

## CLINICAL DECISIONS

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### Transporting Patients with Lethal Contagious Infections



**If a trauma patient is suspected of having Ebola hemorrhagic fever (Ebola HF) or other lethal contagious infection, what precautions should be taken and what resources are available to help with definitive care?**



Ebola HF appears in sporadic outbreaks and can be spread within a health care setting. Although humans do not carry the virus, they can transmit Ebola HF via direct contact with blood and/or secretions of the infected person.<sup>1</sup> Incubation period for Ebola is 2 to 21 days.<sup>2</sup> Within a few days of becoming infected, a person will usually develop a high fever and numerous body aches. Some patients will develop a sore throat, hiccups, red and itchy eyes, hematemesis, and bloody diarrhea. Although the disease progresses rapidly, a recently infected person could fly from an endemic area of the world (eg, Africa) and be seen in a clinical setting far from Africa.

#### High index of suspicion

Ebola HF is a disease that should be considered in a differential diagnosis of any person with a high fever of unknown origin and with a history of traveling in Africa within the last 2 to 21 days. In rare cases, individuals exposed to research monkeys have become infected but not ill.

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The opinions or assertions contained herein are the private views of the author and are not to be considered as official or as reflecting the views of the Department of the Army or the Department of Defense.

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#### Isolate infected person and all body fluids

To prevent spreading the disease within the institution, the patient should be isolated, preferably in a negative pressure room. Infectious disease specialists for the institution, county, and state health departments should be contacted immediately. The Centers for Disease Control and Prevention is the leading agency in the United States and the World Health Organization coordinates care for suspected viral hemorrhagic fever (VHF) cases throughout the world. The agencies have developed a manual, *Infection Control for Viral Haemorrhagic Fevers in the African Health Care Setting*, that can be used by health care providers for the initial care and isolation of patients (see Table 1 for contact information). The use of standard infection-control barriers (eg, gowns, gloves, and goggles) is especially important when caring for a trauma patient who has the potential of having a VHF.

#### Modifying routine trauma care

The assessment and initial care of a critical trauma patient are often driven by protocols that will need to be modified if a VHF patient is suspected. All body fluids, including blood and urine, are sources of the virus and must be handled in a biosafety level 4 laboratory (BSL-4). Routine laboratory specimens should not be sent to a regular hospital laboratory. The patient care providers will need to modify procedures to protect themselves and to prevent secondary infections to others. All human excreta should be treated with a disinfectant or autoclaved before it is discarded or incinerated. This will be a dilemma for infection control. All laboratory specimens should be placed in a bag. The bag should be wiped with a disinfectant and placed inside another bag (double bag). The second bag may be partially filled with a disinfectant solution. The bagged specimen should be transported in a covered container. Local health departments will provide guidance for where the laboratory specimens will be analyzed.

If the patient requires a BSL-4 patient care room, he or she must be transported to the US Army Medical Research Institute of Infectious Diseases (USAMRIID), the only BSL-4 containment care suite in the United States. The patient will need to be transported by the Aeromedical Isolation Team (AIT), a team from the USAM-

# Report Documentation Page

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14. ABSTRACT <b>The Aeromedical Isolation Team (AIT) is maintained under the command of COL Edward M. Eitzen, Jr., at the United States Army Medical Institute of Infectious Diseases (USAMRIID), located at Fort Detrick, Maryland. The AIT is a unique military medical team capable of worldwide air evacuation and management of a limited number of patients who are potentially exposed to known and unknown lethal communicable diseases or biological agents. The mission of the AIT is worldwide air evacuation of these types of patients under the highest level of biological containment to USAMRIID for definitive medical treatment. using a specialized method of air evacuation, the team assists with the early identification of highly contagious diseases or suspected biological warfare agents and provides information used to develop early treatment recommendations for health care professionals.</b>					
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**TABLE 1.** Contact information for International Agencies that Monitor Suspected Ebola HF Patients

