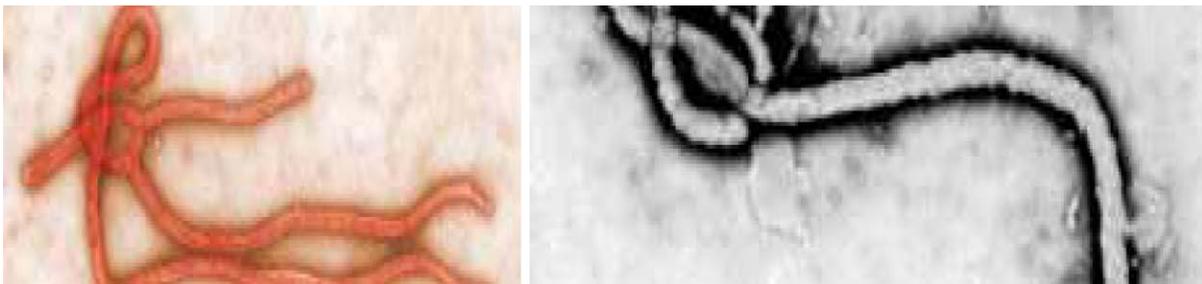


Ebola

Ebola was first discovered in 1976 in the Democratic Republic of the Congo near the Ebola River in a small isolated village of Boende, Equateur. Ebola is also known as Ebola virus disease (EVD) and Ebola hemorrhagic fever (EHF). Ebola is a serious but rare infectious illness that often becomes a fatal viral disease. The Ebola virus has appeared in sporadic outbreaks since 1976.

The outbreaks typically have appeared in remote areas of Central and West Africa, usually near tropical rainforests. The Ebola-Reston virus, a subtype, has also been found in the Philippines. However, this virus from the Philippines only affects animals.



Pictures 1 and 2.

According to the Centers for Disease Control and Prevention, there have been 2,265 reported Ebola cases since 2012 of these 1,531 resulted in death. That means 68% of the people infected with Ebola, die. In 1976 there were two simultaneous outbreaks; one in Nzara, Sudan and the other in Yambuku, Democratic Republic of the Congo.

Table 1: Chronology of previous Ebola virus outbreaks

Year	Country	Ebola Virus Species	Cases	Deaths	Case Fatality
2014 as of 12/14	Guinea, Sierra Leone, Liberia. Countries affected: Nigeria, Spain and U.S. Travel Associated: Senegal. Subject to change	1 st strain Zaire Ebolavirus (EBOV) Emergence of a 2 nd new strain in Guinea	20,000	7,000 +	To be determined
2012	Democratic Republic of Congo	Bundibugyo	57	29	51%
2012	Uganda	Sudan	7	4	57%
2012	Uganda	Sudan	24	17	71%
2011	Uganda	Sudan	1	1	100%
2008	Democratic Republic of Congo	Zaire	264	187	71%
2007	Uganda	Bundibugyo	149	37	25%
2007	Democratic Republic of Congo	Zaire	264	187	71%
2005	Congo	Zaire	12	10	83%
2004	Sudan	Sudan	17	7	41%
2003	Congo	Zaire	35	29	83%
2003	Congo	Zaire	143	128	90%
2001-2002	Congo	Zaire	59	44	75%
2001-2002	Gabon	Zaire	65	54	82%
2000	Uganda	Sudan	425	224	53%
1996	South Africa	Zaire	1	1	100%
1996	Gabon	Zaire	60	45	75%
1996	Gabon	Zaire	31	21	68%
1995	Democratic Republic of Congo	Zaire	315	254	81%
1994	Cote d'Ivoire	Tai Forest	1	0	0%
1994	Gabon	Zaire	52	31	60%
1979	Sudan	Sudan	34	22	65%
1977	Democratic Republic of Congo	Zaire	1	1	100%
1976	Sudan	Sudan	284	151	53%
1976	Democratic Republic of Congo	Bundibugyo	57	29	51%

to that patient and disposed of at the point of use.

Prior to the current outbreak reported in West Africa in March 2014, this region has never been affected by Ebola. It quickly spread from Nzerekore, a remote area of south-eastern Guinea, to urban areas including the capital Conakry. The current outbreak in West Africa is the largest and most complex Ebola outbreak caused by Ebola-Zaire.

There have been more Ebola cases and related deaths in the current outbreak than any other previous outbreaks combined. As of December 2014, the Ebola virus has killed at least 7,500 people. This number includes probable, confirmed and suspected cases.

This number includes:

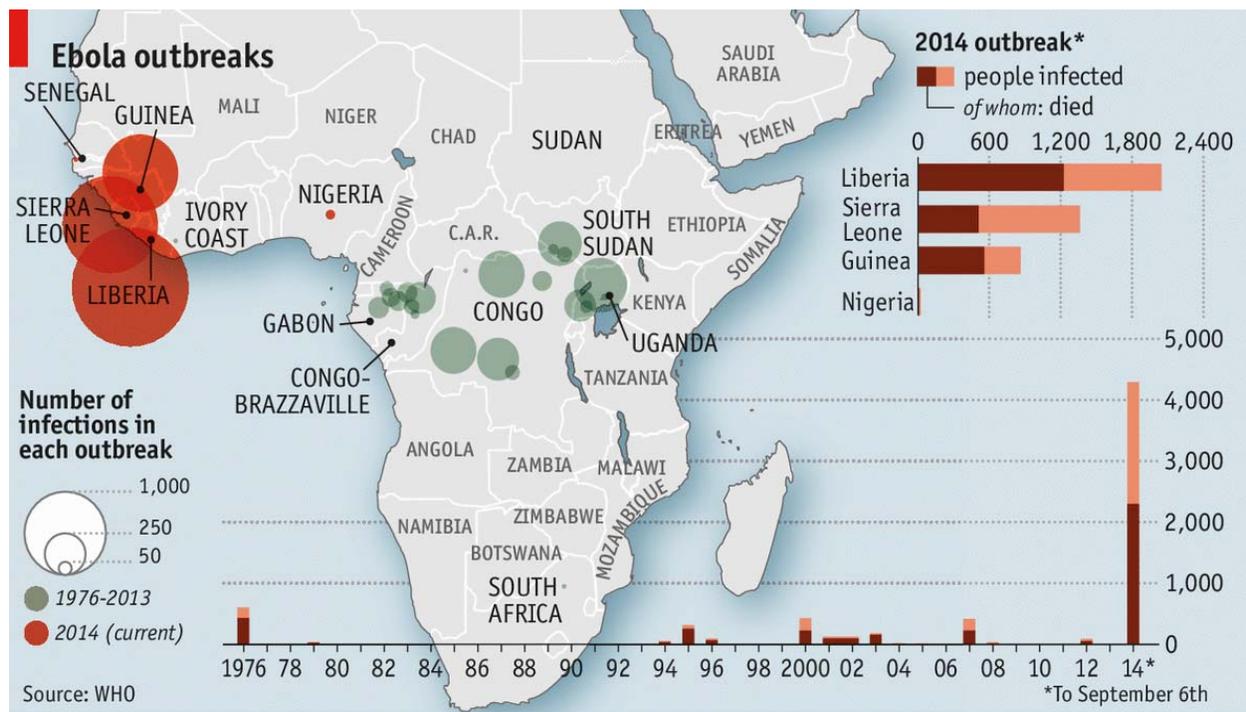
- ☐ 3,413 Liberia
- ☐ 2,732 Sierra Leone
- ☐ 1,697 Guinea
- ☐ 8 Nigeria

Source World Health Organization (WHO)

There have been more Ebola cases and related deaths in the current outbreak than any other previous outbreaks combined. As of December 2014, the Ebola virus has killed at least 7,500 people. This number includes probable, confirmed and suspected cases.

This number includes:

- ☐ 3,413 Liberia
- ☐ 2,732 Sierra Leone
- ☐ 1,697 Guinea
- ☐ 8 Nigeria



Picture: 3

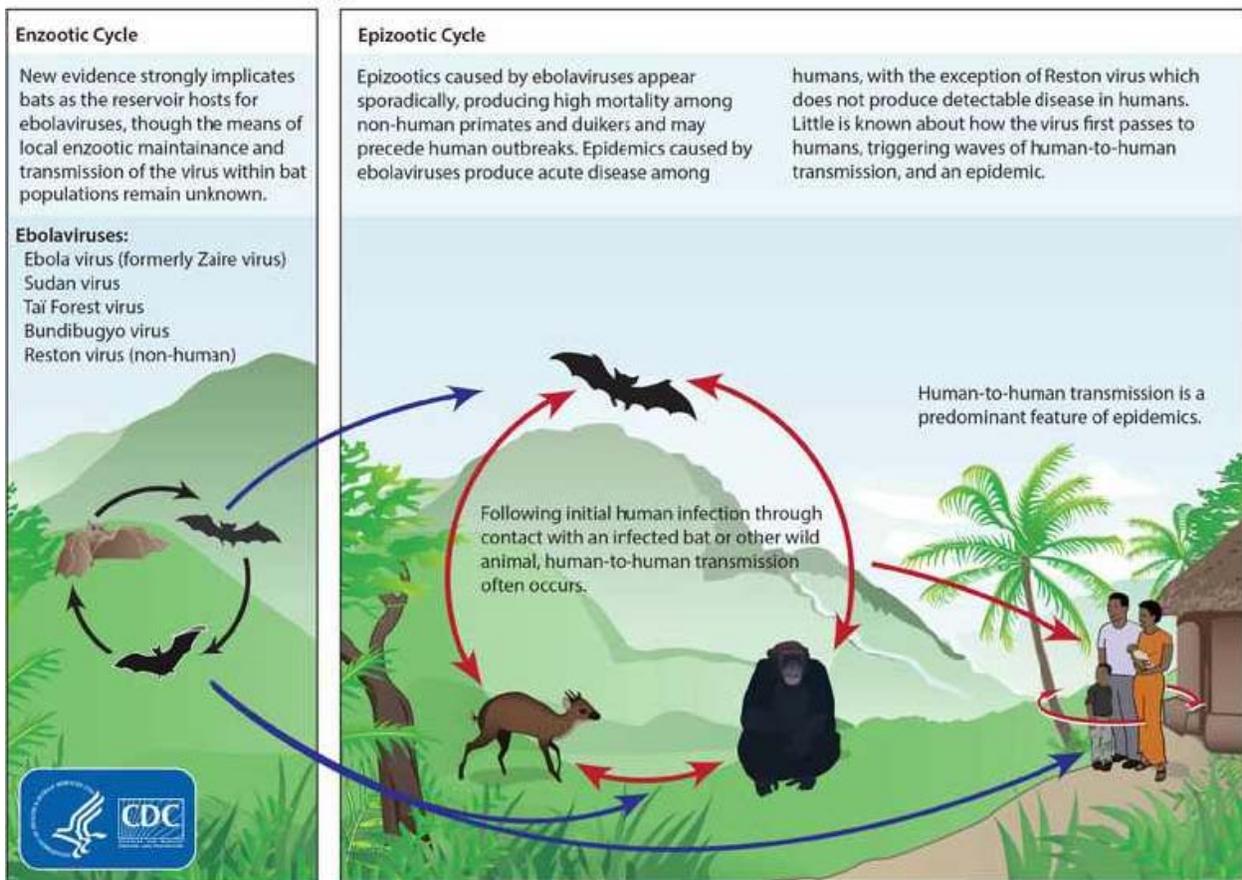
Many have died of the Ebola virus in Guinea, Liberia, Sierra Leone and Nigeria. More than 20,700 people have been infected during this outbreak and the number seems to keep growing. The most severely affected countries, Guinea, Sierra Leone and Liberia have very weak health systems. These regions (or areas) often lack infrastructure and human resources needed to combat Ebola; though these regions (or areas) have also been recovering from long periods of conflicts and instability. Ebola has claimed the lives of dozens of doctors and nurses including Sierra Leone's only virologist and Ebola expert, Sheik Umar Khan.

The United States has two imported cases and two locally acquired cases in health care workers have been reported. During this outbreak five health care workers and one journalist infected with Ebola have been transported to the United States. One of these health care workers from Sierra Leone died on November 17, 2014 in a Nebraska medical center. One confirmed case has been reported in Spain.

There are several different opinions on the family and subtypes of Ebola. Here are the different types mentioned, all from reliable sources. The virus family Filoviridae includes three genera: Cuevavirus, Marburgvirus, and Ebolavirus.

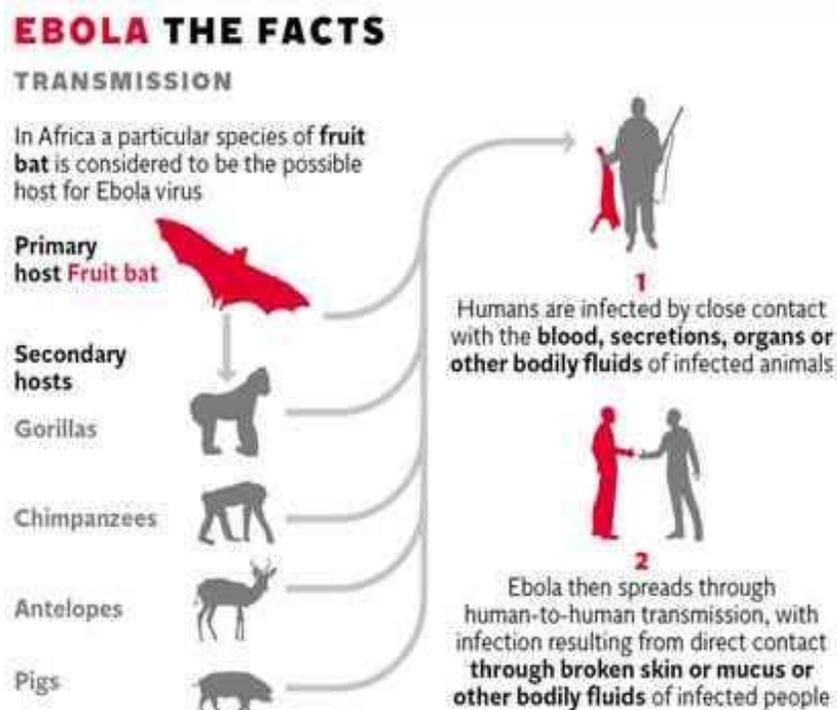
There are five species or subtypes that have been identified: Ebola-Zaire, Ebola-Bundibugyo, Ebola-Sudan, Ebola-Reston, and Tai Forest ebola is mentioned on some sites and Ebola-Ivory coast on others as the fifth subtype. Bundibugyo ebolavirus, Sudan ebolavirus and Zaire ebolavirus have been associated with the largest outbreaks in Africa. The largest and most dangerous outbreak belongs to the Zaire species.

