Centers for Disease Control and Prevention
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Ebola (Ebola Virus Disease)

Guidance for Safe Handling of Human Remains of Ebola Patients in U. S. Hospitals and Mortuaries

Page Summary

Who this is for: Personnel who perform postmortem care in U.S. hospitals and mortuaries.

What this is for: To protect against the postmortem spread of Ebola infection at the site of death, prior to transport, during transport, at the mortuary, and during final disposition of remains

How to use: To guide staff in the safe handling of human remains that may contain Ebola virus by properly using personal protective equipment (PPE) and following decontamination measures at every step of the process. See CDC's Mortuary Guidance Job Aid [1 page] for more information on postmortem preparation in a hospital room.

Summary of Recent Changes

Revisions were made on January 20, 2015, to reflect the following:

- The term "hermetically sealed casket" was replaced with a recommendation to use a metal casket based on common practices in the industry.
- Additional details have been added about equipment needed for workers handling remains and step-by-step guidelines for postmortem preparation and transportation of remains.
- Additional resources have been added on personal protective equipment (PPE), decontamination, infection control, transportation of remains, and burial and cremation practices.

Background

Given the systems currently in place to identify people with Ebola virus disease (EVD), any Ebola-related deaths in the United States would likely occur within a hospital setting. The Ebola virus can be detected throughout the bodies of patients who die of the disease. Ebola can be transmitted in postmortem care settings by laceration and puncture with contaminated instruments used during postmortem care, through direct handling of human remains without recommended PPE, and through splashes of blood or other body fluids such as urine, saliva, feces, or vomit to unprotected mucosa such as eyes, nose, or mouth during postmortem care.

This guidance is based on current knowledge of Ebola. Check CDC's Ebola website frequently for updated information. Guidance for specific occupational groups that may have risks of exposure to Ebola is also available on the National Institute for Occupational Safety and Health (NIOSH) Ebola website and the Occupational Safety and Health Administration (OSHA) Ebola

website .

In addition to federal laws and guidelines that apply to mortuary workers, mortuary practices and workers may also be subject to a variety of state, tribal, territorial, and local regulations. Consult officials or licensed attorneys in your jurisdiction for additional guidance on laws that affect mortuary practices. CDC recommends close collaboration with public health officials in the state or local jurisdiction, as well as with the licensed funeral director who has agreed to accept the bagged remains, to safely implement each step of the process.

Mortuary Guidance Job Aid: Postmortem Preparation in a Hospital Room

Appropriate personal protective equipment (PPE) must be worn while performing these tasks.

1. Turn on thermal sealer.
2. Use digital camera or mobile phone to take a photograph of the deceased's face. Send photo via Wi-Fi, e-mail, or text message to site manager through secure means. Decontaminate or properly discard camera or mobile phone.
3. Position gurney with three pre-opened body bags next to hospital bed.
4. Pull bed sheet(s) up and around body. Do not wash or clean body. Do not remove inserted medical equipment from body.
5. Remove first bag from gurney. Gently roll body wrapped in sheets while sliding first bag under body.
6. Complete transfer of body to first bag. Zip up bag. Minimize air in bag.
7. Disinfect gloved hands using alcohol-based hand rub (ABHR). If any areas of PPE have visible contamination, disinfect with an EPA-registered disinfectant wipe.
8. Disinfect outside of first bag with an EPA-registered hospital disinfectant.
9. Transfer first bag with body to gurney, placing it on top of second bag.
10. Disinfect gloved hands using ABHR.
11. Fold second bag around first bag and heat seal approximately 2" from edges. Remove air from second bag. Heat seal bag again approximately 1" below initial seal and heat seal diagonally across corners. Use scissors to trim off any excess material along seam. Turn off or unplug thermal sealer. Decontaminate thermal sealer before it is removed from hot zone or reused.
12. Disinfect outside of second bag with EPA-registered hospital disinfectant.
13. Disinfect gloved hands using ABHR.
14. Work third bag around second bag. Zip up third bag. Zip tie the zipper shut.
15. Disinfect gloved hands using ABHR.
16. Wheel gurney to decontamination area.
17. Decontaminate surface of body bag with EPA-registered hospital disinfectant.
    - Begin by applying the hospital disinfectant to top of bag and any exposed areas of gurney's cot.
    - Roll bag to one side to decontaminate half of bottom of bag and newly exposed portion of gurney's cot.
    - Repeat with other side of bag and gurney.
    - After visible soil has been removed with EPA-registered disinfectant wipe, reapply EPA-registered hospital disinfectant and allow sufficient contact time, as specified by manufacturer.
18. Disinfect surfaces of gurney from handles to wheels with an EPA-registered hospital disinfectant.
19. Disinfect gloved hands using ABHR.
20. Push gurney so only gurney and decontaminated body bag enter cold zone. Do not enter cold zone. A new set of workers will receive the body.
21. Proceed to PPE removal area.