<b>Source</b>	<b>Contact information</b>
<i>Infection Control for Viral Haemorrhagic Fevers in the African Health Care Setting</i>	<a href="http://www.cdc.gov/ncidod/dvrd/spb/mnpages/vhfmanual.htm">http://www.cdc.gov/ncidod/dvrd/spb/mnpages/vhfmanual.htm</a> <a href="http://www.who.int/emc-documents/haem_fever/whoemcesr982c.html">http://www.who.int/emc-documents/haem_fever/whoemcesr982c.html</a>
<b>Centers for Disease Control and Prevention</b>	(404) 639-3634 or (800) 311-3435 1600 Clifton Rd, Atlanta, Georgia 30333, USA, (404) 639-3311 <a href="http://www.cdc.gov/ncidod/dvrd/spb/index.htm">www.cdc.gov/ncidod/dvrd/spb/index.htm</a>
Public Health Service, US Department of Health and Human Services Special Pathogens Branch. Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases	<a href="http://www.fema.gov/library/all_hzpln6g.htm">http://www.fema.gov/library/all_hzpln6g.htm</a>
<b>Federal Emergency Management Agency</b> Guide for all-hazard emergency operations planning: state and local guide (101), Chapter 6, Attachment G - Terrorism unique planning considerations. Attachment G Terrorism. TAB C.	Avenue Appia 20, 1211 Geneva 27, Switzerland Telephone: (+00 41 22) 791 21 11; Facsimile (fax): (+00 41 22) 791 3111 Telex: 415 416; Telegraph: UNISANTE GENEVA
Telephone hotlines and links to numerous websites.	<a href="http://www.who.int/inf-fs/en/fact103.html">http://www.who.int/inf-fs/en/fact103.html</a>
World Health Organization office in Geneva	<a href="http://www.who.int/emc/diseases/ebola/index.html">http://www.who.int/emc/diseases/ebola/index.html</a> #Ebola
Ebola Haemorrhagic Fever Fact Sheet Haemorrhagic Fevers	



**Figure 1.** Members of USAMRIID aeromedical isolation team deplane from a C-130 aircraft during a joint training exercise with the 167th Aero-medical Evacuation Squadron, Martinsburg, West Virginia. Team members carry a specially designed stretcher isolator, a transparent PVC envelope suspended on an aluminum alloy frame. A battery-powered HEPA filtration system creates a negative differential pressure to ensure containment of highly infectious microorganisms. Butyl rubber hood, battery-powered positive-pressure HEPA filtered respiratory system, and positive

RIID. The AIT is the only team of its kind in the United States. The team uses transport isolators that encase the patient in a transparent flexible lightweight polyvinyl chloride (PVC) container (Figure 1). The isolator can be punctured; therefore no glass bottles or sharp instruments can be used around the patient. The cervical spine and fractures can be stabilized with posterior splints; however, rough objects, such as a traction splint, should not be used.

The AIT consists of a physician, a registered nurse, and 4 to 6 medics who can manage one patient (Figure 2). The team can provide emergency care, such as airway control, endotracheal intubation, supplemental oxygen, defibrillation, and administration of intravenous fluids and blood. Patients can be monitored for tissue oxygen saturation, heart rate and rhythm, and blood pres-

pressure suit with rubber gloves and rubber boots provide personal protection. Team members communicate with battery powered radios with bone conduction headsets. (Photograph by Mr. Charles Boles, USAMRIID–Visual & Audio Department).



**Figure 2.** USAMRIID CPT LeRoy Marklund (right) and SPC Jennifer Gardner (left) practice patient care with volunteer SPC Michelle Dickens (center) under BSL-4 conditions. BSL-4, the highest biological containment level, utilizes HEPA filtration, negative differential room pressure, and sewage sterilized by pressurized steam. Health care professionals wear positive pressure encapsulated suits with HEPA-filtered air for personal protection. USAMRIID maintains the only BSL-4 patient containment suite in the United States. (Photograph by SGT Alan Owens, USAMRIID–Visual & Audio Division).

sure. The team can assess hemoglobin, hematocrit, and serum electrolytes with portable, hand-held laboratory analyzers that are inside the isolator.

### Transport of a VHF patient

The patient must be evaluated, stabilized, and able to withstand the effects of altitude and confinement to be considered appropriate for transfer. Patients who are hemodynamically unstable and/or have severe anemia (<2.5 million erythrocytes/mL or <7.0 g hemoglobin/100 mL) may be considered inappropriate.<sup>3</sup>

If transport is recommended, the aeromedical team will arrive at the site and initiate containment patient care by placing the patient inside a stretcher isolator and carry the sealed stretcher isolator to a decontamination point. At this time, the patient will be transferred into the aircraft transit isolator. The patient transfer is tedious. A PVC transfer sleeve is attached to the patient portal of the stretcher isolator and the patient portal of the aircraft transit isolator. The patient is moved from the stretcher isolator, through the transfer sleeve, into the aircraft transit isolator. The patient lies on a cloth stretcher during the entire transfer process. The transport aircraft can be either a C-130 fixed-wing airplane or a Chinook helicopter. A max-

imum of 2 patients can be transported to the USAMRIID at Fort Detrick, Maryland.

At the USAMRIID, the patient will be considered a “reference” patient who can be observed and treated under BSL-4 conditions. BSL-4 is the highest biologic containment level. This will allow optimal care while providing researchers with first-hand experience to observe the progression of the disease and response to treatment.

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