Ebolavirus Ecology



Picture: 4

The Ebola virus may have originated from infected bats, commonly fruit bats, is zoonotic origin. This means it is transmitted to human populations by direct contact with bats as thought in this case. However, the disease can also be spread through close contact with infected Primates (Apes, Monkeys, chimpanzees) pigs and forest antelope. Fruit bats are commonly suspected as an Ebola virus reservoir as previous outbreaks in Africa indicate. Another question is why the adults were not infected before or at the same time as the two-year-old boy who was the first to be infected according to the index case. Another possibility of infection may have occurred from a large colony of free-tailed insectivorous bats that were living in a hollow tree nearby the boy's home. Villagers reported that children often played in and around the tree.



Picture: 5

Initial Ebola infection occurs when there is contact with infected blood, bodily fluids or organs of an infected animal. It is believed that fruit bats are a carrier and may spread the virus without being affected. It then

spreads between humans by direct contact with infected blood, bodily fluids; including urine and semen. It can be spread indirectly through contact with contaminated environments including medical equipment, needles, bedding, clothing and surfaces thought to be through broken skin. It is unclear how long the virus can exist on surfaces; some evidence suggests up to six days. Bleach and Chlorine can kill Ebola.

The funerals of an Ebola victim can put the mourners at risk if any of them have direct contact with the body of the deceased. If a person has died from Ebola, their body will have a very high viral load. Bleeding is a usual symptom of the disease prior to death. Those who handle the body may come in contact with the blood or other bodily fluids are at an increased risk of catching the disease. Religious worship in Africa includes preparation of the bodies for burial and may include washing, touching (hugging) and kissing. The medical charity Medecins Sans Frontieres (MSF) has been trying to educate people of how their treatment of the dead bodies of those infected with Ebola can put themselves at risk, this is a very difficult message to give to grieving families. Due to the risk, deceased bodies infected with Ebola still pose prompt and safe burials are urged. In places where outbreaks have already occurred, there has been a cultural shift to avoid contact with persons who are infected.

The incubation period can last from two days to three weeks, and diagnosis is difficult. There has been a question with the spread of the Ebola virus to other countries if cold weather can affect the incubation period. Health care workers are at risk if they treat patients without taking the correct precautions or having the correct equipment to avoid contact.

People are infected as long as their blood and secretions contain the Ebola virus. In some cases, recovery has taken up to seven weeks. Men can transmit the virus through their semen for up to seven weeks after recovering from Ebola.

Symptoms of Ebola virus disease



Picture: 6

The incubation period from infection of the virus to onset of symptoms is 2 to 21 days. Humans are not infectious until they develop symptoms. The first symptoms are sudden with the rapid onset of:

- ☐ fever (which can be sudden)
- ☐ chills
- ☐ intense weakness
- ☐ fatigue, including joint and muscle soreness
- ☐ muscle pain
- ☐ headache
- ☐ anorexia
- ☐ sore throat

As Ebola first symptoms progress they are followed by:

- ☐ vomiting
- ☐ diarrhea

- ☐ rash (possibly progressing to a bleeding rash)
- ☐ swelling of genitals
- ☐ redness in the eyes
- ☐ symptoms of impaired kidney and liver function
- ☐ In some cases both internal and external bleeding (e.g. oozing from the gums, blood in stools, bleeding from eyes, nose mouth, ears, or rectum). Laboratory findings include low white blood cell and platelet counts, and elevated liver enzymes.

Patients tend to die from dehydration, low blood pressure due to extreme loss of fluids and multiple organ failure.

If a person thinks they are infected, they should keep themselves isolated and seek professional help. Patients have a better chance for survival if they receive early treatment.

How is Ebola Fever diagnosed?

Ebola can be difficult to distinguish from other infectious diseases such as Malaria, Typhoid fever and Meningitis. A medical history is an important part of diagnosis, including travel, work history, and exposure to wildlife. Confirmation that symptoms are caused by Ebola virus infection is done with different lab tests. Ebola fever is diagnosed using blood tests to detect the Ebola virus. A blood test may be recommended if one has recently traveled into an area where the virus is found. Some of these tests are:

- ☐ antibody-capture enzyme-linked immunosorbent assay (ELISA) can be done for real time diagnosis
- ☐ antigen-capture detection tests
- ☐ serum neutralization test
- ☐ reverse transcriptase polymerase chain reaction (RT-PCR), assay can be used for real time diagnosis

☐ electron microscopy, can identify Filovirions in cell culture due to their unique filamentous shapes ☐ virus isolation by cell culture

Samples from patients are an extreme biohazard risk; laboratory testing on non-inactivated samples should be conducted under maximum biological containment conditions.

During an outbreak, virus isolation is often not feasible.

Treatment and Vaccines

No FDA approved vaccine or medicine (e.g., antiviral drug) is available for Ebola. Potential vaccines are being tested; if the trials are successful they would be used to protect healthcare workers first. As of yet, there is no proven treatment available for Ebola. Supportive basic interventions can significantly improve the chances of survival. Interventions are:

- ☐ Providing intravenous fluids (IV) and balancing electrolytes (body salts). Oral fluids, if tolerated, would also be advantageous. Drinks including Electrolytes may help.
- ☐ Maintaining oxygen status and blood pressure.
- ☐ Treating other specific symptoms or infections as they occur.

However, a range of potential treatments including blood products, immune therapies, and drug therapies are currently being evaluated. Two potential experimental vaccines and treatments that have not been fully tested for safety or effectiveness are undergoing human safety testing. The experimental drug ZMAPP has been given to several people who contracted Ebola: Two U.S. aid workers and a Briton have recovered after taking it. However, a Liberian doctor and a Spanish priest have died. The U.S. pharmaceutical company states it has run out of ZMAPP.

Blood products from survivors are also being tried as a potential therapy.

Recovery from Ebola depends on good supportive care and the patient's immune response. People who recover from Ebola infection develop antibodies that last for at least ten years, possibly longer. It is not known if people who recover are immune for life or if they can become infected with a different species of Ebola. Some people who have recovered from Ebola have developed long-term complications, such as joint and vision problems.

Richard Sacra, a Massachusetts doctor who recovered from Ebola, was hospitalized again for a respiratory condition with a cough and pink eye that is felt to be unrelated to Ebola. He was in the hospital for weeks recovering from Ebola. It is not known what factors allow some people to recover while others do not.

Prevention

The World Health Organization (WHO) warns against consuming raw bushmeat and recommends avoiding any contact with infected bats, monkeys or apes. Fruit bats are considered a delicacy in the area of Guinea where the outbreak started. Avoid contact with Ebola patients and their bodily fluids.

Another approach to stopping the spread of Ebola has been taken on by a geoinformatics researcher at Sweden's Royal Institute of Technology. They are mapping fruit bat habitats. Research could take the historical data and use it to predict the course of future epidemics and pandemics, helping to stop future spread of the disease.

Who is at risk?

Anyone in close contact with an Ebola patient is at risk. However, healthcare workers are using protective clothing including full-body suits and goggles, but hundreds of healthcare workers have still died. Health care workers are becoming scared of treating patients and are demanding better protective clothing when exposed to patients. They are also demanding better training and procedures to be put in place.

Health care workers Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Virus Disease in U.S. Hospitals from the CDC:

Standard, contact, and droplet precautions are recommended for management of hospitalized patients with known or suspected Ebola virus disease (EVD) (See Table below). Note that this guidance outlines only those measures that are specific for EVD; additional infection control measures might be warranted if an EVD patient has other conditions or illnesses for which other measures are indicated (e.g., tuberculosis, multi-drug resistant organisms, etc.).

Though these recommendations focus on the hospital setting, the recommendations can be found at these sites for personal protective equipment (PPE)(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>) and environmentalinfectioncontrol(<http://www.cdc.gov/vhf/ebola/hcp/environmental-infection-control-in-hospitals.html>) measures are applicable to any healthcare setting^{*}. In this guidance healthcare personnel (HCP) refers all persons, paid and unpaid, working in healthcare settings who have the potential for exposure to patients and/or to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or aerosols generated during certain medical procedures. HCP include, but are not limited to, physicians, nurses, nursing assistants, therapists, technicians, emergency medical service personnel, dental personnel, pharmacists, laboratory personnel, autopsy personnel, students and trainees, contractual personnel, home healthcare personnel, and persons not directly involved in patient care (e.g., clerical, dietary, house-keeping, laundry, security, maintenance, billing, chaplains, and volunteers) but potentially exposed to infectious agents that can be transmitted to and

from HCP and patients. **This guidance is not intended to apply to persons outside of healthcare settings.**

As information becomes available, these recommendations will be re-evaluated and updated as needed. These recommendations are based upon available information (as of July 30, 2014) and the following considerations:

- ▣ High rate of morbidity and mortality among infected patients
- ▣ Risk of human-to-human transmission
- ▣ Lack of FDA-approved vaccine and therapeutics

For full details of standard, contact, and droplet precautions see [2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Setting.](#)

For information on symptoms of Ebola Virus Disease infection and modes of transmission, see the [CDC Ebola Virus Disease Website](http://www.cdc.gov/vhf/ebola/index.html)(<http://www.cdc.gov/vhf/ebola/index.html>)

Key Components of Standard, Contact, and Droplet Precautions Recommended for Prevention of EVD Transmission in U.S. Hospitals

Component Recommendation Comments

▣ Single patient room (containing a private Patient bathroom) with the door closed to ensure appropriate and consistent Placement ▣ Facilities should maintain a log of all persons use of PPE by all persons entering the entering the patient's room patient room

Personal [Guidance on Personal Protective Equipment To Be Used by Healthcare Workers During Management of Patients with Ebola Virus Disease](#)

Component Recommendation Comments

(PPE) in U.S. Hospitals, Including Procedures for Putting On (Donning) and Removing (Doffing)(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>)

Dedicated medical equipment (preferably disposable, when possible) should be used for the provision of patient care
 All non-dedicated, non-disposable medical equipment used for patient care should be cleaned and disinfected according to manufacturer's instructions and hospital policies

Limit the use of needles and other sharps as much as possible
 Phlebotomy, procedures, and laboratory testing should be limited to the minimum ^{Patient Care} necessary for essential diagnostic evaluation

and medical care

All needles and sharps should be handled with extreme care and disposed in puncture-proof, sealed containers

Avoid AGPs for patients with EVD. Although there are limited data available to If performing AGPs, use a combination of definitively define a list of AGPs, measures to reduce exposures from aerosol-procedures that are usually included are generating procedures when performed on Bilevel Positive Airway Pressure (BiPAP), Ebola HF patients. bronchoscopy, sputum induction,

Visitors should not be present during aerosol-intubation and extubation, and open generating procedures. suctioning of airways. Limiting the number of HCP present during Because of the potential risk to individuals the procedure to only those essential for reprocessing reusable respirators,

Aerosol
 |
 Generating
 Procedures
 (AGPs)

Component Recommendation Comments

patient-care and support. disposable filtering face piece respirators

☐ Conduct the procedures in a private room are preferred. and ideally in an Airborne Infection Isolation Room (AIIR) when feasible. Room doors should be kept closed during the procedure except when entering or leaving the room, and entry and exit should be minimized during and shortly after the procedure.

☐ HCP should wear appropriate PPE(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>) during aerosol generating procedures.

☐ Conduct environmental surface cleaning following procedures (see section below on environmental infection control).

☐ HCP should perform hand hygiene frequently, including before and after all patient contact with potentially infectious material, contact, and before putting on and upon removal of PPE, including gloves.

Hand Hygiene

☐ Healthcare facilities should ensure that supplies for performing hand hygiene are available.

☐ Hand hygiene in healthcare settings can be performed by washing with soap and water or using alcohol-based hand rubs. If hands are visibly soiled, use soap and water, not alcohol-based hand rubs.

Environmental Infection Control Healthcare Healthcare
Environments(<http://www.cdc.gov/vhf/ebola/hcp> Environments(<http://www.cdc.gov/vhf/ebola/hcp> /environmental-infection-control-in-cp/environmental-infection-control-in-hospitals.html) hospitals.html)

Safe Injection practices

☐ Facilities should follow safe injection practices as specified under Standard Precautions.

☐ Any injection equipment or parenteral medication container that enters the patient treatment area should be dedicated

Component Recommendation Comments

Year	Country	Ebola Virus Species	Cases	Deaths	Case Fatality
2014 as of 12/14	Guinea, Sierra Leone, Liberia. Countries affected: Nigeria, Spain and U.S. Travel Associated: Senegal. Subject to change	1 st strain Zaire Ebolavirus (EBOV) Emergence of a 2 nd new strain in Guinea	20,000	7,000 +	To be determined
2012	Democratic Republic of Congo	Bundibugyo	57	29	51%
2012	Uganda	Sudan	7	4	57%
2012	Uganda	Sudan	24	17	71%
2011	Uganda	Sudan	1	1	100%
2008	Democratic Republic of Congo	Zaire	264	187	71%
2007	Uganda	Bundibugyo	149	37	25%
2007	Democratic Republic of Congo	Zaire	264	187	71%
2005	Congo	Zaire	12	10	83%
2004	Sudan	Sudan	17	7	41%
2003	Congo	Zaire	35	29	83%
2003	Congo	Zaire	143	128	90%
2001- 2002	Congo	Zaire	59	44	75%
2001- 2002	Gabon	Zaire	65	54	82%
2000	Uganda	Sudan	425	224	53%
1996	South Africa	Zaire	1	1	100%
1996	Gabon	Zaire	60	45	75%
1996	Gabon	Zaire	31	21	68%
1995	Democratic Republic of Congo	Zaire	315	254	81%
1994	Cote d'voire	Tai Forest	1	0	0%
1994	Gabon	Zaire	52	31	60%
1979	Sudan	Sudan	34	22	65%
1977	Democratic Republic of Congo	Zaire	1	1	100%
1976	Sudan	Sudan	284	151	53%
1976	Democratic Republic of Congo	Bundibugyo	57	29	51%

to that patient and disposed of at the point

Component Recommendation	Comments
--------------------------	----------

- | | |
|---|--|
| <ul style="list-style-type: none">○ Immediately contact occupational health/supervisor for assessment and access to postexposure management services for all appropriate pathogens (e.g., Human Immunodeficiency Virus, Hepatitis C, etc.) | |
| <p>☒ HCP who develop sudden onset of fever, fatigue, intense weakness or muscle pains, vomiting, diarrhea, or any signs of hemorrhage after an unprotected exposure (i.e. not wearing recommended PPE at the time of patient contact or through direct contact to blood or body fluids) to a patient with EVD should</p> <ul style="list-style-type: none">○ Not report to work or should immediately stop working○ Notify their supervisor○ Seek prompt medical evaluation and testing○ Notify local and state health departments○ Comply with work exclusion until they are deemed no longer infectious to others | |
| <p>☒ For asymptomatic HCP who had an unprotected exposure (i.e. not wearing recommended PPE at the time of patient contact or through direct contact to blood or body fluids) to a patient with Ebola HF</p> <ul style="list-style-type: none">○ Should receive medical evaluation and follow-up care including fever monitoring twice daily for 21 days after | |

Component Recommendation Comments

the last known exposure.

