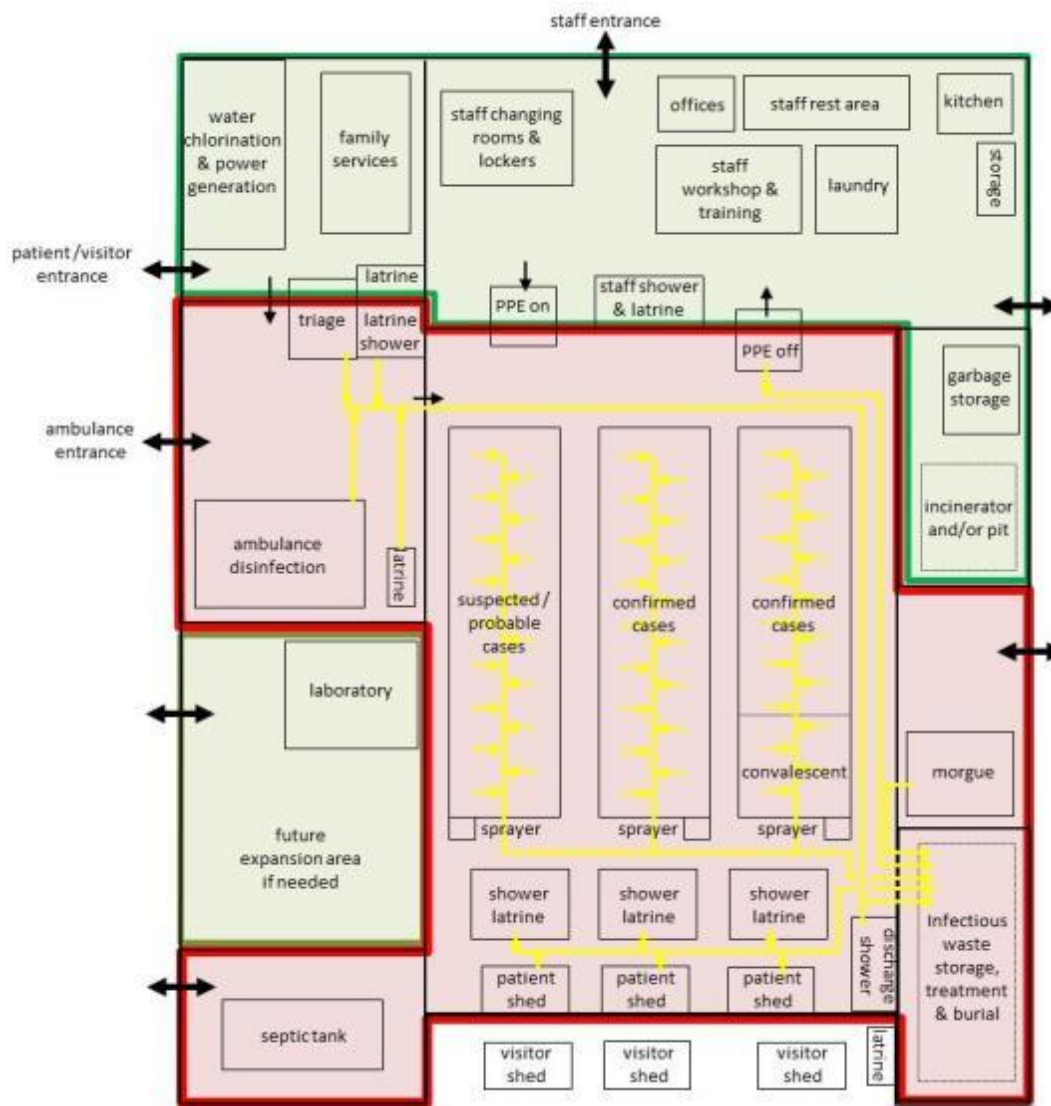




- ❖ Sharps waste management is crucial
  - The risk of Ebola infection from sharps injuries is virtually 100%.



# ❖ Follow the collection plan specifying the collection times and route



- ❖ Waste bags should be collected when 3/4<sup>th</sup> full or at least daily
- ❖ Sharps containers should be collected when 3/4<sup>th</sup> full
- ❖ Bag closure for Ebola-contaminated waste – goose-neck method



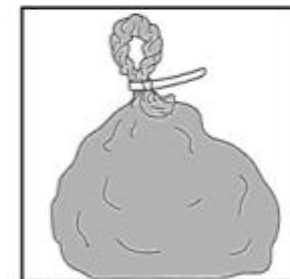
Seal bag when filled to the warning line.

