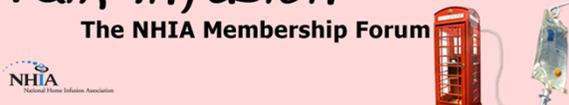


**Ebola Virus Disease:**  
*Applying CDC Guidelines to the  
Protection of At-Risk  
Home Infusion Employees*  
October 7, 2014

**Talk Infusion**  
The NHIA Membership Forum



---

---

---

---

---

---

---

---

**Talk Infusion**  
The NHIA Membership Forum

Presenter:  
Nancy Kramer RN, BSN, CRNI®, Vice President of Clinical Affairs, NHIA

**OVERVIEW OF EBOLA VIRUS  
DISEASE**

10/7/2014 2

---

---

---

---

---

---

---

---

**Talk Infusion**  
The NHIA Membership Forum

**Ebola Virus Disease (EVD)**

- Rare and deadly disease caused by infection with one of the Ebola virus strains; formerly called “Ebola hemorrhagic fever”
- Disease can occur in humans and nonhuman primates (monkeys, gorillas, and chimpanzees)
- Five identified Ebola virus species; four known to cause disease in humans



Virus of the family  
*Filoviridae*, genus  
*Ebolavirus*

10/7/2014 3

---

---

---

---

---

---

---

---

**Talk Infusion**  
The NHIA Membership Forum

Map of West Africa Ebola Outbreak, updated 10/3/2014

Source:  
<http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/distribution-map.html>

10/7/2014

---

---

---

---

---

---

---

---

---

---

**Talk Infusion**  
The NHIA Membership Forum

Symptoms of EVD at Diagnosis

- ✓ Fever (>38.6°C or 101.5°F) 87%\*
- ✓ Fatigue 76%\*
- ✓ Vomiting 68%\*
- ✓ Diarrhea 66%\*
- ✓ Loss of appetite 65%\*
- ✓ Severe headache
- ✓ Muscle pain
- ✓ Weakness
- ✓ Abdominal (stomach) pain

- May appear anywhere from 2 to 21 days after exposure to Ebola, average is 8 to 12 days
- Recovery depends on good supportive clinical care and patient's immune response
- People who recover from Ebola infection develop antibodies that last for at least 10 years

\*Most common s/s reported from West Africa during current outbreak from symptom-onset to the time the case was detected

10/7/2014

---

---

---

---

---

---

---

---

---

---

**Talk Infusion**  
The NHIA Membership Forum

As Symptoms Progress...

- **GI symptoms intensify:** watery diarrhea, nausea, vomiting, abdominal pain
- **May also develop:** conjunctivitis, hiccups, chest pain, shortness of breath, headache, confusion, rash
- **Bleeding** is not universally present, but can manifest as petechiae, bruising, oozing from venipuncture sites, blood in stool, and mucosal hemorrhage

10/7/2014

---

---

---

---

---

---

---

---

---

---

**Talk Infusion**  
The NHIA Membership Forum

### Severity of EVD

<p><b>Non-Fatal Disease</b></p> <ul style="list-style-type: none"> <li>• May have fever for several days and improve, typically around day 6</li> <li>• Patients that survive can have a prolonged convalescence</li> </ul>	<p><b>Fatal Disease</b></p> <ul style="list-style-type: none"> <li>• Develop more severe clinical signs early during infection</li> <li>• Death can occur between days 6 and 16 of complications including multi-organ failure and septic shock</li> <li>• Case fatality among patients in current West Africa outbreak is about 71%</li> </ul>
---	---

10/7/2014 Source: <http://www.cdc.gov/vhf/ebola/hcp/clinician-information-us-healthcare-settings.html>

---

---

---

---

---

---

---

---

---

---

**Talk Infusion**  
The NHIA Membership Forum

### EVD—Pathogenesis

- Ebola virus enters the patient through mucous membranes, breaks in the skin, or parenterally and infects many cell types, including *monocytes, macrophages, dendritic cells, endothelial cells, fibroblasts, hepatocytes, adrenal cortical cells and epithelial cells*
- Ebola virus migrates from the initial infection site to regional lymph nodes and subsequently to the liver, spleen and adrenal gland

10/7/2014

---

---

---

---

---

---

---

---

---

---

**Talk Infusion**  
The NHIA Membership Forum

### EVD Pathogenesis—Cellular Level

The diagram illustrates the cellular effects of Ebola virus. A central blue circle labeled 'Cellular Effects of Ebola Virus' is connected to four colored ovals: a red oval for 'Lymphocytes', a green oval for 'Hepatocytes', an orange oval for 'Adrenal Cortical Cells', and a purple oval for 'Proinflammatory Cytokines'. Each oval is associated with a list of effects:

- Lymphocytes:**
  - Undergo apoptosis
  - Results in decreased lymphocyte counts
- Hepatocytes:**
  - Hepatocellular necrosis occurs
  - Associated with dysregulation of clotting factors and subsequent coagulopathy
- Adrenal Cortical Cells:**
  - Adrenocortical necrosis occurs
  - Associated with hypotension and impaired steroid synthesis
- Proinflammatory Cytokines:**
  - Release triggered with subsequent vascular leak and impairment of clotting
  - Ultimately results in multi-organ failure and shock

10/7/2014

---

---

---

---

---

---

---

---

---

---

**Talk Infusion**  
 The NHIA Membership Forum

**EVD—Laboratory Findings on Admission**

- Leukopenia, often with lymphopenia followed later by ↑ neutrophils and a left shift
- Decreased platelet counts, 50,000 to 100,000 range
- ↑ Amylase, reflecting pancreatic inflammation/infection
- ↑ Hepatic transaminases with AST > ALT; these values may peak at more than 1,000 IU/L
- Proteinuria may be present
- Prolonged prothrombin (PT) and partial thromboplastin times (PTT) and fibrin degradation products are elevated, consistent with disseminated intravascular coagulation (DIC)