- Hospitals should consider policies ensuring twice daily contact with exposed personnel to discuss potential symptoms and document fever checks

☑ Avoid entry of visitors into the patient's room

- Exceptions may be considered on a case by case basis for those who are essential for the patient's wellbeing.

☑ Establish procedures for monitoring managing and training visitors. ☑ Visits should be scheduled and controlled to allow for:

- Screening for EVD (e.g., fever and other symptoms) before entering or upon ☑

Monitoring, arrival to hospital, and patient contact with the

Management,

and Training of and ability to comply with precautions for other patients, visitors, and staff.

Visitors

- providing instruction, before entry into the patient care area on hand hygiene, limiting surfaces touched, and use of PPE according to the current facility policy while in the patient's room
- Visitor movement within the facility should be restricted to the patient care area and an immediately adjacent waiting area.

Table 2

* For laboratory personnel, the recommendations for PPE only apply when in the patient care area. Laboratory personnel who are in the laboratory, not the patient care area, need to wear routine clinical laboratory PPE (gloves, face shield, impermeable gown).

If you travel to or are in an area affected by an Ebola outbreak, make sure to do the following:

- ☐ Practice careful hygiene. For example, wash your hands with soap and water or an alcohol-based hand sanitizer and avoid contact with blood and body fluids.
- ☐ Do not handle items that may have come in contact with an infected person's blood or body fluids (such as clothes, bedding, needles, and medical equipment).
- ☐ Avoid funeral or burial rituals that require handling the body of someone who has died from Ebola.
- ☐ Avoid contact with bats and nonhuman primates or blood, fluids, and raw meat prepared from these animals.
- ☐ Avoid facilities in West Africa where Ebola patients are being treated. The U.S. embassy or consulate is often able to provide advice on facilities.
- ☐ After you return, monitor your health for 21 days and seek medical care immediately if you develop symptoms of Ebola(<http://www.cdc.gov/vhf/ebola/symptoms/index.html>).

Healthcare workers who may be exposed to people with Ebola should follow these steps:

- ☐ Wear appropriate personal protective equipment (PPE).
- ☐ Practice proper infection control and sterilization measures. For more information, see Information for Healthcare Workers and Settings(<http://www.cdc.gov/vhf/ebola/hcp/index.html>).
- ☐ Isolate patients with Ebola from other patients.
- ☐ Avoid direct, unprotected contact with the bodies of people who have died from Ebola.
- ☐ Notify health officials if you have had direct contact with the blood or body fluids, such as but not limited to, feces, saliva, urine, vomit, and semen of a person who is sick with Ebola. The virus can enter the

body through broken skin or unprotected mucous membranes in, for example, the eyes, nose, or mouth.

Guidance on Personal Protective Equipment To Be Used by Healthcare Workers During Management of Patients with Ebola Virus Disease in U.S. Hospitals, Including Procedures for Putting On (Donning) and Removing (Doffing):

This guidance is current as of October 20, 2014

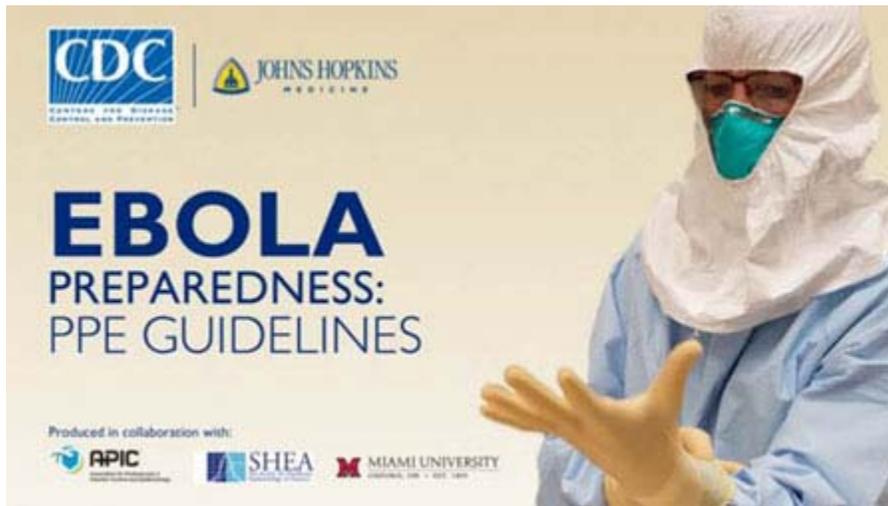
The following procedures provide detailed guidance on the types of personal protective equipment (PPE) to be used and on the processes for donning and doffing (i.e., putting on and removing) PPE for all healthcare workers entering the room of a patient hospitalized with Ebola virus disease (Ebola). The guidance in this document reflects lessons learned from the recent experiences of U.S. hospitals caring for Ebola patients and emphasizes the importance of **training, practice, competence, and observation** of healthcare workers in correct donning and doffing of PPE selected by the facility.

This guidance contains the following key principles:

- 1 Prior to working with Ebola patients, all healthcare workers involved in the care of Ebola patients must have received repeated training and have demonstrated competency in performing all Ebola-related infection control practices and procedures, and specifically in donning/doffing proper PPE.
- 2 While working in PPE, healthcare workers caring for Ebola patients should have no skin exposed.
- 3 The overall safe care of Ebola patients in a facility must be overseen by an onsite manager at all times, and each step of every PPE

donning/doffing procedure must be supervised by a trained observer to ensure proper completion of established PPE protocols.

Respiratory Protection for Ebola



Picture 3

Web-based PPE training is available at the CDC website

Fact Sheet: CDC Tightened Guidance for U.S. Healthcare Workers on Personal Protective Equipment for Ebola

In healthcare settings, Ebola is spread through direct contact(<http://www.cdc.gov/vhf/ebola/transmission/human-transmission.html>) (e.g., through broken skin or through mucous membranes of the eyes, nose, or mouth) with blood or body fluids of a person who is sick with Ebola or with objects (e.g., needles, syringes) that have been contaminated with the virus. For all healthcare workers caring for Ebola patients, PPE with full body coverage is recommended to further reduce the risk of self-contamination.

To protect healthcare workers during care of an Ebola patient, healthcare facilities must provide onsite management and oversight on the safe use of PPE and implement administrative and environmental

controls with established safety checks through direct observation to effectively identify patient health care workers and staff who are at risk of contracting Ebola during the course of their work processes.

Recommended Administrative and Environmental Controls for Healthcare Facilities

Protecting healthcare workers and preventing spread of Ebola requires that proper administrative procedures and safe work practices be carried out in appropriate physical settings. These controls include the following:

- ▣ At an administrative level, the facility's infection prevention management system, in collaboration with the facility's occupational health department, should
 - Designate individuals as site managers responsible for overseeing the implementation of precautions for healthcare workers and patient safety. A site manager's sole responsibility is to ensure the safe and effective delivery of Ebola treatment. These individuals are responsible for all aspects of Ebola infection control including supply monitoring and evaluation with direct observation of care before, during, and after staff enter an isolation and treatment area. ▣ At least one site manager should be on-site at all times in the location where the Ebola patient is being cared for
 - Identify critical patient care functions and essential healthcare workers for care of Ebola patients, for collection of laboratory specimens, and for management of the environment and waste ahead of time.

- Ensure that Ebola patients are treated in a single patient room with a closed door and protocols for safe care of Ebola patients as far as possible before they enter the patient care area.
 - To minimize the number of healthcare workers who come into contact with the Ebola patient (e.g., workers should wear PPE), restrict access to the facility from other healthcare workers.
 - Healthcare workers should practice donning and doffing protocols in a designated area, and log at a minimum entry and exit of the area by thorough testing and assessment before entering.
 - For Ebola patients, a trained observer watches closely each donning and each doffing procedure, and provides supervisory assurance that donning and doffing protocols are followed.
 - Results of each worker's use of sufficient time to don and doff PPE correctly without disturbing procedure.
 - Document training of observers and healthcare workers for proficiency and competency in donning and doffing PPE, and in performing all necessary care-related duties while wearing PPE.
 - Designate spaces so that PPE can be donned and doffed in separate areas.
 - Key safe work practices include the following:

- Ensure that practical precautions are taken during patient care, such as keeping hands away from the face, limiting touch of

surfaces and body fluids, preventing needlestick and sharps injuries, and performing frequent disinfection of gloved hands using an alcohol-based hand rub (ABHR), particularly after handling body fluids. ○ Disinfect immediately any visibly contaminated PPE surfaces, equipment, or patient care area surfaces using an *EPA-registered disinfectant wipe.

- Perform regular cleaning and disinfection of patient care area surfaces, even absent visible contamination. ▪ This should be performed only by nurses or physicians as part of patient care activities in order to limit the number of additional healthcare workers who enter the room.
 - Implement observation of healthcare workers in the patient room, if possible (e.g., glass-walled intensive care unit [ICU] room, video link).
 - Establish a facility exposure management plan that addresses decontamination and follow-up of an affected healthcare worker in case of any unprotected exposure. Training on this plan and follow-up should be part of the healthcare worker training.

Principles of PPE

Healthcare workers must understand the following basic principles to ensure safe and effective PPE use, which include that no skin may be exposed while working in PPE:

- ☐ Donning
 - PPE must be donned correctly in proper order before entry into the patient care area and not be later modified while in the patient care area. The donning activities must be directly observed by a trained observer.
- ☐ During Patient Care

- PPE must remain in place and be worn correctly for the duration of exposure to potentially contaminated areas. PPE should not be adjusted during patient care.

- Healthcare workers should perform frequent disinfection of gloved hands using an ABHR, particularly after handling body fluids.

- If during patient care a partial or total breach in PPE (e.g., gloves separate from sleeves leaving exposed skin, a tear develops in an outer glove, a needlestick) occurs, the healthcare worker must move immediately to the doffing area to assess the exposure.

□ Implement the facility exposure plan, if indicated by assessment.

- The removal of used PPE is a high-risk process that requires a structured procedure, a trained observer, and a designated area for removal to ensure protection

- PPE must be removed slowly and deliberately in the correct sequence to reduce the possibility of self-contamination or other exposure to Ebola virus

- A stepwise process should be developed and used during training and daily practice

Double gloving provides an extra layer of safety during direct patient care and during the PPE removal process. Beyond this, more layers of PPE may make it more difficult to perform patient care duties and put healthcare workers at greater risk for percutaneous injury (e.g., needlesticks), self-contamination during care or doffing, or other exposures to Ebola. If healthcare facilities decide to add additional PPE or modify this PPE guidance, they must consider the risk/benefit of any modification, and train healthcare workers on correct donning and doffing in the modified procedures.

Training on Correct Use of PPE

Training ensures that healthcare workers are knowledgeable and proficient in the donning and doffing of PPE prior to engaging in

management of an Ebola patient. Comfort and proficiency when donning and doffing are only achieved through repeated practice on the correct use of PPE. Healthcare workers should be required to demonstrate competency in the use of PPE, including donning and doffing while being observed by a trained observer, before working with Ebola patients. In addition, during practice, healthcare workers and their trainers should assess their proficiency and comfort with performing required duties while wearing PPE. Training should be available in formats accessible to individuals with disabilities or limited English proficiency. Target training to the educational level of the intended audience.

Use of a Trained Observer

Because the sequence and actions involved in each donning and doffing step are critical to avoiding exposure, a trained observer will read aloud to the healthcare worker each step in the procedure checklist and visually confirm and document that the step has been completed correctly. The trained observer is a dedicated individual with the sole responsibility of ensuring adherence to the entire donning and doffing process. The trained observer will be knowledgeable about all PPE recommended in the facility's protocol and the correct donning and doffing procedures, including disposal of used PPE, and will be qualified to provide guidance and technique recommendations to the healthcare worker. The trained observer will monitor and document successful donning and doffing procedures, providing immediate corrective instruction if the healthcare worker is not following the recommended steps. The trained observer should know the exposure management plan in the event of an unintentional break in procedure.

Designating Areas for PPE Donning and Doffing

Facilities should ensure that space and layout allow for clear separation between clean and potentially contaminated areas. It is critical that physical barriers (e.g., plastic enclosures) be used where necessary, along with visible signage, to separate distinct areas and ensure a one-way flow of care moving from clean areas (e.g., area where PPE is donned and unused equipment is stored) to the patient room and to the PPE removal area (area where PPE is removed and discarded).

Post signage to highlight key aspects of PPE donning and doffing, including

▫ Designating clean areas vs. potentially contaminated areas ▫

Reminding healthcare workers to wait for a trained observer before removing PPE ▫ Reinforcing need for slow and deliberate removal of PPE to prevent self-contamination ▫ Reminding healthcare workers to perform disinfection of gloved hands in between steps of the doffing procedure, as indicated below.

Designate the following areas with appropriate signage:

1. PPE Storage and Donning Area This is an area outside the Ebola patient room (e.g., a nearby vacant patient room, a marked area in the hallway outside the patient room) where clean PPE is stored and where healthcare workers can don PPE before entering the patient's room. Do not store potentially contaminated equipment, used PPE, or waste removed from the patient's room in this area. If waste must pass through this area, it must be properly contained.

2. Patient Room This is a single-patient room. The door is kept closed. Any item or healthcare worker exiting this room should be considered potentially contaminated.

3. PPE Removal Area This is an area in proximity to the patient's room (e.g., anteroom or adjacent vacant patient room that is separate from the clean area) where healthcare workers leaving the patient's room can doff and discard their PPE. Alternatively, some steps of the PPE removal process may be performed in a clearly designated area of the patient's room near the door, provided these steps can be seen and supervised by a trained observer (e.g., through a window such that the healthcare worker doffing PPE can still hear the instructions of the trained observer). Do not use this clearly designated area within the patient room for any other purpose. Stock gloves in a clean section of the PPE removal area accessible to the healthcare worker while doffing.

In the PPE removal area, provide supplies for disinfection of PPE and for performing hand hygiene and space to remove PPE, including a place for sitting that can be easily cleaned and disinfected, where the healthcare workers can remove boot covers. Provide leak-proof infectious waste containers for discarding used PPE. Perform frequent environmental cleaning and disinfection of the PPE removal area, including upon completion of doffing procedure by healthcare workers.