Twist firmly then double over.

Hold the twist firmly.



Pass the seal over the neck of the bag.



Tighten the seal manually to create an effective seal.

- ❖ After removing the waste bag, place the same size bag in the bin or bag holder
- ❖ If the bin or bag holder has visible blood or body fluids:
  - Bring the bin outside of the ward
  - Wash the bin with soap and warm water
  - Wipe the bin with 0.5% chlorine disinfectant and wait 3 minutes
  - Return the bin to the ward

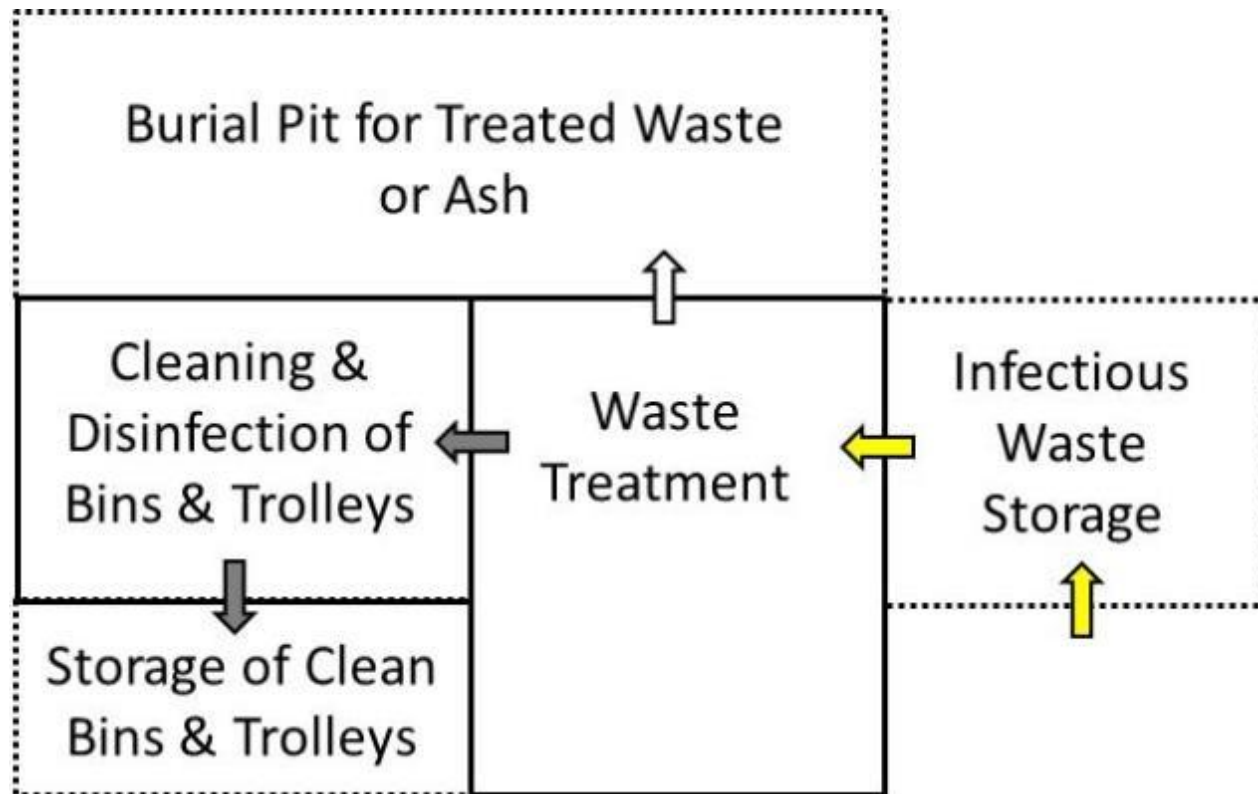
- ❖ Do not carry waste by hand
- ❖ Use a covered trolley, wheeled bin, or closed cart to move waste
- ❖ A covered wheelbarrow or cart may be used
- ❖ Wash with soap and warm water after each use, then wipe handles and inner and outer surfaces of the trolley, bin or cart with 0.5% chlorine solution