For more information: Guidance for Safe Handling of Human Remains in U.S. Hospitals and Mortuaries.
http://www.cdc.gov/vhf/ebola/healthcare-us/hospitals/handling-human-remains.html

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

Mortuary Guidance Job Aid: Postmortem Preparation in a Hospital Room [PDF – 1 page]

Key Points

- Ebola virus can be transmitted in postmortem care settings through unsafe handling of remains.
- Ensure that only personnel trained in handling infected human remains and wearing recommended PPE touch or move any remains that contain Ebola virus.
- Do not wash or clean the body.
- Do not embalm the body.
- Do not perform an autopsy. If an autopsy is necessary, consult the state health department and CDC regarding necessary precautions.
- Do not remove any inserted medical equipment from the body such as intravenous (IV) lines, endotracheal or other tubing, or implanted electronic medical devices.
- Cremate the body. If cremation cannot be done because of safety concerns, the body should be buried in a standard metal casket or other comparable burial method.

Definitions for Terms Used in this Guidance

If a hospital has a patient with EVD, hot and cold safety zones should already be established. Thus, hospitals with an Ebola-related death should be familiar with the following terminology.

- **Hot zone** – contaminated area that includes the patient treatment room. Only workers wearing PPE that conforms to CDC's

Guidance on Personal Protective Equipment for Healthcare Workers are allowed to be in this area.

- **Cold zone** – noncontaminated area used for planning and staging. Only workers who have not entered the hot zone or who have properly doffed their PPE after being in the hot zone are permitted in the cold zone. Workers put on clean PPE in the cold zone under the direction of a trained observer.
- **Cremation** – the act of reducing human remains to ash by intense heat.
- **Leakproof bag** – a body bag that is puncture-resistant and sealed in a manner to contain all contents and prevent leakage of fluids during handling, transport, or shipping.

Equipment List

The following equipment should be used in the hot zone:

- Hospital gurney containing three pre-opened cremation-compatible body bags with the following specifications:
  - First bag (top layer on gurney): vinyl or other chlorine-free material, minimum of 6 mil thickness (152 micrometers). To prevent any leakage of fluids, all seams should be factory heat-sealed or welded, not sewn, and the zipper should be on top.
  - Second bag (middle layer on gurney): chlorine-free material impervious to fluids that can be heat-sealed around the body to form a leakproof body bag. This bag should be specifically designed for the containment and transport of infectious bodies. The material should be precut to provide sufficient material to envelop the body and first bag.
  - Third bag (bottom layer on gurney): laminated vinyl or other chlorine-free material, minimum of 18 mil thickness (457 micrometers) with handles that are not sewn on, such as riveted handles reinforced with handle straps that run under the pouch. To prevent any leakage of fluids, all seams should be factory heat-sealed or welded, not sewn, and the zipper should be on top.
- Thermal sealer for sealing the second bag
- PPE recommended for personnel entering the room of a patient with EVD as described in CDC's Guidance on Personal Protective Equipment for Healthcare Workers
- Scissors for cutting excess material from heat-sealed bag
- Camera or mobile phone capable of securely transferring photographs electronically via Wi-Fi, e-mail, or text message
- U.S. Environmental Protection Agency (EPA)-registered hospital disinfectant and wipes with a label-claim for use against a nonenveloped virus
- Alcohol-based hand rub (ABHR)
- Red biohazard bag for medical waste
- Zip tie for locking the third bag shut at the zipper
- Enlarged copy of the Mortuary Guidance Job Aid: Postmortem Preparation in a Hospital Room [PDF – 1 page] and tape for posting these step-by-step guidelines to a wall in the hot zone