If a facility must use the hallway outside the patient room as the PPE removal area, construct physical barriers to close the hallway to through traffic and thereby create an anteroom. In so doing, the facility should make sure that this hallway space complies with fire-codes. Restrict access to this hallway to essential personnel who are properly trained on recommended infection prevention practices for the care of Ebola patients.

Facilities should consider making showers available for use by healthcare workers after doffing of PPE.

Selection of PPE for Healthcare Workers during Management of Ebola patients

This section outlines several PPE combinations and how they should be correctly worn. The key to all PPE is consistent implementation through repeated training and practice. A facility should select and standardize the PPE to be used by all essential healthcare workers directly interacting with Ebola patients and provide a written protocol outlining procedures for donning and doffing of this PPE, which will be reviewed and monitored by the trained observer.

CDC recommends facilities use a powered air-purifying respirator (PAPR) or an N95 or higher respirator in the event of an unexpected aerosol-generating procedure.

For healthcare workers who may spend extended periods of time in PPE while caring for Ebola patients, safety and comfort are critical. Standardizing attire under PPE (e.g., surgical scrubs or disposable garments and dedicated washable footwear) facilitates the donning and doffing process and eliminates concerns of contamination of personal clothing.

If facilities elect to use different PPE from what is outlined below (e.g., coveralls with either an integrated hood or a surgical hood with integrated full face shield), they must train healthcare workers in this use and ensure that donning and doffing procedures are adjusted and practiced accordingly.

Recommended Personal Protective Equipment

- ▣ **PAPR or N95 Respirator.** If a NIOSH-certified PAPR and a NIOSH-certified fit-tested disposable N95 respirator is used in facility protocols, ensure compliance with all elements of the OSHA Respiratory Protection Standard, 29 CFR 1910.134, including fit testing, medical evaluation, and training of the healthcare worker.

- **PAPR:** A PAPR with a full face shield, helmet, or headpiece. Any reusable helmet or headpiece must be covered with a single-use (disposable) hood that extends to the shoulders and fully covers the neck and is compatible with the selected PAPR. The facility should follow manufacturer's instructions for decontamination of all reusable components and, based upon those instructions, develop facility protocols that include the designation of responsible personnel who assure that the equipment is appropriately reprocessed and that batteries are fully charged before reuse. ▪ A PAPR with a self-contained filter and blower unit integrated

- inside the helmet is preferred.

- A PAPR with external belt-mounted blower unit requires adjustment of the sequence for donning and doffing, as described below.

- **N95 Respirator:** Single-use (disposable) N95 respirator in combination with single-use (disposable) surgical hood extending to shoulders and single-use (disposable) full face shield.** If N95 respirators are used instead of PAPRs, careful observation is required to ensure healthcare workers are not inadvertently touching their faces under the face shield during patient care.

▣ Single-use (disposable) fluid-resistant or impermeable gown that extends to at least mid-calf or coverall without integrated hood. Coveralls with or without integrated socks are acceptable. Consideration should be given to selecting gowns or coveralls with thumb hooks to secure sleeves over inner glove. If gowns or coveralls with thumb hooks are not available, personnel may consider taping the sleeve of the gown or coverall over the inner glove to prevent potential skin exposure from separation between sleeve and inner glove during activity. However, if taping is used, care must be taken to remove tape gently. Experience in some facilities suggests that taping may increase risk by making the doffing process more difficult and cumbersome.

- ☐ Single-use (disposable) nitrile examination gloves with extended cuffs. Two pairs of gloves should be worn. At a minimum, outer gloves should have extended cuffs.
- ☐ Single-use (disposable), fluid-resistant or impermeable boot covers that extend to at least mid-calf or single-use (disposable) shoe covers. Boot and shoe covers should allow for ease of movement and not present a slip hazard to the worker.
 - Single-use (disposable) fluid-resistant or impermeable shoe covers are acceptable only if they will be used in combination with a coverall with integrated socks.
- ☐ Single-use (disposable), fluid-resistant or impermeable apron that covers the torso to the level of the mid-calf should be used if Ebola patients have vomiting or diarrhea. An apron provides additional protection against exposure of the front of the body to body fluids or excrement. If a PAPR will be worn, consider selecting an apron that ties behind the neck to facilitate easier removal during the doffing procedure.

Recommended PPE for Trained Observer during Observations of PPE Doffing

The trained observer should not enter the room of a patient with Ebola, but will be in the PPE removal area to observe and assist with removal of specific components of PPE, as outlined below. The observer should not participate in any Ebola patient care activities while conducting observations. The following PPE are recommended for trained observers:

- ☐ Single-use (disposable) fluid-resistant or impermeable gown that extends to at least mid-calf or coverall without integrated hood. ☐ Single-use (disposable) full face shield.

- ☐ Single-use (disposable) nitrile examination gloves with extended cuffs. Two pairs of gloves should be worn. At a minimum, outer gloves should have extended cuffs.
- ☐ Single-use (disposable) fluid-resistant or impermeable shoe covers. Shoe covers should allow for ease of movement and not present a slip hazard to the worker.

Trained observers should don and doff selected PPE according to same procedures outlined below. Of note, if the trained observer assists with PPE doffing, then the trained observer should disinfect outer-gloved hands with an *EPA-registered disinfectant wipe or ABHR immediately after contact with healthcare worker's PPE.

Donning PPE, PAPR Option – This donning procedure assumes the facility has elected to use PAPRs. An established protocol facilitates training and compliance. Use a trained observer to verify successful compliance with the protocol.

1. **Engage Trained Observer:** The donning process is conducted under the guidance and supervision of a trained observer, who confirms visually that all PPE is serviceable and has been donned successfully. The trained observer uses a written checklist to confirm each step in donning PPE and can assist with ensuring and verifying the integrity of the ensemble. No exposed skin or hair of the healthcare worker should be visible at the conclusion of the donning process.
2. **Remove Personal Clothing and Items:** Change into surgical scrubs (or disposable garments) and dedicated washable (plastic or rubber) footwear in a suitable clean area. No personal items (e.g., jewelry, watches, cell phones, pagers, pens) should be brought into patient room.
3. **Inspect PPE Prior to Donning:** Visually inspect the PPE ensemble to be worn to ensure that it is in serviceable condition, that all required PPE and supplies are available, and that the sizes selected are correct for the healthcare worker. The trained observer reviews the donning

sequence with the healthcare worker before the healthcare worker begins the donning process and reads it to the healthcare worker in a step-by-step fashion.

4. **Perform Hand Hygiene:** Perform hand hygiene with ABHR. When using ABHR, allow hands to dry before moving to next step.

5. **Put on Inner Gloves:** Put on first pair of gloves.

6. **Put on Boot or Shoe Covers.**

7. **Put on Gown or Coverall:** Put on gown *or* coverall. Ensure gown or coverall is large enough to allow unrestricted freedom of movement. Ensure cuffs of inner gloves are tucked under the sleeve of the gown *or* coverall

If a PAPR with a self-contained filter and blower unit that is integrated inside the helmet is used, then the belt and battery unit must be put on prior to donning the impermeable gown *or* coverall so that the belt and battery unit are contained under the gown *or* coverall.

If a PAPR with external belt-mounted blower is used, then the blower and tubing must be on the outside of gown *or* coverall to ensure proper airflow.

8. **Put on Outer Gloves:** Put on second pair of gloves (with extended cuffs). Ensure the cuffs are pulled over the sleeves of the gown *or* coverall

9. **Put on Respirator:** Put on PAPR with a full face-shield, helmet, or headpiece

If a PAPR with a self-contained filter and blower unit integrated inside the helmet is used, then a single-use (disposable) hood that extends to the shoulders and fully covers the neck must also be used. Be sure that the hood covers all of the hair and the ears, and that it extends past the neck to the shoulders.

If a PAPR with external belt-mounted blower unit and attached reusable headpiece is used, then a single-use (disposable) hood that extends to the shoulders and fully covers the neck must also

be used. Be sure that the hood covers all of the hair and the ears, and that it extends past the neck to the shoulders.

10. **Put on Outer Apron (if used):** Put on full-body apron to provide additional protection to the front of the body against exposure to body fluids or excrement from the patient.

11. **Verify:** After completing the donning process, the integrity of the ensemble is verified by the trained observer. The healthcare worker should be comfortable and able to extend the arms, bend at the waist, and go through a range of motions to ensure there is sufficient range of movement while all areas of the body remain covered. A mirror in the room can be useful for the healthcare worker while donning PPE.

12. **Disinfect Outer Gloves:** Disinfect outer-gloved hands with ABHR. Allow to dry prior to patient contact.

Donning PPE, N95 Respirator Option – This donning procedure assumes the facility has elected to use N95 respirators. An established protocol facilitates training and compliance. Use a trained observer to verify successful compliance with the protocol.

1. **Engage Trained Observer:** The donning process is conducted under the guidance and supervision of a trained observer who confirms visually that all PPE is serviceable and has been donned successfully. The trained observer will use a written checklist to confirm each step in donning PPE and can assist with ensuring and verifying the integrity of the ensemble. No exposed skin or hair of the healthcare worker should be visible at the conclusion of the donning process.

2. **Remove Personal Clothing and Items:** Change into surgical scrubs (or disposable garments) and dedicated washable (plastic or rubber) footwear in a suitable, clean area. No personal items (e.g., jewelry, watches, cell phones, pagers, pens) should be brought into patient room.

3. Inspect PPE Prior to Donning: Visually inspect the PPE ensemble to be worn to ensure it is in serviceable condition, all required PPE and supplies are available, and that the sizes selected are correct for the healthcare worker. The trained observer reviews the donning sequence with the healthcare worker before the healthcare worker begins and reads it to the healthcare worker in a

4. Perform Hand Hygiene: Perform hand hygiene with ABHR.

When using ABHR, allow hands to dry before moving to next

5. Put on Inner Gloves: Put on first pair

6. Put on Boot or Shoe

7. Put on Gown or Coverall: Put on gown *or* coverall. Ensure gown *or* coverall is large enough to allow unrestricted freedom of movement. Ensure cuffs of inner gloves are tucked under the sleeve of the gown *or* coverall.

8. Put on N95 Respirator: Put on N95 respirator. Complete a user seal check.

9. Put on Surgical Hood: Over the N95 respirator, place a surgical hood that covers all of the hair and the ears, and ensure that it extends past the neck to the shoulders. Be certain that hood completely covers the ears and neck.

10. Put on Outer Apron (if used): Put on full-body apron to provide additional protection to the front of the body against exposure to body fluids or excrement from the patient.

11. Put on Outer Gloves: Put on second pair of gloves (with extended cuffs). Ensure the cuffs are pulled over the sleeves of the gown *or* coverall.

12. Put on Face Shield: Put on full face shield over the N95 respirator and surgical hood to provide additional protection to the front and sides of the face, including skin and eyes.

13. Verify: After completing the donning process, the integrity of the ensemble is verified by the trained observer. The healthcare worker should be comfortable and able to extend the arms, bend at the waist and go through a range of motions to ensure there is sufficient range

of movement while all areas of the body remain covered. A mirror in the room can be useful for the healthcare worker while donning PPE.

14. **Disinfect Outer Gloves:** Disinfect outer-gloved hands with ABHR. Allow to dry prior to patient contact.

Preparing for Doffing

The purpose of this step is to prepare for the removal of PPE. Before entering the PPE removal area, inspect and disinfect (using an *EPA-registered disinfectant wipe) any visible contamination on the PPE. As a final step, disinfect outer-gloved hands with either an *EPA-registered disinfectant wipe or ABHR, and allow to dry. Verify that the trained observer is available in the PPE removal area before entering and beginning the PPE removal process.

Doffing PPE, PAPR Option – PPE doffing should be performed in the designated PPE removal area. Place all PPE waste in a leak-proof infectiouswastecontainer(<http://www.cdc.gov/vhf/ebola/hcp/environmental-infection-control-in-hospitals.html>).

1. **Engage Trained Observer:** The doffing process is conducted under the supervision of a trained observer, who reads aloud each step of the procedure and confirms visually that the PPE is removed properly. Prior to doffing PPE, the trained observer must remind the healthcare worker to avoid reflexive actions that may put them at risk, such as touching their face. Post this instruction and repeat it verbally during doffing. Although the trained observer should minimize touching the healthcare worker or the healthcare worker's PPE during the doffing process, the trained observer may assist with removal of specific components of PPE, as outlined below. The trained observer disinfects the outer-gloved hands immediately after handling any healthcare worker PPE.

2. **Inspect:** Inspect the PPE to assess for visible contamination, cuts, or tears before starting to remove. If any PPE is potentially

contaminated, then disinfect using an *EPA-registered disinfectant wipe. If the facility conditions permit and appropriate regulations are followed, an *EPA-registered disinfectant spray can be used, particularly on contaminated

3. **Disinfect Outer Gloves:** Disinfect outer-gloved hands with either an *EPA-registered disinfectant wipe or ABHR, and allow to dry.

4. **Remove Apron (if used):** Remove and discard apron taking care to avoid contaminating gloves by rolling the apron from inside to outside.

5. **Inspect:** Following apron removal, inspect the PPE ensemble to assess for visible contamination or cuts or tears. If visibly contaminated, then disinfect affected PPE using an *EPA-registered disinfectant wipe.

6. **Disinfect Outer Gloves:** Disinfect outer-gloved hands with either an *EPA-registered disinfectant wipe or ABHR.

7. **Remove Boot or Shoe Covers:** While sitting down, remove and discard boot *or* shoe covers.

8. **Disinfect and Remove Outer Gloves:** Disinfect outer-gloved hands with either an *EPA-registered disinfectant wipe or ABHR. Remove and discard outer gloves, taking care not to contaminate inner glove during removal process.

9. **Inspect and Disinfect Inner Gloves:** Inspect the inner gloves' outer surfaces for visible contamination, cuts, or tears. If an inner glove is visibly soiled, cut, or torn, then disinfect the glove with either an *EPA-registered disinfectant wipe or ABHR. Then remove the inner gloves, perform hand hygiene with ABHR on bare hands, and don a clean pair of gloves. If no visible contamination, cuts, or tears are identified on the inner gloves, then disinfect the inner-gloved hands with either an *EPA-registered disinfectant wipe or ABHR.

10. **Remove Respirator (PAPR)***:**

If a PAPR with a self-contained filter and blower unit integrated inside the helmet is used, then wait until Step 15 for removal and go to Step 11.

If a PAPR with an external belt-mounted blower unit is used, then all components must be removed at this step.

Remove and discard disposable hood.