- ❖ Ebola-contaminated waste should be treated within 24 hours
- ❖ General requirements for storage of waste
  - Impermeable hard floor with good drainage
  - Disinfectant nearby for cleaning purposes
  - **Inaccessible to animals, insects and birds**
  - Protected from rain
  - Sign with biohazard symbol
  - Prevent access to unauthorized people



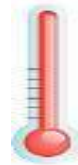
## ❖ Generic design of a storage and treatment area



## ❖ Inactivation of Ebola

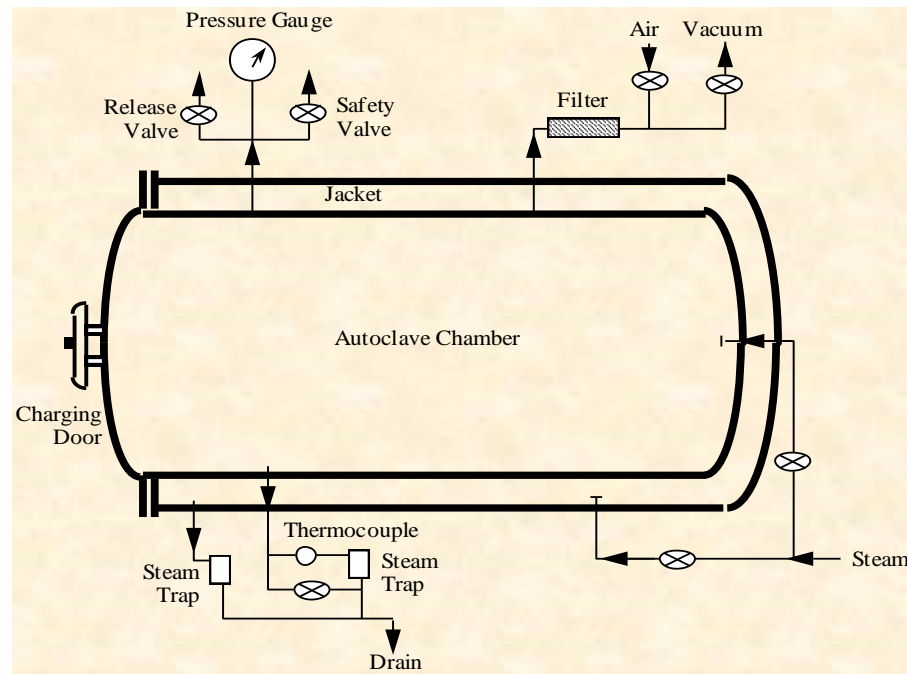
### ◦ Heat:

- Ebola is relatively fragile
- Ebola is killed by heat and boiling
- **Autoclave will destroy Ebola rapidly**





## ❖ Examples of waste treatment autoclave and shredder



[www.medi-clave.co.za](http://www.medi-clave.co.za)



