

# Emergency Medical Services Public Health Implications and Interim Guidance for the Ebola Virus in the United States

**Christopher E. McCoy, MD, MPH** University of California, Irvine, Department of Emergency Medicine, Orange, California  
**Shahram Lotfipour, MD, MPH**  
**Bharath Chakravarthy, MD, MPH**  
**Carl Schultz, MD**  
**Erik Barton, MD, MBA**

*Supervising Section Editor:* Mark I. Langdorf, MD, MHPE

Submission history: Submitted October 6, 2014; Revision received October 10, 2014; Accepted October 10, 2014

Electronically published October 10, 2014

Full text available through open access at [http://escholarship.org/uc/uciem\\_westjem](http://escholarship.org/uc/uciem_westjem)

DOI: 10.5811/westjem.2014.10.24155

The 25th known outbreak of the Ebola Virus Disease (EVD) is now a global public health emergency and the World Health Organization (WHO) has declared the epidemic to be a Public Health Emergency of International Concern (PHEIC). Since the first cases of the West African epidemic were reported in March 2014, there has been an increase in infection rates of over 13,000% over a 6-month period. The Ebola virus has now arrived in the United States and public health professionals, doctors, hospitals, Emergency Medical Services Administrators, Medical Directors, and policy makers have been working with haste to develop strategies to prevent the disease from reaching epidemic proportions. Prehospital care providers (emergency medical technicians and paramedics) and medical first responders (including but not limited to firefighters and law enforcement) are the healthcare systems front lines when it comes to first medical contact with patients outside of the hospital setting. Risk of contracting Ebola can be particularly high in this population of first responders if the appropriate precautions are not implemented. This article provides a brief clinical overview of the Ebola Virus Disease and provides a comprehensive summary of the Center for Disease Control and Prevention's Interim Guidance for Emergency Medical Services (EMS) Systems and 9-1-1 Public Safety Answering Points (PSAPS) for Management of Patients with Known or Suspected Ebola Virus Disease in the United States. [West J Emerg Med. 2014;15(7):723-727.]

The Ebola virus has now arrived to the United States. The twenty-fifth known outbreak of Ebola virus disease (EVD) is unlike any of the previous epidemics and is now a global public health emergency. The first cases of the current West African epidemic of EVD were reported on March 22, 2014, with a report of 49 cases in Guinea.<sup>1</sup> By August 31, 2014, the World Health Organization (WHO) had reported 3,685 probable, confirmed, and suspected cases in West Africa, with 2,914 in Sierra Leone and Liberia and 771 in Guinea.<sup>2</sup> According to the most recent WHO update 6,574 cases have been reported as of September 23, 2014, from five West Africa countries (Guinea, Liberia, Nigeria, Senegal, and Sierra Leone).<sup>3</sup> This yields an increase in case rates of disease of over 13,000% during the six-month period. The current epidemic has already killed over 3,860 people – more than all previous Ebola epidemics combined.<sup>4,5</sup> The average

EVD case fatality rate is approximately 50%, with rates as high as 90% in past outbreaks.<sup>6</sup> Despite the vast scale of the current outbreak, the clinical manifestations of the disease, duration of illness, case fatality rate, and degree of transmissibility are similar to those in earlier epidemics. It is therefore unlikely that the particularly devastating course of this epidemic can be attributed to biologic characteristics of the virus.<sup>5</sup> It is more likely the result of the combination of resource-poor health delivery systems, difficulties in surveillance, densely populated capitals, local customs, and high population mobility.

On September 30, 2014, the Centers for Disease Control and Prevention (CDC) confirmed, through laboratory tests, the first travel-associated case of Ebola to be diagnosed in the U.S. in a person who had traveled to Dallas, Texas, from West Africa.<sup>7</sup> Since this time, medical and public health

professionals, hospitals and emergency medical services (EMS) administrators, medial directors, and policy makers have been working with haste to develop strategies to prevent the disease from reaching epidemic proportions in the U.S. Owing to its rapid spread, high case fatality rate, and no current cure for the virus, recommendations for evaluation and management are time sensitive and may evolve as fast as our knowledge about the disease.