10/7/2014 10

---

---

---

---

---

---

---

---

---

---

**Talk Infusion**  
 The NHIA Membership Forum

**EVD Incubation Period**

- 2 to 21 days from exposure to Ebola until symptoms emerge; average is 8 to 12 days
- May be related to the infection route (e.g., average of 6 days from injection versus 10 days from direct contact)
- ***Patients do not transmit Ebola virus (are not infectious) until they show signs of illness***

10/7/2014 11

---

---

---

---

---

---

---

---

---

---

**Talk Infusion**  
 The NHIA Membership Forum

**CDC Case Definition for EVD**

**Person Under Investigation (PUI):** A person who has ***both*** consistent symptoms (clinical criteria) and risk factors as follows:

- Clinical criteria:
  - Fever >38.6 degrees Celsius or 101.5 degrees Fahrenheit
  - Additional symptoms such as severe headache, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage; **AND**
- Epidemiologic risk factors—one or more in < 21 days before symptoms:
  - Contact with blood or other body fluids or human remains of a patient known to have or suspected to have EVD
  - Residence in—or travel to—an area where EVD transmission is active\*
  - Direct handling of bats, rodents or non-human primates from disease-endemic areas

10/7/2014 Source: <http://www.cdc.gov/vhf/ebola/hcp/case-definition.html> 12

---

---

---

---

---

---

---

---

---

---

**Talk Infusion**  
 The NHIA Membership Forum




### Treatment of EVD

- No **approved** treatments are available
- Clinical management focuses on supportive care of complications (*hypovolemia, electrolyte abnormalities, hematologic abnormalities, refractory shock, hypoxia, hemorrhage, septic shock, multi-organ failure and disseminated intravascular coagulation [DIC]*)

10/7/2014 13

---

---

---

---

---

---

---

---

**Talk Infusion**  
 The NHIA Membership Forum




### Recommended Care:

- Volume repletion
- Maintenance of blood pressure
- Oxygenation
- Pain control
- Nutritional support
- Treatment of secondary bacterial infections
- Infection prevention and control measures—all bodily fluids and clinical specimens should be considered potentially infectious

10/7/2014 14

---

---

---

---

---

---

---

---

**Talk Infusion**  
 The NHIA Membership Forum




### Experimental Treatments for EVD

- Brincidofovir (Chimerix, U.S.)
  - Oral compound in Phase 3 trials for cytomegalovirus and adenovirus infections, not yet tested for Ebola in animals or humans
- ZMapp (Mapp Biopharmaceutical, U.S.)
  - Used successfully in several previous human cases however supply is currently depleted, unclear when it will be available for further study
- TKM-Ebola (Tekmira Pharmaceuticals Corp, Canada)
  - Given IV, primate studies are promising, human studies pending

Source: Modern Healthcare,  
[http://www.modernhealthcare.com/article/20141006/NEWS/310069984?AllowView=VD3UXk1SxVDdkICbkjYkY0M3hia09waVVZEF1ST0=Kulm\\_source=link-20141006-NEWS-310069984&utm\\_medium=email&utm\\_campaign=moddaily&utm\\_name=top](http://www.modernhealthcare.com/article/20141006/NEWS/310069984?AllowView=VD3UXk1SxVDdkICbkjYkY0M3hia09waVVZEF1ST0=Kulm_source=link-20141006-NEWS-310069984&utm_medium=email&utm_campaign=moddaily&utm_name=top)

10/7/2014 15

---

---

---

---

---

---

---

---

**Talk Infusion**  
 The NHIA Membership Forum

Protecting Health Care Workers and the Community

## PREVENTING THE SPREAD OF EVD

10/7/2014 16

---

---

---

---

---

---

---

---

**Talk Infusion**  
 The NHIA Membership Forum

### Ebola is Spread Through...

- Direct contact with blood and body fluids
  - Through broken skin or mucous membranes (mouth, nose, eyes)
  - Blood and body fluids = urine, feces, saliva, vomit, sweat, and semen\* of a person who is sick with Ebola
- Objects (like needles) that have been contaminated with the blood or body fluids of a person sick with Ebola

***Ebola is not spread through the air, water, or food.***  
***A person infected with Ebola cannot spread the disease until they have symptoms.***

10/7/2014 \*Ebola virus has been found in semen up to 3 months after recovery 17

---

---

---

---

---

---

---

---

**Talk Infusion**  
 The NHIA Membership Forum

### Controlling the Spread of Ebola Virus

- Early recognition is critical
- Health care providers (HCPs) should be alert for patients with symptoms of EVD **and** a potential exposure history
- Standard, Contact and Droplet Precautions should be immediately implemented if EVD is suspected
- Reporting of suspicious cases to the state or local health department is generally done by the prescribing physician when diagnostic testing is ordered

10/7/2014 Source: <http://www.cdc.gov/vhf/ebola/hcp/monitoring-and-movement-of-persons-with-exposure.html> 18

---

---

---

---

---

---

---

---







 **Talk Infusion**  
The NHIA Membership Forum 

### Questions?

- Please refer to the CDC's "Frequently Asked Questions" website at <http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/qa.html>
- Check back often to the CDC's Ebola webpages (<http://www.cdc.gov/vhf/ebola/>) for up-to-date information.

10/7/2014 28

---

---

---

---

---

---

---

---