- ii. Disinfect inner gloves with either an *EPA-registered disinfectant wipe or ABHR.
- iii. Remove headpiece, blower, tubing, and the belt and battery unit. This step might require assistance from the trained observer.

Disinfect inner gloves with either an *EPA-registered disinfectant wipe or ABHR.

Place all reusable PAPR components in an area or container designated for the collection of PAPR components for disinfection.

11. Remove Gown or Coverall: Remove and discard.

Depending on gown design and location of fasteners, the healthcare worker can either untie fasteners, receive assistance by the trained observer to unfasten the gown, or gently break fasteners. Avoid contact of scrubs or disposable garments with outer surface of gown during removal. Pull gown away from body, rolling inside out and touching only the inside of the gown.

To remove coverall, tilt head back and reach under the PAPR hood to reach zipper or fasteners.

Use a mirror to help avoid touching the skin. Unzip

12. Disinfect Inner Gloves: Disinfect inner gloves with either an *EPA-registered disinfectant wipe or ABHR. Avoid contact of scrubs with

13. Disinfect Washable Shoes: Sit on a stool or bench surface (e.g., only the inside of the shoe) use an *EPA-registered disinfectant wipe to wipe down every external surface of the washable shoes.

14. Disinfect Inner Gloves: Disinfect inner gloves with either an *EPA-registered disinfectant wipe or ABHR.

15. **Remove Respirator (if not already removed):** If a PAPR with a self-contained filter and blower unit that is integrated inside helmet is used, then remove all components.

Remove and discard disposable hood

Disinfect inner gloves with either an *EPA-registered disinfectant wipe or ABHR

Remove and discard inner gloves taking care not to contaminate bare hands during removal process

Perform hand hygiene with ABHR

Don a new pair of inner gloves

Remove helmet and the belt and battery unit. This step might require assistance from the trained observer.

16. **Disinfect and Remove Inner Gloves:** Disinfect inner-gloved hands with either an *EPA-registered disinfectant wipe or ABHR. Remove and discard gloves taking care not to contaminate bare hands during removal process.

17. **Perform Hand Hygiene:** Perform hand hygiene with ABHR.

18. **Inspect:** Perform a final inspection of healthcare worker for any indication of contamination of the surgical scrubs or disposable garments. If contamination is identified, immediately inform infection preventionist or occupational safety and health coordinator or their designee before exiting PPE removal area.

19. **Scrubs:** Healthcare worker can leave PPE removal area wearing dedicated washable footwear and surgical scrubs or disposable garments.

20. **Shower:** Showers are recommended at each shift's end for healthcare workers performing high-risk patient care (e.g., exposed to large quantities of blood, body fluids, or excreta). Showers are also suggested for healthcare workers spending extended periods of time in the Ebola patient room.

21. **Protocol Evaluation/Medical Assessment:** Either the infection preventionist or occupational safety and health coordinator or their designee on the unit at the time should meet with the healthcare

worker to review the patient care activities performed to identify any concerns about care protocols and to record healthcare worker's level of fatigue.

Doffing PPE, N95 Respirator Option – PPE doffing is performed in the designated PPE removal area. Place all PPE waste in a leak-proof infectiouswastecontainer(<http://www.cdc.gov/vhf/ebola/hcp/environmental-infection-control-in-hospitals.html>).

1. Engage Trained Observer: The doffing process is conducted under the supervision of a trained observer, who reads aloud each step of the procedure and confirms visually that the PPE has been removed properly. Prior to doffing PPE, the trained observer must remind healthcare workers to avoid reflexive actions that may put them at risk, such as touching their face. Post this instruction and repeat it verbally during doffing. Although the trained observer should minimize touching healthcare workers or their PPE during the doffing process, the trained observer may assist with removal of specific components of PPE as outlined below. The trained observer disinfects the outer-gloved hands immediately after handling any healthcare worker PPE.

2. Inspect: Inspect the PPE to assess for visible contamination, cuts, or tears before starting to remove. If any PPE is visibly contaminated, then disinfect using an *EPA-registered disinfectant wipe. If the facility conditions permit and appropriate regulations are followed, an *EPA-registered disinfectant spray can be used, particularly on contaminated areas.

3. Disinfect Outer Gloves: Disinfect outer-gloved hands with either an *EPA-registered disinfectant wipe or ABHR.

4. Remove Apron (if used): Remove and discard apron taking care to avoid contaminating gloves by rolling the apron from inside to outside.

5. **Inspect:** Following apron removal, inspect the PPE ensemble to assess for visible contamination or cuts or tears. If visibly contaminated, then disinfect affected PPE using an *EPA-registered disinfectant wipe.
6. **Disinfect Outer Gloves:** Disinfect outer-gloved hands with either an *EPA-registered disinfectant wipe or ABHR.
7. **Remove Boot or Shoe Covers:** While sitting down, remove and discard boot or shoe covers.
8. **Disinfect and Remove Outer Gloves:** Disinfect outer-gloved hands with either an *EPA-registered disinfectant wipe or ABHR. Remove and discard outer gloves taking care not to contaminate inner gloves during removal process.
9. **Inspect and Disinfect Inner Gloves:** Inspect the inner gloves' outer surfaces for visible contamination, cuts, or tears. If an inner glove is visibly soiled, cut, or torn, then disinfect the glove with either an *EPA-registered disinfectant wipe or ABHR. Then remove the inner gloves, perform hand hygiene with ABHR on bare hands, and don a clean pair of gloves. If no visible contamination, cuts, or tears are identified on the inner gloves, then disinfect the inner-gloved hands with either an *EPA-registered disinfectant wipe or ABHR.
10. **Remove Face Shield:** Remove the full face shield by tilting the head slightly forward, grabbing the rear strap and pulling it over the head, gently allowing the face shield to fall forward and discard. Avoid touching the front surface of the face shield.
11. **Disinfect Inner Gloves:** Disinfect inner gloves with either an *EPA-registered disinfectant wipe or ABHR.
12. **Remove Surgical Hood:** Unfasten (if applicable) surgical hood, gently remove, and discard. The trained observer may assist with unfastening hood.
13. **Disinfect Inner Gloves:** Disinfect inner gloves with either an *EPA-registered disinfectant wipe or ABHR.
14. **Remove Gown or Coverall:** Remove and discard.
 - a. Depending on gown design and location of fasteners, the healthcare worker can either untie fasteners, receive assistance by

the trained observer to unfasten to gown, or gently break fasteners. Avoid contact of scrubs or disposable garments with outer surface of gown during removal. Pull gown away from body, rolling inside out and touching only the inside of the gown.

b. To remove coverall, tilt head back to reach zipper or fasteners. Unzip or unfasten coverall completely before rolling down and turning inside out. Avoid contact of scrubs with outer surface of coverall during removal, touching only the inside of the coverall.

15. **Disinfect and Change Inner Gloves:** Disinfect inner gloves with either an *EPA-registered disinfectant wipe or ABHR. Remove and discard gloves taking care not to contaminate bare hands during removal process. Perform hand hygiene with ABHR. Don a new pair of inner gloves.

16. **Remove N95 Respirator:** Remove the N95 respirator by tilting the head slightly forward, grasping first the bottom tie or elastic strap, then the top tie or elastic strap, and remove without touching the front of the N95 respirator. Discard N95 respirator.

17. **Disinfect Inner Gloves:** Disinfect inner gloves with either an *EPA-registered disinfectant wipe or ABHR

18. **Disinfect Washable Shoes:** Sitting on a new clean surface (e.g., second clean chair, clean side of a bench) use an *EPA-registered disinfectant wipe to wipe down every external surface of the washable shoes.

19. **Disinfect and Remove Inner Gloves:** Disinfect inner-gloved hands with either an *EPA-registered disinfectant wipe or ABHR. Remove and discard gloves taking care not to contaminate bare hands during removal process.

20. **Perform Hand Hygiene:** Perform hand hygiene with

ABHRInspect: Perform a final inspection of healthcare worker for any indication of contamination of the surgical scrubs or disposable garments. If contamination is identified, immediately inform infection preventionist or occupational safety and health coordinator or their designee before exiting PPE removal area.

22. **Scrubs:** Healthcare worker can leave PPE removal area wearing dedicated washable footwear and surgical scrubs or disposable garments.

23. **Shower:** Showers are recommended at each shift's end for healthcare workers performing high risk patient care (e.g., exposed to large quantities of blood, body fluids, or excreta). Showers are also suggested for healthcare workers spending extended periods of time in the Ebola patient room.

24. **Protocol Evaluation/Medical Assessment:** Either the infection preventionist or occupational health safety and health coordinator or their designee on the unit at the time should meet with the healthcare worker to review the patient care activities performed to identify any concerns about care protocols and to record healthcare worker's level of fatigue.

Footnotes

*EPA-registered disinfectant wipe: Use a disposable wipe impregnated with a U.S. Environmental Protection Agency (EPA)-registered hospital disinfectant with a label claim of potency at least equivalent to that for a non-enveloped virus (e.g., norovirus, rotavirus, adenovirus, poliovirus).

** Note: A full face shield may not provide full face protection in the setting of significant splashing.

***All facilities should have a protocol for removing their particular PAPR and preparing equipment for reprocessing (e.g., bagging for temporary storage before reprocessing, immediate reprocessing in the doffing area)

Information for Specific Groups can be found at:

[Travelers](http://www.cdc.gov/vhf/ebola/travelers/index.html)(<http://www.cdc.gov/vhf/ebola/travelers/index.html>)

[Healthcare Workers](http://www.cdc.gov/vhf/ebola/hcp/index.html)(<http://www.cdc.gov/vhf/ebola/hcp/index.html>)

Ports of Entry

[Airports](http://www.cdc.gov/vhf/ebola/airports/index.html)

[Airlines](http://www.cdc.gov/vhf/ebola/airlines/index.html)

Parents, Schools, and Pediatric Healthcare

[Professionals](http://www.cdc.gov/vhf/ebola/children/index.html)

Communication Resources for West African

[Audiences](http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/communication-resources/index.html)

CDC Partners and Partner Organizations



<http://www.cdc.gov/amd/stories/ebola.html>



Page last reviewed: December 12, 2014

Page last updated: December 12, 2014

Content source:

- Centers for Disease Control and Prevention National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) Division of High-Consequence Pathogens and Pathology (DHCPP) Viral Special Pathogens Branch (VSPB)

Procedures for Safe Handling and Management of Ebola-Associated Waste

Created: December 10, 2014

Who this is for: Hospital infection control, occupational health systems, and facility medical waste managers and personnel

What this is for: To provide detailed step by step procedures for use with the CDC guidance on [Ebola-Associated Waste Management](http://www.cdc.gov/vhf/ebola/hcp/medical-waste-management.html)(<http://www.cdc.gov/vhf/ebola/hcp/medical-waste-management.html>).

Key Points

The safe handling and in-hospital management of waste generated through the care of patients with Ebola is based on three main principles.

- 1 Safe containment and packaging of waste should be performed as close as possible to the point of generation. Staff should avoid opening containers to manipulate the waste after primary containment.
- 2 Limit the number of personnel entering the Ebola patient care area and those handling generated waste before and after primary containment.
- 3 Always use appropriate personal protective equipment (PPE) and procedures for handling waste until onsite inactivation or transport away from the hospital for offsite inactivation.

Preparing a Waste Management Plan as Part of Ebola Patient Care

1. Comply with your State and local regulations for handling, storage, treatment, and disposal of Ebola-associated waste.

2. Determine whether Ebola-associated waste will be inactivated onsite at the hospital or transported offsite for inactivation.
3. Identify a dedicated waste management team with specific training on standardized procedures for waste handling, including wearing appropriate PPE, and protocols for safely bagging and packaging waste, storing waste, and transporting packaged waste.
 - Onsite inactivation: Ebola-associated waste may be inactivated through incineration or by autoclaving using properly maintained equipment with appropriate biological indicators.
 - Offsite inactivation: Comply with regulations for packaging, transport and disposal of Ebola-associated waste.
4. When selecting emergency department triage areas for the evaluation of patients with possible Ebola, a designated area should be identified for waste storage pending a determination of whether the patient has Ebola or not. The storage space should meet all applicable fire codes and principles of maintaining a clutter-free, safe environment.
 - Waste bags should never be over-filled. Bags should be closed when two thirds full.
 - If stored within the patient room, all filled solid waste bags and sharps containers should undergo primary closure procedures as outlined below.
 - If stored outside the patient room, all filled solid waste bags and sharps containers should undergo both primary and secondary closure, and be removed as outlined below.
5. Be sure healthcare personnel and environmental services staff handling waste are trained to wear recommended PPE (same used for patient care) and follow appropriate putting on and taking off procedures. Use the [OSHA PPE Selection Matrix for Occupational Exposure to Ebola Virus\[PDF -3 pages\]](#) to guide selection of appropriate PPE for environmental services and waste collection workers handling, transporting, and disposing of waste.

- Handling and primary packaging of waste should occur in the patient room and the area where PPE is removed and be performed by the primary healthcare workers (i.e., doctors and nurses) wearing PPE as designated in the guidance for hospitals(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>).

Supplies for Hand Hygiene, Cleaning and Disinfection, and Packaging Waste

- ☐ Leak-proof labeled biohazard bags: The film bags must have a minimum film thickness of 1.5 mils (0.0015 inch) and be 175 liters or smaller (46 gallons). Reference U.S. Department of Transportation (DOT) HMR requirements
- ☐ Approved sharps waste container
- ☐ Waste container in patient's room
- ☐ Transport cart
- ☐ Absorbent disposable towels
- ☐ EPA-registered hospital disinfectant for use against the Ebola virus
 - Select a hospital grade disinfectant available as wipe, spray, pull-top, or refill bottles (depending on application) with a label claim for one of the non-enveloped viruses (e.g., norovirus, rotavirus, adenovirus, poliovirus) to disinfect hospital environmental surfaces.
- ☐ Disposable cleaning cloths ☐ Alcohol-based hand rub (ABHR) that is at least 60% alcohol ☐ Rigid outer receptacle that conforms to U.S. DOT HMR requirements
 - for transport of Category A DOT waste provided by approved waste vendor
 - Note: Outer package must be either a rigid United Nations Standard-or DOT-approved non-bulk packaging. If the outer packaging is fabricated from fiberboard, it must be a minimum of triple wall and contain a 6 mil polyethylene liner. Reference DOT

Guidance for Preparing Packages of Ebola Contaminated Waste for Transportation and Disposal. ○ Waste should be packaged with an installed liner provided by the waste vendor.

- Absorbent material sufficient to absorb potential free liquid (if any) should be placed in the bottom of the rigid outer packaging or the liner of the fiberboard outer packaging.