One area of public health services in particular that needs timely information is EMS. Prehospital care providers are the healthcare systems' first point of contact with patients in the prehospital setting. The objective of this article is to provide a brief clinical overview of EVD and to summarize the CDC's Interim Guidance for Emergency Medical Services (EMS) Systems and 9-1-1 Public Safety Answering Points (PSAPs) for management of patients with known or suspected EVD in the U.S.<sup>8</sup> The target audience includes but is not limited to paramedics, emergency medical technicians, emergency physicians and nurses, EMS agencies and system administrators, law enforcement, firefighters, and policymakers.

## CLINICAL ASPECTS OF EBOLA

### Signs and Symptoms of Ebola Virus Disease.<sup>9</sup>

- Fever (>38.6°C or 101.5°F)
- Severe headache
- Muscle pain
- Weakness
- Diarrhea
- Vomiting
- Abdominal pain
- Unexplained hemorrhage

Symptoms may appear from two to 21 days after exposure to Ebola with an average of eight to 10 days. During this latent period an individual may be infected with the virus yet not show any signs or symptoms.

### Transmission<sup>10</sup>

Current research indicates that the first person becomes infected through contact with an infected animal. When the infection occurs in humans, the virus can be spread in several ways to others. Ebola is spread through direct contact (through broken skin or mucous membranes) with:

- Blood or body fluids (including but not limited to urine, saliva, sweat, feces, vomit, breast milk, and semen) of a person who is sick with Ebola
- Objects (like needles and syringes) that have been contaminated with the virus
- Infected animals

Ebola is not spread through air, water or, in general, by food. There is no evidence that mosquitos or other insects can transmit the virus. Healthcare providers caring for Ebola

patients are at the highest risk of getting sick because they may come in contact with infected blood or body fluids. The disease can spread quickly within healthcare settings if appropriate protective precautions are not taken. However, with appropriate personal protective equipment (PPE) and exposure precautions, the risk of contagion can be greatly reduced.

### Diagnosis

There are currently a variety of diagnostic tests available for Ebola; however, none of these are available in the prehospital care setting. Diagnosing Ebola in a person with the aforementioned signs and symptoms may be difficult in isolation as the signs and symptoms overlap with a multitude of other more commonly occurring medical and surgical conditions. However, knowledge that the patient has been in contact with someone with suspected or confirmed Ebola or has traveled to an area where Ebola is occurring can be obtained from the patient history and can greatly aid the healthcare provider in risk stratification.

### Treatment

There are no FDA-approved vaccines or medications currently available for Ebola. Therefore, treatment is primarily supportive and may include intravenous fluids, maintaining oxygen status and blood pressure and treating any other underlying conditions or organ dysfunction. Recovery from Ebola is dependent on supportive care and the patient's immune response.

Several experimental drugs and vaccines are under development and may be given to individual patients on a case-by-case basis. No current algorithm is available to help determine an ethical method to allocate the limited supply of these agents. One drug, identified as ZMAPP, has been given to several patients, but it remains unclear if it was actually effective. ZMAPP is an experimental biopharmaceutical drug comprising three humanized monoclonal antibodies under development as a treatment for EVD. These monoclonal antibodies bind to the Ebola virus, rendering it less harmful. In addition, the National Institutes of Health's (NIH) National Institute of Allergy and Infectious Diseases (NIAID) is in the process of developing a vaccine against Ebola. The NIH announced that they will accelerate production and begin phase 1 clinical trials of this vaccine. At the end of August, the NIH announced that it would begin human testing of an investigational vaccine to prevent Ebola in the first week of September 2014. NIAID will supervise this testing.