Place waste inside stainless steel barrel and close the lid



When barrel is full, take to autoclave



Slide barrel into autoclave



Close sliding door



Start heating, multi-vacuum and sterilization cycles



When finished, open door and remove sterilized barrel



Unlock & rotate barrel to dump treated waste at the bottom



Barrel and trolley are ready to pick up more waste

1

2

3

4

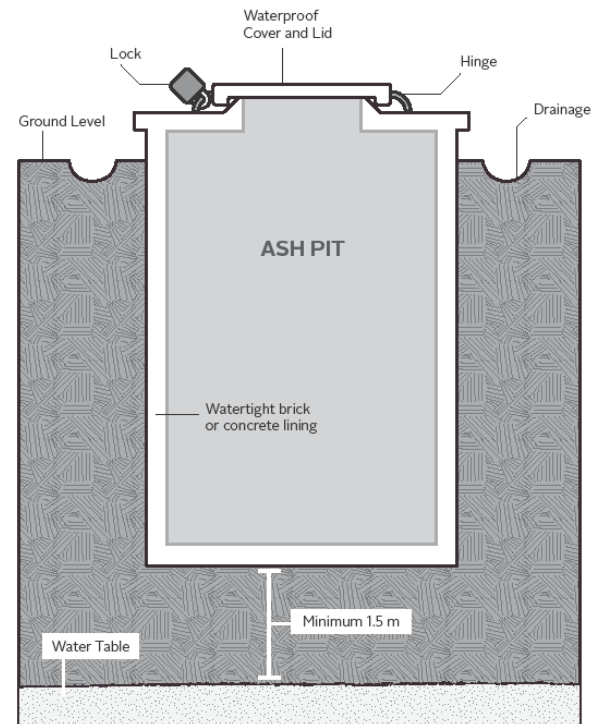
8

7

6

5

- ❖ Bury treated waste in a sanitary landfill or bury inside or just outside the Ebola Treatment Unit
- ❖ Minimum depth between the floor of the burial site to the water table: 1.5 meters
- ❖ Keep the pit closed during filling
- ❖ After dumping each load, cover with 10 cm of soil



Refer to the text for more information about sizing.

- ❖ A protocol is a set of procedures that must be followed for different practices
- ❖ Each healthcare facility or ETU should have their own written protocols
- ❖ It is critical for waste workers and cleaners to follow the protocols

- ❖ Decontamination procedures (follow the written protocol)
  - Soak in a disinfectant (e.g., 0.5% chlorine)
  - Wash with warm water and detergent to remove dirt, dried blood, other body fluids, etc. on the surfaces
  - Disinfect with a disinfectant using the correct concentration and correct time
    - Disinfection is only effective if washing with detergent is done first
  - Rinse and dry

## ◦ Disinfectants that kill Ebola:

- 60-90% alcohol
- 0.5% chlorine



- ❖ How to prepare 0.5% chlorine from bleach
  - If you have 5.5% bleach:  
Mix 1 cup of bleach to 10 cups of water  
The result is a **1:10 mixture = 0.5% chlorine**
  
- ❖ How to prepare 0.05% chlorine from bleach
  - If you have 5.5% bleach:  
Mix 1 cup of bleach to 100 cups of water  
The result is a **1:100 mixture = 0.05% chlorine**

## ❖ Issue to consider for chlorine disinfection

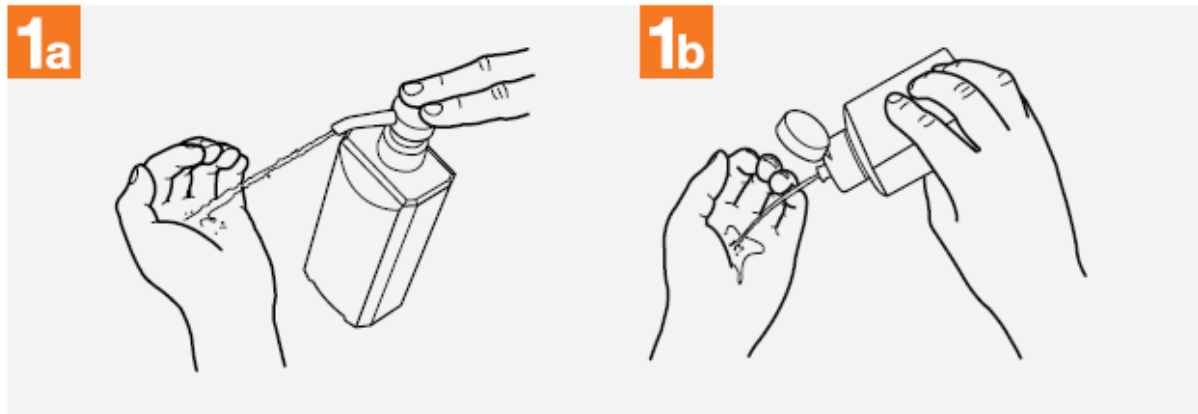
- Chlorine solutions are not effective with a lot of body fluid – therefore it is important to clean with detergent (soap and water) before disinfection
- Chlorine solution degrades with time, exposure to sunlight, and elevated temperatures
- Wipe instead of spraying where possible to minimize occupational exposures
- Be sure to use the correct concentrations:
  - 0.05% chlorine for hand hygiene as an interim measure if alcohol rub is not available; also used for linen
  - 0.5% chlorine for surfaces and equipment