Primary Packaging of Medical Waste in Patient's Room

Procedures for management of **solid** waste generated during Ebola patient care are outlined in CDC's Interim Guidance for Environmental Infection Control in Hospitals for Ebola Virus(<http://www.cdc.gov/vhf/ebola/hcp/environmental-infection-control-in-hospitals.html>). Examples of solid waste include medical equipment, sharps, linens, privacy curtains, and used healthcare products (such as soiled absorbent pads or dressings, kidney-shaped emesis pans, portable toilets, used PPE [gowns, masks, gloves, goggles, face shields, respirators, booties, etc.] or byproducts of cleaning).

All placement of receptacles (including sharps containers) and primary packaging by double-bagging of waste should occur in the patient's room and be performed by the primary healthcare workers (i.e., doctors and nurses) wearing PPE as designated in the guidance for U.S. Emergency Departments(<http://www.cdc.gov/vhf/ebola/hcp/ed-management-patients-possible-ebola.html>) and Hospitals(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>).

1. Line appropriate-sized waste containers with a leak-proof biohazard bag.
2. Place non-sharps solid waste in the biohazard bag. Bags should not be filled beyond two thirds full to allow safe closure.

3. Carefully place sharps waste in appropriate disposable sharps container and close the container. Containers should not be filled beyond two thirds full to allow safe closure.
4. Prepare filled bags and sharps containers for **onsite inactivation (step 5) or offsite inactivation/incineration (step 6)**.
5. Prior to closure of bag and sharps container, prepare waste for **onsite autoclaving**:
 - Non-sharps waste: Add a sufficient volume of water (according to validated procedures) to primary bag.
 - Sharps waste: Add sufficient volume of water (according to validated procedures).

6. Prior to closure of bag and sharps container, prepare waste for **offsite inactivation/incineration**: Pour EPA-registered hospital disinfectant to sufficiently cover surface of contents as required by the DOT Special Permit-16279.
7. Place closed sharps containers in a biohazard bag.
8. Close the bag with a method that will not tear or puncture the bag (e.g., tying the neck of bag with a knot) and will ensure no leaks.
9. Apply EPA-registered hospital cleaner/disinfectant (wipe or spray) to the outside surface of the closed bag.
10. Place the wiped/sprayed closed bag into a second biohazard bag.
11. Close the bag with a method that will not tear or puncture the outer bag and will ensure no leaks (e.g., tying the neck of bag with a knot).
12. Apply EPA-registered hospital cleaner/disinfectant (wipe or spray) to the outside surface of the secondary bag.
13. Store the disinfected closed bags in a designated area to await removal.
14. Follow recommended procedures for disinfecting visibly soiled PPE and taking off PPE(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>).

Secondary Packaging and Removal of Waste

1. The healthcare workers (i.e., doctors and nurses) caring for the patient and wearing PPE as designated in the guidance for [hospitals](http://www.cdc.gov/vhf/ebola/hcp/procedures-forppe.html)(<http://www.cdc.gov/vhf/ebola/hcp/procedures-forppe.html>) should spray or wipe the outside surfaces of double-bagged waste with an EPA-registered hospital disinfectant immediately before removing waste from the room.
2. Upon removing the double-bagged waste from the patient's room, the healthcare worker should place the double-bagged waste in a designated transport cart (for onsite inactivation or a rigid outer receptacle (with absorbent material and liner as described above, for offsite inactivation).
3. The designated container should be located at the periphery of the area for taking off PPE so that removal from the area is efficient and does not create a risk of recontamination of the outer container.
4. Environmental services personnel removing the waste from the care area should only handle the outer container/transport cart and should never open the container or handle the double-bagged waste. PPE should be used according to the [OSHA PPE Selection Matrix for Occupational Exposure to Ebola Virus](#)[PDF -3 pages].
5. For **onsite inactivation, environmental services personnel wearing appropriate PPE according to the [OSHA PPE Selection Matrix for Occupational Exposure to Ebola Virus](#)[PDF -3 pages] should:**
 - Safely transfer waste in a transport cart to dedicated waste autoclave room or secured storage location.
 - Refer to <http://www.cdc.gov/vhf/ebola/hcp/survivability-ebolamedical-waste.html>(<http://www.cdc.gov/vhf/ebola/hcp/survivability-ebola-medical-waste.html>) for guidance on inactivation of Ebola virus in waste.
6. For **offsite inactivation**, refer to [U.S. DOT Guidance for Transporting Ebola Contaminated Items, a Category A Infectious Substance](#):
 - Before removal from the area, the healthcare workers wearing appropriate PPE should close the liner (either by zip tie or similar

means of closure as specified by the manufacturer of the packaging), and close the outer lid and packaging. Disinfect the entire exterior surface of the container with an EPA-registered hospital disinfectant (wipe or spray).

- Environmental services personnel wearing appropriate PPE according to the OSHA PPE Selection Matrix for Occupational Exposure to Ebola Virus[PDF -3 pages] should secure the outer lid and packaging and apply the special Category A DOT Waste labels provided and as directed by the manufacturer of the packaging.
- Safely transport to a designated and secure storage area that is preferably isolated and with limited access for approved waste vendor pickup.

Procedures for Handling Liquid Waste (Body Fluids Including Blood, Urine, Vomit, Feces)

Consult with State or local regulations regarding pretreatment of waste. Sanitary sewers may be used for the safe disposal of patient waste. Reference CDC's Interim Guidance for Environmental Infection Control in Hospitals for Ebola Virus(<http://www.cdc.gov/vhf/ebola/hcp/environmental-infection-control-in-hospitals.html>); WHO Infection prevention and control guidance for care of patients in health-care settings, with focus on Ebola, 2014[PDF -24 pages].

1. Primary handling of liquid waste should occur in the patient's room and be performed by the primary healthcare workers (i.e., doctors and nurses) wearing recommended PPE as designated in the guidance for hospitals(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>)
2. Pour waste, avoiding splashing by pouring from a low level, into the toilet.
3. Close the lid first, and then flush toilet.

4. Clean and disinfect flush handles, toilet seat, and lid surfaces with EPA-registered hospital disinfectant/cleaner.
5. Discard cleaning cloths in biohazard bag.
6. Discard emesis and portable toileting containers as solid waste.
7. Follow recommended procedures for disinfecting visibly soiled PPE and removal of PPE(<http://www.cdc.gov/vhf/ebola/hcp/proceduresfor-ppe.html>).

Handling Spills: Basic principles for spills of blood and other potentially infectious materials are outlined in the U.S. Occupational Safety and Health Administration (OSHA) Bloodborne Pathogen Standard, 29 CFR 1910.1030 and guidance for Bloodborne Pathogens and Needlestick Prevention.

1. Spills should be managed by the doctors and nurses caring for the Ebola patient and by wearing recommended PPE as designated in the guidance for hospitals(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>).
2. Isolate the area of the spill; do not let other individuals access the area until disinfection is completed.
3. Place absorbent material on the spill (a solidifier agent can be used). Pour the EPA-registered disinfectant over the spill and allow sufficient contact time (according to manufacturer's instructions for treating spills).
4. Use disposable absorbent towels to remove bulk spill material. Dispose of the towels in a biohazard bag as specified above.
5. Apply the EPA-registered hospital disinfectant to the cleaned surface and allow the specified contact time.
6. Use disposable cleaning cloths or wipes to wipe the treated area.
7. Follow handling of solid waste protocol as described above to discard materials used for containing the spill and for cleaning and disinfection.

8. Follow recommended procedures for disinfecting visibly soiled PPE and taking off PPE(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>).

Resources

- ② CDC Ebola-Associated Waste Management(<http://www.cdc.gov/vhf/ebola/hcp/medical-waste-management.html>)
- ② CDC Guidance on Personal Protective Equipment To Be Used by Healthcare Workers During Management of Patients with Ebola Virus Disease in U.S. Hospitals, Including Procedures for Putting On (Donning) and Removing (Doffing)(<http://www.cdc.gov/vhf/ebola/hcp/procedures-forppe.html>)
- ② CDC Interim Guidance for Environmental Infection Control in Hospitals for Ebola Virus(<http://www.cdc.gov/vhf/ebola/hcp/environmental-infection-control-in-hospitals.html>)
- ② OSHA Ebola Webpage
- ② OSHA Bloodborne Pathogens Standard (29 CFR 1910.1030)
- ② OSHA PPE Selection Matrix for Occupational Exposure to Ebola Virus[PDF -3 pages]
- ② U.S. EPA Where You Live – State Medical Waste Programs and Regulations
- ② U.S. EPA Disinfectants for Use Against the Ebola Virus
- ② U.S. DOT Transporting Infectious Substances

[U.S. DOT Procedural Guidance for Preparing Packages of Ebola Contaminated Waste for Transportation and Disposal\[PDF -4 pages\]](#)
[U.S. DOT Guidance for Transporting Ebola Contaminated Items, a Category A Infectious Substance FAQs](#)

[NIOSH Selecting, Evaluating, and Using Sharps Disposal Containers](#)

Interim Guidance for Specimen Collection, Transport, Testing, and Submission for Persons Under Investigation for Ebola Virus Disease in the United States:

Updated: October 20, 2014

Who this is for: Laboratorians and other healthcare personnel handling specimens for Ebola testing

What: CDC provides updated guidance for collecting specimens correctly, transporting and testing specimens from persons under investigation for Ebola virus disease(<http://www.cdc.gov/vhf/ebola/hcp/case-definition.html>)

How to use: This guidance should be used to explain exactly the biosafety requirements for how to collect and perform routine testing of specimens to staff working in laboratory and healthcare settings.

Key Points

U.S. clinical laboratories can safely handle specimens from these potential Ebola patients by taking all required precautions and practices in the laboratory, specifically designed for pathogens spread in the blood.

Risk assessments should be conducted by each laboratory director, biosafety officer, or other responsible person to determine the

potential for sprays, splashes, or aerosol generated during procedures. Any person collecting specimens from a patient with suspected Ebola

virus disease should wear appropriate PPE(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>). 

Anyone collecting specimens from a patient should follow the procedures below for transporting them through the healthcare facility, clean-up of spills, storing, packaging and shipping to CDC for testing.

Updates: The Infection Control for Collecting and Handling Specimens and the Preferred Specimens for Ebola Testing at CDC sections were clarified and a link to U.S. DOT transportation regulations was added.

Background

CDC is working with the World Health Organization (WHO), the ministries of health and other international organizations in response to an outbreak of Ebola virus disease (EVD) in West Africa, which was first reported in late March 2014. For the latest information on the outbreak, please see the 2014 Ebola Outbreak in West Africa highlights(<http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/index.html>). This is the largest outbreak of EVD ever documented and the first recorded in West Africa.

EVD is one of numerous viral hemorrhagic fevers (VHF). It is a severe, often fatal disease in human and nonhuman primates. Ebola virus is spread by direct contact with the blood or body fluids (such as urine, saliva, feces, vomit and semen) of an infected person or by being exposed to objects that have been contaminated with infected blood or body fluids. The incubation period is usually 8–10 days (rarely ranging from 2 to 21 days). Patients can transmit the virus once symptoms appear and through the later stages of disease, as well as postmortem.

U.S. hospitals can safely manage a patient with EVD by using all recommended isolation and infection control procedures(http://www.cdc.gov/hicpac/2007IP/2007ip_part4.html#a4). Standard, contact, and droplet precautions are recommended for management of hospitalized patients with known or suspected EVD. Similarly, U.S. clinical laboratories can safely handle specimens from these patients by strict adherence to precautions and practices specifically designed for bloodborne pathogens in the laboratory environment. However, Ebola has an apparent low infectious dose, the potential of high virus titers in the blood of ill patients, and can result in severe disease. Therefore, it is essential that laboratorians, supervisors, and other workers review laboratory safety procedures and guidelines to make sure to follow these biosafety recommendations. Following these guidelines U.S. hospitals and clinical laboratories have safely managed a number of VHF patients including cases of Lassa fever and Marburg virus (a closely related virus to Ebola).¹⁴

Potentially infectious diagnostic specimens are routinely handled and tested in U.S. laboratories in a safe manner, by closely following the standard safety precautions below.

**INTERIM GUIDANCE FOR
Specimen Collection, Transport, Testing, and Submission
for Patients with Suspected Infection with Ebola Virus Disease**

NOTIFICATION & CONSULTATION

Hospitals should follow their state and/or local health department procedures for notification and consultation for Ebola testing requests before contacting CDC. CDC cannot accept any specimens without prior consultation.

**FOR CONSULTATION
CALL THE EMERGENCY
OPERATIONS CENTER AT
770-488-7100**

WHEN SPECIMENS SHOULD BE COLLECTED FOR EBOLA TESTING

 **Ebola virus is detected in blood** only after onset of symptoms, most notably fever. It may take up to three days after onset of symptoms for the virus to reach detectable levels. Virus is generally detectable by real-time RT-PCR between 3 to 10 days after onset of symptoms.

Ideally, specimens should be taken when a symptomatic patient reports to a healthcare facility and is suspected of having an Ebola virus exposure. However, if the onset of symptoms is less than three days after potential exposure, a subsequent specimen will be required to rule out Ebola.

3 days

PREFERRED SPECIMENS FOR EBOLA TESTING

A minimum volume of 4 milliliters of whole blood preserved with EDTA, clot activator, sodium polyethanol sulfonate (SPS), or citrate in plastic collection tubes can be submitted for Ebola virus disease testing.

Specimens should be shipped at 4°C. Do not submit specimens to CDC in glass containers. Do not submit specimens preserved in heparin tubes.

4°C

Specimens other than blood may be submitted upon consult with the CDC.

Standard labeling should be applied for each specimen. The requested test needs to be identified only on the requisition and CDC specimen submission forms.

DIAGNOSTIC TESTING FOR EBOLA PERFORMED AT CDC

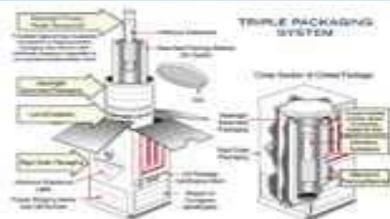
Several diagnostic tests are available for detection of Ebola virus disease. Acute infections will be confirmed using a real-time RT-PCR assay (CDC test directory code CDC-10009 Ebola Identification) in a CLIA-accredited laboratory. Virus isolation may also be attempted. Serologic testing for IgM and IgG antibodies will be completed for certain specimens and to monitor the immune response in confirmed Ebola virus disease patients (CDC-10310 Ebola Serology).

Lassa fever is also endemic in certain areas of West Africa and may show symptoms similar to early Ebola virus disease. Diagnostic tests including but not limited to RT-PCR, antigen detection, and IgM serology may be utilized to rule out Lassa fever in patients who test negative for Ebola virus disease.