The following equipment should be used in the cold zone:

- Hospital gurney or mortuary stretcher
- Adhesive-backed pouch that is applied to the decontaminated body bag
- Single-use (disposable) gloves with extended cuffs and a long-sleeved disposable gown
- Biohazard spill kit, including: recommended PPE, absorbent materials such as paper towels, kitty litter or a solidifier, an EPA-registered hospital disinfectant , and biohazard waste bags
- Infectious substance labels that are applied to the decontaminated body bag. These include the following:

- Black and white “infectious substance” label
- United Nations (UN) 2814 label
- “Do not open” label
- Name and phone number of the hospital administrator

Postmortem Preparation in a Hospital Room

The following points are important considerations for postmortem preparation of human remains containing Ebola virus:

- Ensure that workers handling the body and the trained observer wear the recommended PPE and follow all of the procedures in CDC’s Guidance on Personal Protective Equipment for Healthcare Workers.
- Follow the cleaning and disinfecting recommendations found in CDC’s Guidance for Environmental Infection Control in Hospitals for Ebola Virus. According to this guidance, PPE surfaces, equipment, or patient care area surfaces that become visibly soiled should be decontaminated immediately using a U.S. Environmental Protection Agency (EPA)-registered hospital disinfectant with a label claim for use against a nonenveloped virus.
- Place all waste produced during postmortem preparation and decontamination into red biohazard bags in the hot zone, following the CDC Guidelines for Ebola-Associated Waste Management.

Step-by-step Guidelines for Postmortem Preparation

These step-by-step guidelines are intended to protect workers involved in the postmortem preparation of the body in a hospital setting. The number of workers needed for this process will be determined by the size and weight of the body being prepared and the ability of the workers to lift the body and assist with managing the body bag. For the death of an average size adult, for example, this process should be performed by a minimum of three healthcare workers or other workers properly trained in handling infectious bodies: two to lift the body and one to hold the body bag open.

CDC recommends posting an enlarged copy of the following step-by-step guidelines in the hot zone. The workers should read the guidelines aloud as they perform each step of the procedure.

1. Turn on the thermal sealer to allow it to warm up during the initial preparation of the body. This sealer will be used to seal the second body bag.
2. Use the camera or mobile phone to take a photograph of the decedent’s face for identification purposes. The photograph should be securely transferred via Wi-Fi, e-mail, or text message to the pre-identified site manager. The camera or mobile phone must be decontaminated before being removed from the hot zone or reused. If not decontaminated, the camera or mobile phone should be discarded along with other medical waste.
3. Position the gurney with the three pre-opened body bags next to the hospital bed with the body.
4. Pull the bed sheet(s) that are under the body up and around the front of the body. Do not wash or clean the body. Do not remove any inserted medical equipment such as IV lines or endotracheal or other tubing from the body.
5. Remove the first bag from the gurney. Gently roll the body wrapped in sheets while sliding the first bag under the body.
6. Complete the transfer of the body wrapped in sheets to the first bag, and zip up the bag. Minimize the amount of air trapped in the bag.
7. Disinfect gloved hands using ABHR. If any areas of the PPE have visible contamination, disinfect with an EPA-registered disinfectant wipe.
8. Disinfect the outside of the first bag with an EPA-registered hospital disinfectant applied according to the manufacturer’s recommendations.