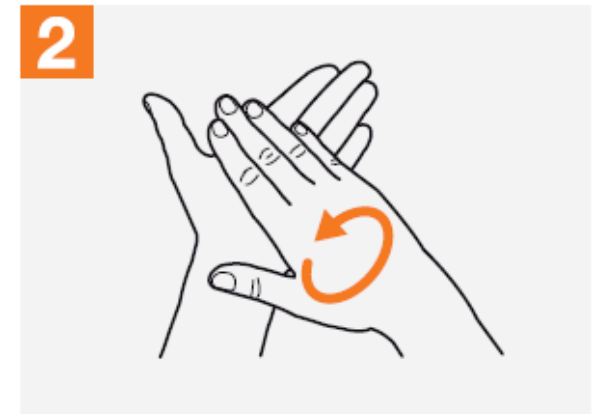
- **Alcohol-based rub is the preferred method**
- **Health facilities should make alcohol-based rubs available as much as possible**

## RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

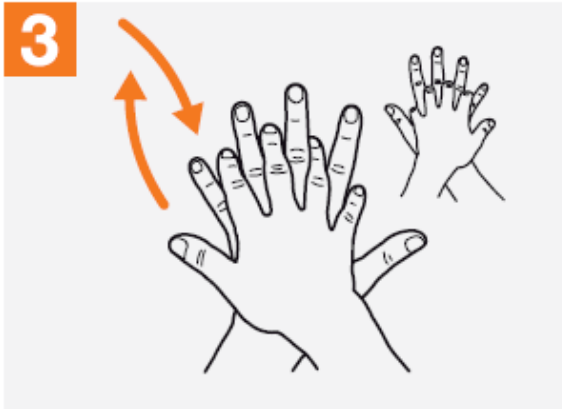
 **Duration of the entire procedure: 20-30 seconds**



**1a** Apply a palmful of the product in a cupped hand, covering all surfaces;



**2** Rub hands palm to palm;



**3** Right palm over left dorsum with interlaced fingers and vice versa;



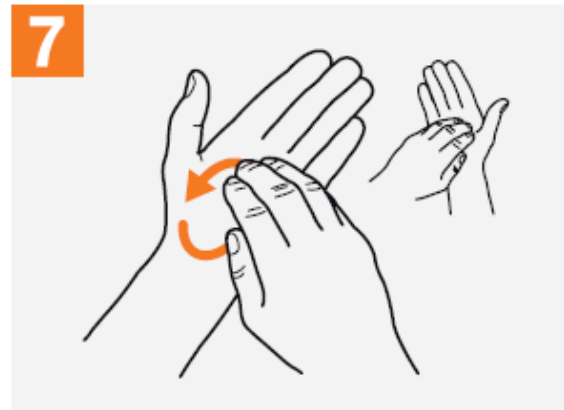
**4** Palm to palm with fingers interlaced;



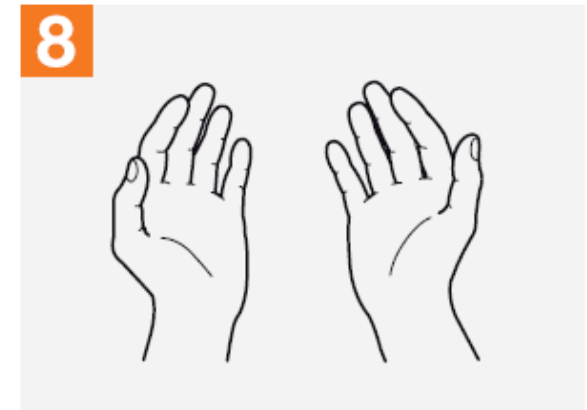
**5** Backs of fingers to opposing palms with fingers interlocked;



**6** Rotational rubbing of left thumb clasped in right palm and vice versa;



**7** Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;

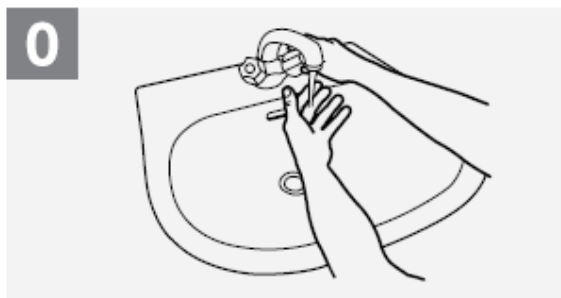


**8** Once dry, your hands are safe.

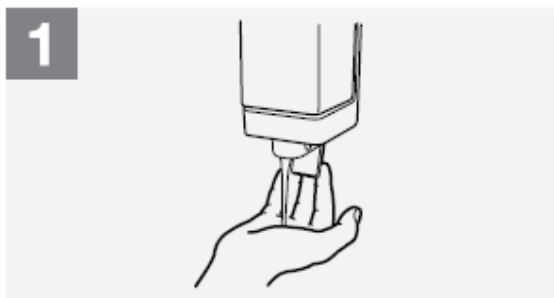
## Recommendation: Use alcohol-based hand rub whenever possible