## SUMMARY OF INTERIM GUIDANCE FOR EMERGENCY MEDICAL SERVICES SYSTEMS AND 9-1-1 PUBLIC SAFETY ANSWERING POINTS FOR MANAGEMENT OF PATIENTS WITH KNOWN OR SUSPECTED EBOLA VIRUS DISEASE IN THE UNITED STATES

EMS personnel have a vital role in responding to, triaging, and providing initial medical care for patients in the prehospital care setting. The prehospital care environment often requires EMS personnel to work in uncontrolled settings, often in small spaces, and with little medical information about the patient prior to initiating management. With the arrival of Ebola to the U.S., policies, protocols, and procedures may require modification to address this public health concern and to reduce the risk of transmission to healthcare providers as well as the public.

## CASE DEFINITION FOR EBOLA VIRUS DISEASE (EVD)

### Person under Investigation (PUI)

A person who has both consistent symptoms and risk factors as follows:

1. Clinical criteria, which includes fever > 38.6°C (101.5°F), and additional symptoms such as severe headache, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage, AND
2. Epidemiologic risk factors within the past 21 days before the onset of symptoms, such as contact with blood or body fluids or human remains of a patient with the virus; residence in – or travel to – an area where EVD transmissions is active; or direct handling of bats or non-human primates from disease-endemic areas.

### Probable Case

A PUI whose epidemiologic risks factors include high- or low-risk exposures(s).

### Confirmed Case

A case with laboratory-confirmed diagnostic evidence of Ebola virus infection.

### High Risk Exposures

- Percutaneous (e.g., needle stick) or mucous membrane exposure to blood or body fluids of EVD patient
- Direct skin contact with, or exposure to blood or body fluids of an EVD patient without appropriate PPE
- Processing blood or body fluids of an confirmed EVD patient without appropriate PPE or standard biosafety precautions
- Direct contact with a dead body without appropriate PPE in a country where an EVD outbreak is occurring

### Low Risk Exposures

- Household contact with an EVD patient
- Other close contact (three feet) with EVD patients in healthcare facilities while not wearing recommended PPE

## RECOMMENDATIONS FOR 9-1-1 PUBLIC SAFETY ANSWERING POINTS (PSAPs)

State and local EMS authorities may authorize PSAPs and other emergency call centers to use modified caller

queries about Ebola when they consider the risk of Ebola to be elevated in their community.

### Modified Caller Queries

- Important for PSAPs to question callers for possible Ebola infection and immediately notify EMS personnel prior to arrival if suspected
- Calls should be screened for symptoms and risks factors for Ebola:
  - Contact with blood or body fluids of a patient known to have or suspected to have Ebola;
  - Residence in – or travel to – a country where Ebola outbreak is occurring
  - Direct handling of bats or nonhuman primates from disease-endemic areas
  - If responding at an airport or other port of entry to the U.S., the PSAP should notify the CDC quarantine station for the port of entry <http://www.cdc.gov/quarantine/quarantinestationcontactlistfull.html>

## RECOMMENDATIONS FOR EMS AND MEDICAL FIRST RESPONDERS (INCLUDING FIRE AND LAW ENFORCEMENT)

### Patient Assessment

1. Scene safety:
  - If PSAP call with suspicion of Ebola, EMS personnel to don PPE appropriate for suspected cases of Ebola before entering scene
  - Keep patient separated from other persons
  - Caution for unexpected movements (flailing) in Ebola patients with delirium, as may increase risk of infection
2. During patient assessment and management, EMS personnel should consider symptoms and risk factors of Ebola:
  - Assess for symptoms of Ebola (fever > 38.6° or 101.5°F and additional symptoms: severe headache, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage). If the patient has aforementioned symptoms, then ask about risk factors within the past three weeks, including:
    - Contact with blood or body fluids of patient known to have or suspected to have Ebola;
    - Residence in – or travel to – a country with an Ebola outbreak (a list of impacted countries can be accessed at the following link: <http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/index.html>), or
    - Direct handling of bats or nonhuman primates from disease-endemic areas.
  - Put on PPE based on presence of symptoms and risk factors

### EMS Transfer of Patient Care to a Healthcare Facility

It is vital that EMS personnel notify the receiving healthcare facility when transporting a suspected Ebola patient, so that appropriate infection control precautions may be prepared prior to patient arrival. Any U.S. hospital that is

following the CDC's infection control recommendations and can isolate a patient in a private room is capable of safely managing a patient with Ebola.<sup>11</sup> EMS personnel involved in the air or ground interfacility transport of patients with suspected or confirmed Ebola should wear recommended PPE.