9. Transfer the first bag with the body in it to the gurney, placing it on top of the second bag material.
10. Disinfect gloved hands using ABHR.
11. Fold the second bag material around the first bag, and heat-seal approximately 2 inches from the edges while removing as much air from the second bag as possible. Heat-seal the bag a second time approximately 1 inch below the initial seal and then heat-seal diagonally across the corners. Use scissors to trim off any excess material along the seam. Turn off or unplug the thermal sealer to allow it to cool. The thermal sealer must be decontaminated before being removed from the hot zone or reused.
12. Disinfect the outside of the second bag with an EPA-registered hospital disinfectant applied according to the manufacturer's recommendations.
13. Disinfect gloved hands using ABHR.
14. Work the third bag around the second bag, and zip up the third bag. If possible, zip tie the zipper shut.
15. Disinfect gloved hands using ABHR.
16. Wheel the gurney to the decontamination area.
17. Decontaminate the surface of the body bag with an EPA-registered hospital disinfectant applied according to the manufacturer's recommendations. Begin by applying the hospital disinfectant to the top of the bag and any exposed areas of the gurney's cot. Roll the bag to one side to decontaminate half of the bottom of the bag and the newly exposed portion of the gurney's cot. Repeat with the other side of the bag and gurney. When performing decontamination, remove any visible soil on surfaces of the bag or gurney with the EPA-registered disinfectant wipe. After the visible soil has been removed, reapply the hospital disinfectant, and allow sufficient contact time as specified by the manufacturer of the disinfectant.
18. Disinfect the surfaces of the gurney from the handles to the wheels with an EPA-registered hospital disinfectant applied according to the manufacturer's recommendations.
19. Disinfect gloved hands using ABHR.
20. Push the gurney gently so that only the gurney and the decontaminated body bag enter the cold zone. The workers in the hot zone should not enter the cold zone. Another set of workers should receive the body in the cold zone and transport the body for disposition (see Transportation of Human Remains below).
21. Proceed to the PPE removal area and follow the procedures in CDC's Guidance on Personal Protective Equipment for Healthcare Workers. The trained observer should provide instructions on the decontamination and removal of PPE.

At this point, the body bag has been decontaminated, and the potential for further contamination has been eliminated as long as the body is handled carefully. Workers who handle the body bag from this point until the body is cremated or placed into a metal casket should wear single-use (disposable) gloves with extended cuffs and a long-sleeved disposable gown; other PPE is optional. If there is no evidence that the body bag has been compromised by a tear or puncture or liquid coming from the bag, surfaces that contact the body bag should not be considered contaminated, and gloves and disposable gowns used for transport can be disposed of as regular trash.

Transportation of Human Remains

The following points are important considerations when transporting human remains:

- Ensure that anyone handling the body bag wears single-use (disposable) gloves with extended cuffs and a long-sleeved disposable gown.
- Minimize transportation of remains that contain Ebola virus to the extent possible.
- Coordinate all transportation, including local transport for mortuary care or burial, with relevant local and state authorities in advance.

- Coordinate interstate transport with CDC by calling the Emergency Operations Center at (770) 488-7100.
- Avoid transporting noncremated remains via aircraft.
- Human remains transported for interment, cremation, or medical research at a college, hospital, or laboratory are excepted from the U.S. Department of Transportation's Hazardous Materials Regulations (49 C.F.R., Parts 171-180). See §173.134(b)(14).

Step-by-step Guidelines for Transportation of Remains

These step-by-step guidelines are intended to protect workers involved in the transportation of human remains from the cold zone in the hospital to the place of final disposition. This process should be performed by a minimum of two healthcare or mortuary workers. A plan should be in place to transport the body safely from the hospital to the hearse or vehicle used to transport the body. For example, the plan should include a pre-identified route through the hospital that is secure and either free of or with limited patient and personnel traffic. The route should take the body directly to a pre-identified hearse or vehicle to transport the body. A hospital or public health official should be designated in advance to accompany the body from the hospital to the place of final disposition to ensure the safety of all those involved in the process. There should be protocols in place so the designated official accompanying the body knows what to do if the body bag is compromised during transport and how to safely decontaminate it. For example, this official should have a biohazard spill kit with all of the equipment needed for any situation in which the body bag is compromised, including: recommended PPE, absorbent materials such as paper towels, kitty litter or a solidifier, an EPA- registered hospital disinfectant, additional body bags, and biohazard waste bags.