TRANSPORTING SPECIMENS WITHIN THE HOSPITAL/INSTITUTION

 In compliance with 29 CFR 1910.1030, specimens should be placed in a durable, leak-proof secondary container for transport within a facility. To reduce the risk of breakage or leaks, do not use any pneumatic tube system for transporting specimens from a patient with suspected Ebola virus disease.

PACKAGING & SHIPPING CLINICAL SPECIMENS TO CDC

 **Specimens collected for Ebola virus disease testing should be packaged and shipped without attempting to open collection tubes or aliquot specimens.**

Specimens for shipment should be packaged following the basic triple packaging system, which consists of a primary receptacle (a sealable specimen bag wrapped with absorbent material), secondary receptacle (watertight, leak-proof), and an outer shipping package.

THE SUBMISSION PROCESS

Contact your state and/or local health department and CDC (770-488-7100) to determine the proper category for shipment based on clinical history and risk assessment by CDC and to obtain detailed shipping guidance and required CDC submission documents. State guidelines may differ and state or local health departments should be consulted before shipping.

<http://www.cdc.gov/vhf/ebola/pdf/ebola-lab-guidance.pdf>
 Printable factsheet: Interim Guidance for Specimen Collection, Transport, Testing, and Submission for Patients with Suspected Infection with Ebola Virus Disease[PDF -1 page](<http://www.cdc.gov/vhf/ebola/pdf/ebola-lab-guidance.pdf>)

Infection Control When Collecting and Handling Specimens

All laboratorians and other healthcare personnel collecting or handling specimens must follow established standards compliant with the OSHA bloodborne pathogens standard, which includes blood and other potentially infectious materials. These standards include wearing appropriate personal protective equipment (PPE) and following all safety rules for all specimens regardless of whether they are identified as being infectious.

Recommendations for risk assessment to staff: Risk assessments should be conducted by each laboratory director, biosafety officer, or other responsible personnel to determine the potential for sprays, splashes, or aerosols generated from laboratory procedures. They should adjust, as needed, PPE requirements, practices, and safety equipment controls to protect the laboratorian's skin, eyes, and mucous membranes.

Recommendations for specimen collection by staff: Any person collecting specimens from a patient with a case of suspected Ebola virus disease should wear gloves, water-resistant gowns, full face shield or goggles, and masks to cover all of nose and mouth. Additional PPE may be required in certain situations.(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>)

Recommendations for laboratory testing by staff: Any person testing specimens from a patient with a suspected case of Ebola virus disease should wear gloves, water-resistant gowns, full face shield or goggles, and masks to cover all of nose and mouth, and as an added precaution use a certified class II Biosafety cabinet or Plexiglass splash guard with PPE to protect skin and mucous membranes. All manufacturer-installed safety features for laboratory instruments should be used.

Specimen Handling for Routine Laboratory Testing (not for Ebola Diagnosis)

Routine laboratory testing includes traditional chemistry, hematology, and other laboratory testing used to support and treat patients. Precautions as described above offer appropriate protection for healthcare personnel performing laboratory testing on specimens from patients with suspected infection with Ebola virus. These precautions include both manufacturer installed safety features for instruments and the laboratory environment as well as PPE specified in the box above.

Environmental Cleaning and Disinfection

See the [Interim Guidance for Environmental Infection Control in Hospitals for Ebola](http://www.cdc.gov/vhf/ebola/hcp/environmental-infection-control-in-hospitals.html)

[Virus](http://www.cdc.gov/vhf/ebola/hcp/environmental-infection-control-in-hospitals.html)(<http://www.cdc.gov/vhf/ebola/hcp/environmental-infection-control-in-hospitals.html>) for recommendations regarding the cleaning and disinfection of patient care area surfaces including the management of blood and body fluid spills. These recommendations also apply to cleaning and disinfecting in a laboratory where specimens are being processed from persons under investigation, or with probable or confirmed Ebola virus infections.

In the case of a spill in the laboratory, the basic principles for blood or body substance spill management are outlined in the United States OSHA Blood Borne Pathogens Standards. There are no disinfection products with specific label claims against the Ebola virus. Enveloped viruses such as Ebola are susceptible to a broad range of hospital disinfectants used to disinfect hard, non-porous surfaces. In contrast, non-enveloped viruses are more resistant to disinfectants. As an added precaution, use a disinfectant with a higher potency than what is normally required for an enveloped virus to disinfect potentially Ebolacontaminated surfaces. EPA-registered hospital disinfectants with label claims against non-enveloped viruses (e.g., norovirus, rotavirus,

adenovirus, poliovirus) are broadly antiviral and capable of inactivating both enveloped and non-enveloped viruses.

Management of Laboratory Waste

The Ebola virus is classified as a Category A infectious substance by the Department of Transportation (DOT) and, when transported in commerce, is regulated by DOT's Hazardous Materials Regulations (HMR, 49 C.F.R., Parts 171-180). Any item transported in commerce that is contaminated or suspected of being contaminated with a Category A infectious substance must be packaged and transported in accordance with the HMR. This includes medical equipment, sharps, linens, and used health care products (such as soiled absorbent pads or dressings, kidney-shaped emesis pans, portable toilets, used Personal Protection Equipment (gowns, masks, gloves, goggles, face shields, respirators, booties, etc.) or byproducts of cleaning) contaminated or suspected of being contaminated with a Category A infectious substance.

Waste generated during laboratory testing should be placed in leak-proof containment. To minimize contamination of the exterior of the waste bag, place this bag in a rigid waste container designed for this use. If available, steam sterilization (autoclave) or incineration as a waste treatment process can inactivate the virus and reduces waste volume. For equipment that drains directly into the sewer system, the United States sanitary sewer system handling processes (e.g., anaerobic digestion, composting, disinfection) are designed to safely inactivate infectious agents. However, check with your state's medical waste program for more guidance and coordinate your waste management activities for the laboratory area with your medical waste contractor. ⁵⁻

CDC Division of Select Agents and Toxins (DSAT) Considerations

If these guidelines for the collection, transport, and testing of specimens from suspected or confirmed Ebola patients are followed, waste generated during the handling and testing of such specimens and which is properly disposed would not be subject to Federal select agent regulations (See the exclusion provision 42 CFR § 73.3(d)(1)). However, this exclusion would not apply to any facility or laboratory that intentionally collected or otherwise extracted the Ebola virus from waste generated during the delivery of patient care.

Transporting Specimens within the Hospital / Institution

In compliance with 29 CFR 1910.1030, specimens should be placed in a durable, leak-proof secondary container for transport within a facility. To reduce the risk of breakage or leaks, do not use any pneumatic tube system for transporting suspected EVD specimens.

When Specimens Should Be Collected for Ebola Testing at CDC

Ebola virus is detected in blood only after the onset of symptoms, usually fever. It may take up to 3 days after symptoms appear for the virus to reach detectable levels. Virus is generally detectable by real-time RT-PCR from 3-10 days after symptoms appear.

Specimens ideally should be taken when a symptomatic patient reports to a healthcare facility and is suspected of having an Ebola exposure. However, if the onset of symptoms is <3 days, a later specimen may be needed to completely rule-out Ebola virus, if the first specimen tests negative.

Preferred Specimens for Ebola Testing at CDC

A minimum volume of 4mL whole blood in *plastic* collection tubes can be used to submit specimens for testing for Ebola virus. Do not submit specimens to CDC in glass containers or in heparinized tubes. Whole blood preserved with EDTA is preferred but whole blood preserved with; sodium polyanethol sulfonate (SPS), citrate, or with clot activator is acceptable. It is not necessary to separate and remove serum or plasma from the primary collection container. Specimens should be immediately stored or transported at 2-8°C or frozen on cold-packs to the CDC. Specimens other than blood may be submitted upon consult with the CDC by calling the Emergency Operations Center at 770-488-7100.

Standard labeling should be applied for each specimen. The requested test only needs to be identified on the requisition and CDC specimen submission forms.

Storing Clinical Specimens for Ebola Testing at CDC

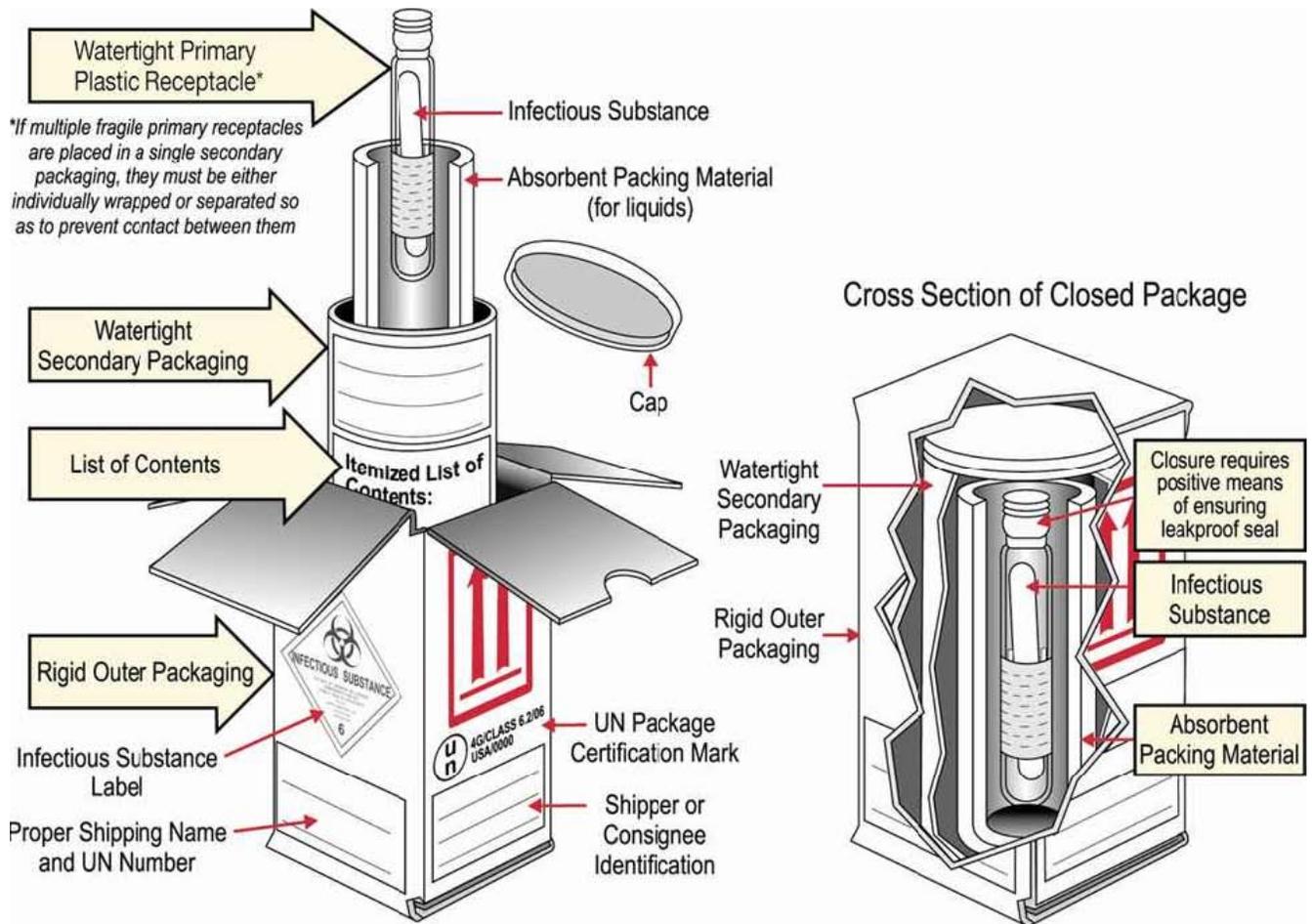
Short-term storage of specimens prior to shipping to CDC should be at 4°C or frozen.

Diagnostic Testing for Ebola Performed at CDC

Several diagnostic tests are available for detection of EVD. Acute infections will be confirmed using a real-time RT-PCR assay (CDC test directory code CDC -10309 Ebola Identification) in a CLIA-certified laboratory. Virus isolation may also be attempted. Serologic testing for IgM and IgG antibodies will be completed for certain specimens and to monitor the immune response in confirmed EVD patients (#CDC-10310 Ebola Serology).

Lassa fever is also endemic in certain areas of West Africa and may show symptoms similar to early EVD. Diagnostic tests available at CDC include but are not limited to RT-PCR, antigen detection, and IgM serology all of which may be utilized to rule out Lassa fever in EVD-negative patients.

Packaging and Shipping Clinical Specimens to CDC



(<http://www.cdc.gov/vhf/ebola/hcp/packaging-diagram.html>)

PACKAGING

DIAGRAM(HTTP://WWW.CDC.GOV/VHF/EBOLA/HCP/PACKAGING-DIAGRAM.HTML)

Specimens collected for EVD testing should be packaged and shipped without attempting to open collection tubes or aliquot specimens. The following steps should be used in submitting

☐ ~~samples to CDC~~ Hospitals should follow their state and/or local health department procedures for notification and consultation for Ebola testing requests and prior to contacting CDC.

☐ NO specimens will be accepted without prior consultation. For consultation call the EOC at **770-488-7100**.

☐ Contact your state and/or local health department and CDC to determine the proper category for shipment based on clinical history and risk assessment by CDC. State guidelines may differ and state or local health departments should be consulted prior to shipping.

☐ Email tracking number to **EOCEVENT246@CDC.GOV**. ☐ Do not ship for weekend delivery unless instructed by CDC. ☐ Ship to:

Centers for Disease Control and Prevention
ATTN STAT LAB: VSPB, UNIT #70
1600 Clifton Road NE Atlanta,
GA 30333 Phone 770-488-7100

☐ Include the following information: your name, the patient's name, test(s) requested, date of collection, laboratory or accession number, and the type of specimen being shipped.

☐ Include the CDC Infectious Disease (CDC Form 50.34) and Viral Special Pathogens Branch[PDF -2 pages] specimen submission forms. ☐ On the **outside** of the box, specify how the specimen should be stored: **refrigerated**.

Specimens for shipment should be packaged following the basic triple packaging system which consists of a primary container (a sealable

specimen bag) wrapped with absorbent material, secondary container (watertight, leak-proof), and an outer shipping package. See diagram. All applicable requirements of the U.S. Hazardous Materials Regulations (HMR) issued by the U.S. Department of Transportation (U.S. DOT) can be found on the DOT website. For questions on (packaging) transportation regulations, contact the U.S. DOT HazMat Information Center at 1-800-467-4922.

[Top of Page](#)

Occupational Health

Potential exposures to blood, body fluids and other infectious materials must be reported immediately according to your institution's policies and procedures.