### Infection Control

EMS personnel can safely manage a patient with suspected or confirmed Ebola by following recommended isolation and infection control procedures, including standard, contact, and droplet precautions. Particular attention should be paid to protecting mucous membranes from splashes of infectious material, or self-inoculation from soiled gloves. It is recommended that an EMS agency managing a suspected Ebola patient should follow these CDC recommendations:

- Limit activities that can increase the risk of exposure to infectious material
- Limit use of needles and other sharps as much as possible

### Use of PPE

Use of standard, contact, and droplet precautions is sufficient for most situations when treating a patient with a suspected case of Ebola. EMS personnel should wear:

- Gloves
- Gown (fluid resistant or impermeable)
- Eye protection (goggles or face shield that fully covers front and sides of face)
- Facemask
- Additional PPE may be required in certain situations, including but not limited to double gloving, disposable shoe covers, and leg coverings.

During prehospital resuscitation procedures (intubation, open suctioning of airways, cardiopulmonary resuscitation):

- In addition to recommended PPE, respiratory protection at least as protective as a NIOSH-certified fit-tested N95 filtering facepiece respirator or higher is recommended (instead of facemask).
- Additional PPE must be considered for these situations owing to potential increased risk of contact with blood and body fluids.

The CDC also provides recommendations on cleaning EMS transport vehicles after transporting a patient with suspected or confirmed Ebola. Their essential recommendation is to thoroughly clean all areas where patient care was provided, while wearing appropriate PPE.

### Recommendations for EMS personnel who are exposed to body fluids from a patient with suspected or confirmed Ebola

The CDC recommends that EMS personnel with exposure to blood, body fluids, secretions, or excretions from a patient with suspected or confirmed Ebola should immediately:

- Stop working and wash the affected skin surfaces with

soap and water. Mucous membranes should be irrigated with a large amount of water or eyewash solution

- Contact occupational health/supervisor for assessment and access to post-exposure management services; and
- Receive medical evaluation and follow-up care, including fever monitoring twice daily for 21 days, after the last known exposure. The CDC recommends they may continue to work while receiving twice-daily fever checks, based upon EMS agency policy

EMS personnel who develop signs and symptoms suggestive of and consistent with those seen with Ebola after an unprotected exposure to a patient with suspected or confirmed Ebola should:

- Not report to work or immediately stop working and isolate themselves;
- Notify their supervisor, who should notify local and state health departments;
- Contact occupational health/supervisor for assessment and access to post-exposure management services; and
- Comply with work exclusions until they are deemed no longer infectious to others.

### Follow-up and/or reporting measures by EMS personnel after caring for a suspected or confirmed Ebola patient

EMS personnel should be aware of the follow-up and/or reporting measures they should take after caring for a suspected or confirmed Ebola patient. The CDC recommends that EMS agencies develop policies for monitoring and managing EMS personnel potentially exposed to Ebola.

The U.S. Department of Health and Human Services (DHHS), CDC, and Office of the Assistant Secretary for Preparedness and Response (ASPR), in addition to other federal, state, and local partners, encourage U.S.-based EMS agencies and systems to prepare for managing patients with Ebola and other infectious diseases. Their detailed EMS checklist for Ebola preparedness can be found on the CDC website.<sup>12</sup> The checklist provides practical and specific suggestions to ensure the agency is able to help its personnel detect possible Ebola cases, protect those personnel, and respond appropriately. The U.S. Department of Health and Human Services and the CDC have also put together a checklist for use when patients arrive to clinical settings such as emergency department triage.<sup>13</sup> (Appendix I) The CDC is available 24/7 for consultation by calling the CDC Emergency Operations Center (EOC) at 770-488-7100.