1. A new set of workers in the cold zone will receive the decontaminated body bag.
2. Place patient identification and any other documents that need to accompany the body, including a printout of the photograph taken before the body was bagged, in an adhesive-backed pouch that is attached to the body bag. This will serve the function of toe tags. This should be done after the bagged body enters the cold zone but before the bagged body is transported to the morgue or out of the hospital.
3. Notify the mortuary if the body has any implanted electronic medical devices.
4. Affix the following labels to the body bag before it is placed into the hearse or other vehicle used to transport the body:
   - Black and white "infectious substance" label
   - United Nations (UN) 2814 label
   - "Do not open" label
   - Name and phone number of the hospital administrator
5. Transport the body using a pre-identified hearse or vehicle to a pre-identified place of final disposition using a pre-identified route.

Mortuary Care and Disposition of Remains

The guidance below is primarily intended to protect workers involved with the disposition of human remains either by cremation (recommended) or burial.

- Ensure that anyone handling the body bag wears single-use (disposable) gloves with extended cuffs and a long-sleeved disposable gown.
- Do not open the body bags.
- Do not embalm the body.
- Do not remove any implanted medical devices.
- Cremate the remains. An oversized cremation container may be needed to contain the bagged body for cremation.

Cremated remains are no longer infectious and can be handled and provided to the family using normal procedures.

- Consult your authorized state regulator and EPA regulations governing required cremation temperatures. Cremation and cremation temperatures may be subject to state, local, and EPA regulations.
- Bury the remains in instances where cremation cannot be safely performed. For example, some crematoriums may have concerns about cremating bodies containing implanted electronic medical devices. Some of these medical devices can explode, potentially damaging the retort. Other medical devices can normally be cremated safely. Where damage to the retort is a concern, the body should be buried in a standard metal casket or other comparable burial method in accordance with state and local burial requirements. The casket containing the bagged remains can be handled without PPE.

Resources for More Information

Personal Protective Equipment, Decontamination, and Infection Control

- CDC Guidance on Personal Protective Equipment To Be Used by Healthcare Workers During Management of Patients with Ebola Virus Disease
- OSHA PPE Selection Matrix for Occupational Exposure to Ebola Virus [PDF – 3 pages]
- CDC Guidance: Ebola-Associated Waste Management
- CDC Guidance: Procedures for Safe Handling and Management of Ebola-Associated Waste
- CDC Infection Prevention and Control Recommendations for Hospitalized Patients Under Investigation (PUIs) for Ebola Virus Disease (EVD) in U.S. Hospitals
- CDC Interim Guidance for Environmental Infection Control in Hospitals for Ebola Virus
- CDC (Centers for Disease Control and Prevention) [2004]. Medical examiners, coroners, and biologic terrorism: a guidebook for surveillance and case management. MMWR *11*(53)(RR-8);1–27. [https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5308a1.htm].
- OSHA Fact Sheet: Cleaning and Decontamination of Ebola on Surfaces: Guidance for Workers and Employers in Non-Healthcare/Non-Laboratory Settings [PDF – 4 pages]
- Personal Protective Equipment Training: Donning and Doffing Procedures
- University of Nebraska Medical Center, Healthcare and Emergency Responder Organization Education through Simulation (HEROES): Body Sealer Basics
- U.S. EPA: Disinfectants for Use Against the Ebola Virus
- World Health Organization: Infection Prevention and Control Guidance for Care of Patients in Health-Care Settings, with Focus on Ebola

Transportation of Remains

- CDC: Guidance for Importation of Human Remains into the United States for Interment or Subsequent Cremation
- U.S. Department of Transportation: Guidance for Transporting Ebola Contaminated Items

Mortuary, Burial, and Cremation

- EPA Regulations for Crematories and Pathological Incinerators
- United Kingdom Health and Safety Executive: Controlling the Risks of Infection at Work from Human Remains [PDF – 30 pages]
- Gale CP, Mulley DM [2002]. Pacemaker explosions in crematoria: problems and possible solutions. J R Soc Med 95(7):353–

355. [http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1279940/].

- U.S. Army Center for Health Promotion and Preventive Medicine: Guidelines for Protecting Mortuary Affairs Personnel from Potentially Infectious Materials [PDF – 28 pages]
- Cremation Association of North America [2011]. Recommended Procedures for Handling Dead Human Bodies by an Authorized Cremation Authority. [http://c.ymcdn.com/sites/www.cremationassociation.org/resource/resmgr/industry_practitioners_technical_papers/handling-procedures.pdf [PDF – 5 pages]].

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