When to Contact CDC

CDC highly recommends contacting your state and/or local health department *before* contacting CDC.

CDC is available for consultation 24/7 at 770-488-7100.

CDC will continue to evaluate new information as it becomes available and will update this guidance as needed.

References:

1. Amorosa V, et al.,. Imported Lassa fever, Pennsylvania, USA, 2010. *Emerg Infect Dis.* 2010 Oct;16(10):1598-600.
2. Imported case of Marburg hemorrhagic fever -Colorado, 2008. Centers for Disease Control and Prevention (CDC). *MMWR Morb Mortal Wkly Rep.* 2009 Dec 18;58(49):1377-81.
3. Timen A, et. al., Response to imported case of Marburg hemorrhagic fever, in the Netherlands. *Emerg Infect Dis.* 2009 Aug;15(8):1171-5.

4. Centers for Disease Control and Prevention (CDC). Imported Lassa fever—New Jersey, 2004. MMWR Morb Mortal Wkly Rep. 2004 Oct 1;53(38):894-7.

5. EPA Where You Live – State Medical Waste Programs and Regulations (see: <http://www.epa.gov/epawaste/nonhaz/industrial/medical/programs.htm>).

Additional Resources and Information

☐ <http://www.cdc.gov/ncezid/dhcpp/vspb/pdf/specimen-submission.pdf>[PDF -2 pages](<http://www.cdc.gov/ncezid/dhcpp/vspb/pdf/specimen-submission.pdf>)

☐ <http://www.cdc.gov/ncezid/dhcpp/vspb/specimens.html>(<http://www.cdc.gov/ncezid/dhcpp/vspb/specimens.html>)

<http://www.cdc.gov/vhf/ebola/hcp/infection-prevention-and-controlrecommendations.html>(<http://www.cdc.gov/vhf/ebola/hcp/infection-prevention-and-controlrecommendations.html>)

☐ http://www.cdc.gov/hicpac/disinfection_sterilization/6_0disinfection.html(http://www.cdc.gov/hicpac/disinfection_sterilization/6_0disinfection.html)

☐ <http://www.cdc.gov/mmwr/pdf/other/su6101.pdf>[PDF -105 pages]

☐ <http://www.cdc.gov/laboratory/specimen-submission/form.html>

Interim Guidance for Environmental Infection Control in Hospitals for Ebola Virus

On August 1, 2014, CDC released Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Virus Disease in U.S. Hospitals(<http://www.cdc.gov/vhf/ebola/hcp/infection-prevention-and-control-recommendations.html>).

Ebola viruses are transmitted through direct contact with blood or body fluids/substances (e.g., urine, feces, vomit) of an infected person with symptoms or through exposure to objects (such as needles) that have been contaminated with infected blood or body fluids. The role of the environment in transmission has not been established. Limited laboratory studies under favorable conditions indicate that Ebola virus can remain viable on solid surfaces, with concentrations falling slowly over several days.^{4,2} In the only study to assess contamination of the patient care environment during an outbreak, Ebola virus was not detected in any of 33 samples collected from sites that were not visibly bloody. However, virus was detected on a blood-stained glove and bloody intravenous insertion site.² There is no epidemiologic evidence of Ebola virus transmission via either the environment or fomites that could become contaminated during patient care (e.g., bed rails, door knobs, laundry). However, given the apparent low infectious dose, potential of high virus titers in the blood of ill patients, and disease severity, higher levels of precaution are warranted to reduce the potential risk posed by contaminated surfaces in the patient care environment.

As part of the care of patients who are persons under investigation, or with probable or confirmed Ebola virus infections(<http://www.cdc.gov/vhf/ebola/hcp/case-definition.html>), hospitals are recommended to:

☐ **Be sure environmental services staff wear recommended personal protective equipment (PPE)**(<http://www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html>) **to protect against direct skin and mucous membrane exposure of cleaning chemicals, contamination, and splashes or spatters during environmental cleaning and disinfection activities.** If reusable heavy-duty gloves are used for cleaning and disinfecting, they should be disinfected and kept in the room or anteroom. Be sure staff are instructed in the proper use of personal protective equipment including safe removal to prevent contaminating themselves or others in the process, and that contaminated equipment is disposed of appropriately. (see question 8).

☐ **Use a U.S. Environmental Protection Agency (EPA)-registered hospital disinfectant with a label claim for a non-enveloped virus (e.g., norovirus, rotavirus, adenovirus, poliovirus) to disinfect environmental surfaces in rooms of patients with suspected or confirmed Ebola virus infection.** Although there are no products with specific label claims against the Ebola virus, enveloped viruses such as Ebola are susceptible to a broad range of hospital disinfectants used to disinfect hard, non-porous surfaces. In contrast, non-enveloped viruses are more resistant to disinfectants. As a precaution, selection of a disinfectant product with a higher potency than what is normally required for an enveloped virus is being recommended at this time. EPA-registered hospital disinfectants with label claims against non-enveloped viruses (e.g., norovirus, rotavirus, adenovirus, poliovirus) are broadly antiviral and capable of inactivating both enveloped and non-enveloped viruses.

☐ **Avoid contamination of reusable porous surfaces that cannot be made single use.** Use only a mattress and pillow with plastic or other covering that fluids cannot get through. Do not place patients with suspected or confirmed Ebola in carpeted rooms. Remove all upholstered furniture and decorative curtains from patient rooms before use.

☐ **Routine cleaning and disinfection of the PPE doffing area.**

Routine cleaning of the PPE doffing area should be performed at least once per day and after the doffing of grossly contaminated PPE.

Cleaning should be performed by a healthcare worker (HCW) wearing clean PPE. An EPA-registered hospital disinfectant with label claims against non-enveloped viruses (e.g., norovirus, rotavirus, adenovirus, poliovirus) should be used for disinfection. When cleaning and disinfection are complete, the HCW should carefully doff PPE and perform hand hygiene.

☐ **To reduce exposure among staff to potentially contaminated textiles (cloth products) while laundering, discard all linens, non-fluid-impermeable pillows or mattresses, and textile privacy curtains into the waste stream and disposed of appropriately.**

☐ **Ebola virus is classified as a Category A infectious substance regulated by the U.S. Department of Transportation's (DOT) Hazardous Materials Regulations (HMR, 49 C.F.R., Parts 171-180). Any item transported offsite for disposal that is contaminated or suspected of being contaminated with a Category A infectious substance must be packaged and transported in accordance with the HMR. This includes medical equipment, sharps, linens, used healthcare products such as soiled absorbent pads or dressings, kidney-shaped emesis pans, portable toilets; and used PPE (gowns, masks, gloves, goggles, face shields, respirators, booties, etc.) or byproducts of cleaning contaminated or suspected of being contaminated with a Category A infectious substance.^{6,7} (see question 8).**

Frequently Asked Questions

1. How can I determine whether a particular EPA-registered hospital disinfectant is appropriate for use in the room of a patient with suspected or confirmed Ebola virus infection?

Check EPA's [Disinfectants for Use Against the Ebola Virus](#) for a list of EPA-registered disinfectants. Users should be aware that an 'enveloped' or 'non-enveloped virus' designation may not be included on the container label. Instead check the disinfectant's label for at least one of the common non-enveloped viruses (e.g., norovirus, rotavirus, adenovirus, poliovirus).

2. Are there special instructions for cleaning and disinfecting the room of a patient with suspected or confirmed Ebola virus infection?

Daily cleaning and disinfection of hard, non-porous surfaces (e.g., high-touch surfaces such as bed rails and over bed tables, housekeeping surfaces such as floors and counters) should be done.⁴ Before disinfecting a surface, cleaning should be performed. In contrast to disinfection where products with specific claims are used, any cleaning product can be used for cleaning tasks. Use cleaning and disinfecting products according to label instructions. Check the disinfectant's label for specific instructions for inactivation of any of the non-enveloped viruses (e.g., norovirus, rotavirus, adenovirus, poliovirus) follow label instructions for use of the product that are specific for inactivation of that virus. Use disposable cleaning cloths, mop cloths, and wipes and dispose of these in leak-proof bags. Use a rigid waste receptacle designed to support the bag to help minimize contamination of the bag's exterior.

3. How should spills of blood or other body substances be managed?

The basic principles for blood or body substance spill management are outlined in the United States Occupational Safety and Health Administration (OSHA) [Bloodborne Pathogen Standards](#) (29 CFR 1910.1030).⁵ CDC guidelines recommend removal of bulk spill matter, cleaning the site, and then disinfecting the site.⁴ For large spills, a chemical disinfectant with sufficient potency is needed to overcome the tendency of proteins in blood and other body substances to neutralize the disinfectant's active ingredient. An EPA-registered

hospital disinfectant with label claims for non-enveloped viruses (e.g., norovirus, rotavirus, adenovirus, poliovirus) and instructions for cleaning and decontaminating surfaces or objects soiled with blood or body fluids should be used according to those instructions.

4. How should disposable materials (e.g., any single-use PPE, cleaning cloths, wipes, single-use microfiber cloths, linens, food service) and linens, privacy curtains, and other textiles be managed after their use in the patient room?

These materials should be placed in leak-proof containment and discarded appropriately. To minimize contamination of the exterior of the waste bag, place the bag in a rigid waste receptacle designed for this use. Incineration or autoclaving as a waste treatment process is effective in eliminating viral infectivity and provides waste minimization. If disposal requires transport offsite then this should be done in accordance with the U.S. Department of Transportation's (DOT) Hazardous Materials Regulations (HMR, 49 C.F.R., Parts 171-180).^{6, 7} Guidance from DOT has been released for Ebola.⁷

5. Is it safe for Ebola patients to use the bathroom?

Yes. Sanitary sewers may be used for the safe disposal of patient waste.⁸ Additionally, sewage handling processes in the United States are designed to inactivate infectious agents.

6. How long does the Ebola virus persist in indoor environments?

Only one laboratory study has been reported, which was done under environmental conditions that favor virus persistence. This study found that under these ideal conditions, Ebola virus could remain active for up to six days.¹ In a follow-up study, Ebola virus was found, relative to other enveloped viruses, to be quite sensitive to inactivation by ultraviolet light and drying; yet sub-populations did persist in organic debris.²

In the only study to assess contamination of the patient care environment during an outbreak, conducted in an African hospital under "real-world conditions", Ebola virus was not detected by either nucleic acid amplification or culture in any of 33 samples collected from sites that were not visibly bloody. Virus was detected on a blood-stained glove and bloody intravenous insertion site by nucleic acid amplification, which may detect non-viable virus, but not by culture for live, infectious virus.³ Based upon these data and what is known regarding the environmental infection control of other enveloped RNA viruses, the expectation is that with consistent daily cleaning and disinfection practices in U.S. hospitals, the persistence of Ebola virus in the patient care environment would be short, with 24 hours³ considered a cautious upper limit.

7. Are wastes generated during delivery of care to Ebola virus-infected patients subject to select agent regulations?

As long as facilities treating patients with Ebola follow CDC's Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Hemorrhagic Fever in U.S. Hospitals(<http://www.cdc.gov/vhf/ebola/hcp/infection-prevention-and-control-recommendations.html>), waste generated during delivery of care to patients with Ebola would not be subject to Federal select agent regulations (See the exclusion provision 42 CFR § 73.3(d)(1)). However, this would not apply to any facility that intentionally collected or otherwise extracted Ebola virus from waste generated during the delivery of patient care.

8. Are wastes generated during delivery of care to Ebola virus-infected patients subject to any special transportation requirements?

Wastes contaminated or suspected to be contaminated with Ebola virus must be packaged and transported in accordance with U.S. DOT Hazardous Materials Regulations (HMR, 49 C.F.R., Parts 171-180).^{6,7}

Once a patient with suspected Ebola virus disease (EVD) (e.g., patients under investigation) is no longer suspected to have EVD or has ruled out for EVD, their waste materials no longer need to be managed as if contaminated with Ebola virus.

References

- 1 Sagripanti JL, Rom AM, Holland LE. Persistence in darkness of virulent alphaviruses, Ebola virus, and Lassa virus deposited on solid surfaces. *Arch Virol* 2010; 155:2035-2039.
- 2 Sagripanti JL, Lytle DC. Sensitivity to ultraviolet radiation of Lassa, vaccinia, and Ebola viruses dried on surfaces. *Arch Virol* 2011; 156:489–494.
- 3 Bausch DG et al. Assessment of the Risk of Ebola Virus Transmission from Bodily Fluids and Fomites. *J Infect Dis* 2007; 196:S142–7.
- 4 CDC Guidelines for Environmental Infection Control in Healthcare Facilities[PDF -249 pages] (see: Environmental Surfaces Section).
- 5 OSHA Bloodborne Pathogen Standard 29 CFR 1910.1030.
- 6 DOT. Guidance for Transporting Ebola Contaminated Items, a Category A Infectious Substance.
- 7 DOT. Hazardous Materials Regulations [49 CFR Parts 100-1999; 49 CFR 172.700; 49 CFR 173.134(a)(5)].
- 8 WHO. Interim Infection Prevention and Control Guidance of patients with Suspected or confirmed Filovirus Hemorrhagic Fever in Health-care Settings, with Focus on Ebola. World Health Organization, Geneva, Switzerland, 2014.

References:

AP. (2014). New concern worldwide as nurse in Spain gets Ebola: Connie Cass and Lauran Neergaard. Retrieved on October 06, 2014. Retrieved from

<http://www.aol.com/article/2014/10/06/spanish-nurse-is-suspected-of-ebola-infection/2097...>

BBC News. (2014). Ebola: Why is this disease we fear?: Dr Seth Berkley (8/8/2014). Retrieved on December 30, 2014. Retrieved from <http://www.bbc.com/news/health-28689949?print=true>

BBC News Africa. (2014). Why Ebola is so dangerous. Retrieved on December 30, 2014. Retrieved from <http://www.bbc.com/news/worldafrica-26835233?print=true>

Ebola. (2014) Retrieved on December 14, 2014. Retrieved from www.wikipedia.org.

NBC News. (2014). Why has Nurse Amber Vinson Recovered from Ebola so Quickly?: Maggie Fox. Retrieved on December 30, 2014. Retrieved from

<http://nbcnews.com/storyline/ebola-virus-outbreak/why-has-nurse-amber-vinson-re...>

Science Daily. (2014). Bats are a possible source of Ebola epidemic in west Africa. Retrieved on December 14, 2014. Retrieved from www.sciencedaily.com/releases/2014/12/14230075752.htm

The World Health Organization. (2014) Retrieved on December 28, 2014. Retrieved from www.who.int

The Centers for Disease Controls and prevention: Ebola (Ebola Virus Disease) Retrieved on December 28, 2014. Retrieved from www.cdc.com