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

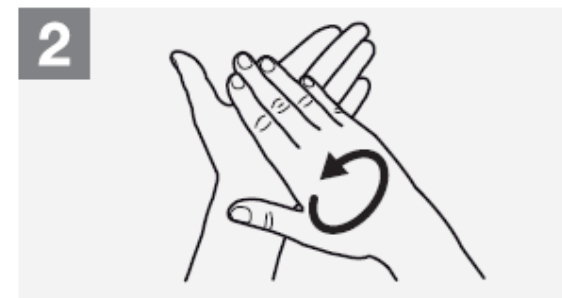
 Duration of the entire procedure: 40-60 seconds



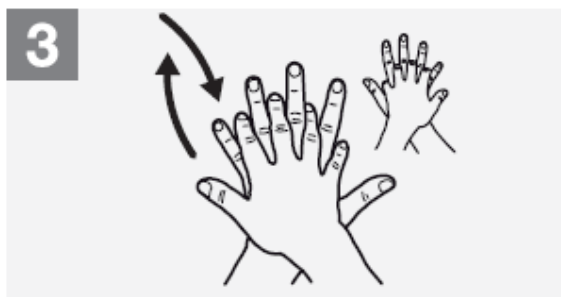
Wet hands with water;



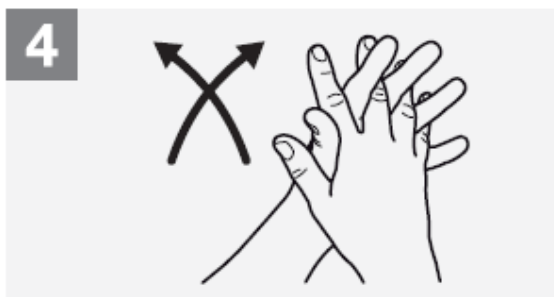
Apply enough soap to cover all hand surfaces;



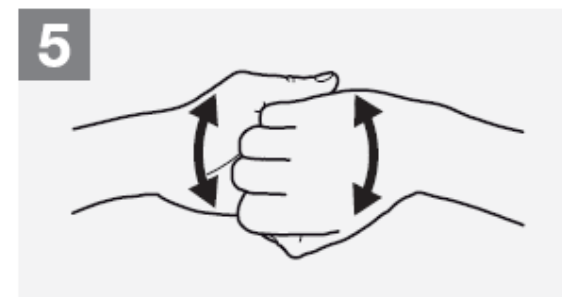
Rub hands palm to palm;



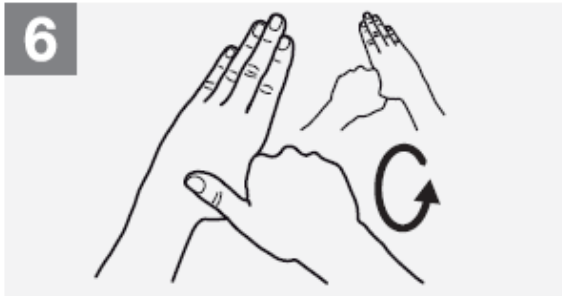
Right palm over left dorsum with interlaced fingers and vice versa;



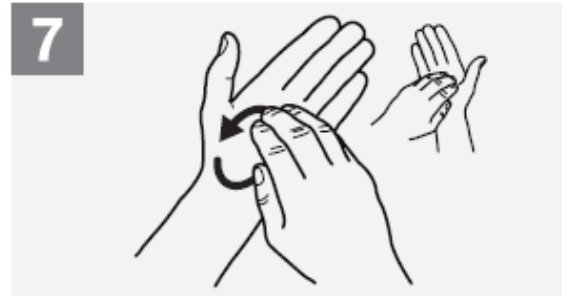
Palm to palm with fingers interlaced;