---

*Address for Correspondence:* Christopher Eric McCoy, MD, University of California Irvine Medical Center, Department of Emergency Medicine, 101 The City Drive South, Orange, CA 92868. Email: cmccoy@uci.edu.

---

**Conflicts of Interest:** By the *WestJEM* article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. The authors disclosed none.

## REFERENCES

1. World Health Organization, Africa Regional Office. Ebola virus disease in Guinea. Geneva, Switzerland: World Health Organization; 2014. Available at: <http://www.afro.who.int/en/clusters-a-programmes/dpc/epidemic-a-pandemic-alert-and-response/outbreak-news/4063-ebola-hemorrhagic-fever-in-guinea.html>. Accessed Oct 4, 2014.
2. World Health Organization. Ebola virus disease outbreak – West Africa. Geneva, Switzerland: World Health Organization; 2014. Available at: [http://www.who.int/csr/don/2014\\_09\\_04\\_ebola/en/](http://www.who.int/csr/don/2014_09_04_ebola/en/). Accessed Oct 4, 2014.
3. World Health Organization. Ebola response roadmap update 26 September 2014. Geneva, Switzerland: World Health Organization; 2014. Available at: [http://apps.who.int/iris/bitstream/10665/135029/1/roadmapupdate26sept14\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/135029/1/roadmapupdate26sept14_eng.pdf). Accessed Oct 4, 2014.
4. 2014 Ebola Outbreak in West Africa. Centers for Disease Control and Prevention. Available at: <http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/index.html>. Accessed Oct 10, 2014.
5. Farrar JJ, Piot P. The Ebola Emergency – Immediate Action, Ongoing Strategy. *N Engl J Med*. 2014.
6. Ebola Virus Disease. World Health Organization. Available at: <http://www.who.int/mediacentre/factsheets/fs103/en/>. Accessed Oct 10, 2014.
7. First Imported Case of Ebola Diagnosed in the United States. Centers for Disease Control and Prevention. Available at: <http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/usa-imported-case.html>. Accessed Oct 4, 2014.
8. Interim Guidance for Emergency Medical Services (EMS) Systems and 9-1-1 Public Safety Answering Points (PSAPs) for Management of Patients with known or Suspected Ebola Virus Disease in the United States. Centers for Disease Control and Prevention. October 2014. Available at: <http://www.cdc.gov/vhf/ebola/index.html>. Accessed Oct 4, 2014.
9. Ebola Virus Disease. Signs and Symptoms. Centers for Disease Control and Prevention. Available at: <http://www.cdc.gov/vhf/ebola/symptoms/index.html>. Accessed Oct 4, 2014.
10. Ebola Virus Disease. Transmission. Centers for Disease Control and Prevention. Available at: <http://www.cdc.gov/vhf/ebola/transmission/index.html>. Accessed Oct 4, 2014.
11. Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Hemorrhagic Fever in U.S. Hospitals. Center for Disease Control and Prevention. Available at: <http://www.cdc.gov/vhf/ebola/hcp/infection-prevention-and-control-recommendations.html>. Accessed Oct 4, 2014.
12. Detailed Emergency Medical Services (EMS) Checklist for Ebola Preparedness. Available at: <http://www.cdc.gov/vhf/ebola/pdf/ems-checklist-ebola-preparedness.pdf>. Accessed Oct 4, 2014.
13. Checklist for Patients Being Evaluated for Ebola Virus Disease (EVD) in the United States. U.S. Department of Health and Human Services and The Centers For Disease Control and Prevention. Available at: <http://www.cdc.gov/vhf/ebola/pdf/checklist-patients-evaluated-us-evd.pdf>. Accessed Oct 5, 2014.