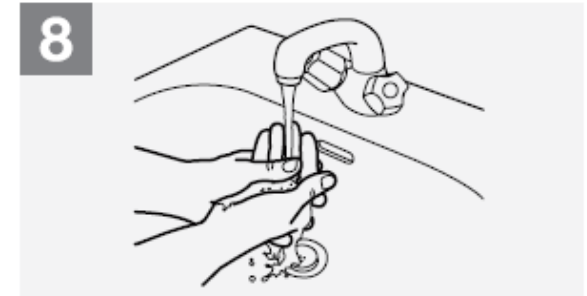
Backs of fingers to opposing palms with fingers interlocked;



**6** Rotational rubbing of left thumb clasped in right palm and vice versa;



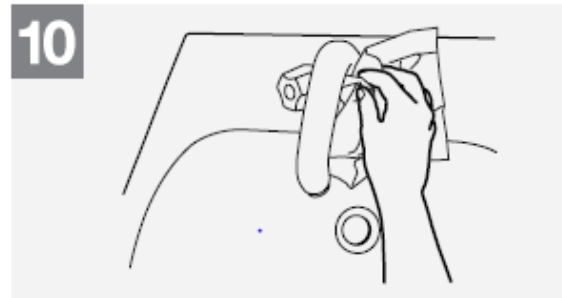
**7** Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



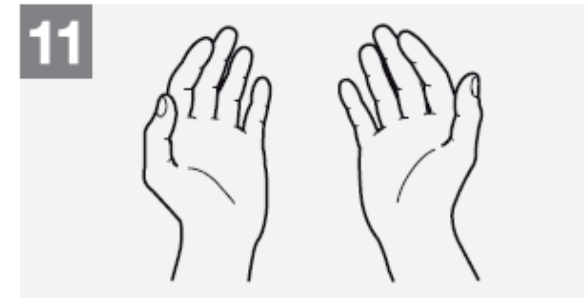
**8** Rinse hands with water;



**9** Dry hands thoroughly with a single use towel;



**10** Use towel to turn off faucet;



**11** Your hands are now safe.

- ❖ **Alcohol-based hand rub** is more effective
- ❖ When alcohol-based hand rub is not available during this interim period, it is acceptable to use **0.05% chlorine** but the duration of the procedure should be **40 to 60 seconds**.

❖ When should the waste worker conduct hand hygiene?

1. Before donning of PPE
2. After any exposure to body fluids of the patients
3. After the end of a waste collection route and storage
4. After the placement of waste bags in the treatment system
5. Before, during and after removal of PPE

- ❖ Recommendation for waste workers inside high risk zone
  - Full PPE with no skin exposure
  - Shoe cover or boot, inner gloves, coverall or gown (Tyvek, Tychem, etc.), water resistant apron, water resistant face mask and goggles or face shield, hood, outer heavy duty gloves
- ❖ Recommendation for waste workers outside the high risk zone, in low risk zones or regular healthcare facilities
  - Inner gloves + outer heavy duty gloves
  - Water resistant face mask and goggles (preferable to face shield)
  - Gown or coverall
  - Water resistant apron
  - Shoe cover or boot

- ❖ All PPE after use should be considered as infectious
- ❖ Disposable PPE: Dispose in the infectious waste bags
- ❖ Reusable PPE: Wash and disinfect
  - Soak in decontamination solution for the specified time
  - Wash with soap and water
  - Disinfect
  - Allow to dry



## IMPORTANT:

- ❖ Procedures for the removal of PPE must be followed carefully
- ❖ Removal of PPE must include a trained observer to ensure proper procedures
- ❖ Removal of PPE must be done in designated area

## ❖ Key Practices

- Use of PPE + no skin exposure for waste workers who enter high risk zones
- Repeated training
- Pairing of waste workers
- Use of puncture-resistant containers for sharps
- All waste in high risk zones treated as potentially infectious waste
- Proper segregation, collection, transport, storage, treatment and disposal

## PROCEDURES FOR PUTTING ON AND REMOVING FULL SET OF PPE INCLUDING COVERALL

### PROCEDURE FOR PUTTING ON PPE

1. Remove all personal items (e.g., jewelry, watches, cell phones, pens)
2. Put on scrub suit and rubber boots<sup>1</sup> in the changing room
3. Move to the clean area at the entrance of the isolation unit
4. By visual inspection, ensure that all sizes of the PPE set are correct and the quality is good
5. Always remove PPE under the guidance and supervision of a trained observer (colleague)
6. Perform hand hygiene
7. Put on gloves (examination, nitrile gloves)



OR,  
IF BOOTS  
UNAVAILABLE



8. Put on coverall<sup>2,3</sup>
9. Put on a fluid-resistant medical/surgical mask with a structured design
10. Put on goggles or face shield



or



or



11. Put on head and neck covering:  
Bonnet (preferable with face shield) or hood<sup>4</sup>
12. Put on a disposable waterproof apron (if not available, use heavy duty, reusable waterproof apron)
13. Put on second pair of (preferably long cuff) gloves over the cuff



If outer gloves are damaged:

- I. Conduct hand hygiene with the damaged glove
- II. Remove damaged glove safely
- III. Conduct hand hygiene with the inner gloves
- IV. Put on new outer glove



## PROCEDURE FOR REMOVING PPE

1. Always perform the procedure of removing PPE under the guidance and supervision of a trained observer (colleague).
2. If apron is visibly soiled with blood or bodily fluids, perform hand hygiene on gloved hands and then clean apron with a disinfectant (e.g., chlorine solution or alcohol) using a wipe.
3. Perform hand hygiene on gloved hands

**Work  
with  
Trained  
Observer**

Hand hygiene  
on gloves



Disinfect visibly  
soiled aprons



Hand hygiene  
on gloves





4. Remove apron taking care to avoid contaminating your hands by peeling it off from inside to outside and dispose of safely or decontaminate (if heavy duty, reusable waterproof apron)
5. Perform hand hygiene on gloved hands
6. Remove outer pair of gloves and dispose of safely
7. Perform hand hygiene on gloved hands

Remove apron



Hand hygiene on gloves



Remove outer gloves



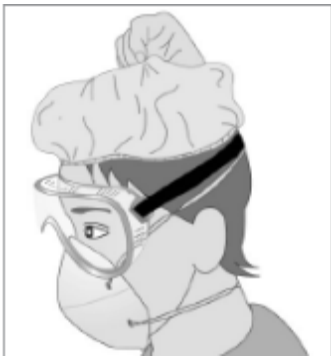
Hand hygiene on gloves





8. Remove head and neck covering taking care to avoid contaminating your face, and dispose of it safely
9. Remove coverall.  
Tilt head back to reach zipper, unzip completely and then remove coverall from top to bottom. After shoulder and arms removed, roll down remaining suit all the way to boot heels from inside. Use one boot to pull off coverall from other boot and vice versa. Step away from coverall so it can be discarded safely.
10. Perform hand hygiene on gloved hands

Remove head-neck cover



Remove coverall from top to bottom



Hand hygiene on gloves



11. Remove eye protection from behind the head and dispose of safely or decontaminate if reusable
12. Perform hand hygiene on gloved hands
13. Remove the mask from behind the head by first untying the bottom string above the head and leaving it hanging in front; and then the top string next from behind head and dispose of safely.
14. Perform hand hygiene on gloved hands

## Remove eye protection



## Hand hygiene on gloves



## Remove face mask



## Hand hygiene on gloves



15. Remove rubber boots (or overshoes if wearing shoes) without touching them and decontaminate appropriately
16. Perform hand hygiene on gloved hands
17. Remove gloves carefully with appropriate technique and dispose of safely
18. Perform hand hygiene

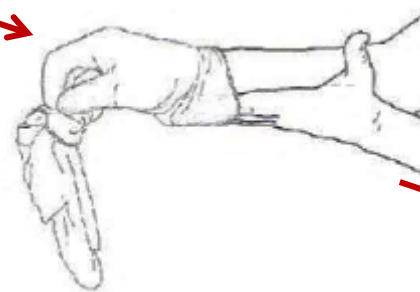
Remove shoe covers or boots



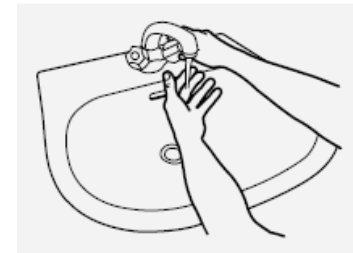
Hand hygiene on gloves



Remove inner gloves carefully



Hand hygiene



- ❖ Report any accidents to the **designated physician** in charge of emergencies because of exposure to blood including needle-stick injuries



# Thank you for your attention



## Questions & Discussion