Michigan Special Pathogens Response Network

April 1, 2016

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Symptoms & Presentation

- Prototype Viral Hemorrhagic Fever Pathogen
  - Filovirus: enveloped, non-segmented, negative-stranded RNA virus
  - Severe disease with high case fatality
- Absence of specific treatment or vaccine
- >20 previous Ebola and Marburg virus outbreaks
- 2014 West Africa Ebola outbreak caused by Zaire ebolavirus species (five known Ebola virus species)
Ebola viruses:
- Ebola virus (formerly Zaire virus)
- Sudan virus
- Tai Forest virus
- Bundibugyo virus
- Reston virus (non-human)

Human-to-human transmission is a predominant feature of epidemics.

Following initial human infection through contact with an infected bat or other wild animal, human-to-human transmission often occurs.
Human to Human Transmission

- Infected persons are not contagious until onset of symptoms
- Infectiousness of body fluids increases due to increased viral load as patients become more ill
- Human-to-human transmission of Ebola virus via inhalation has not been demonstrated
- However, respiratory protection (e.g. N-95, PAPR) is recommended in case there is an unexpected need to perform an aerosol-generating procedure (e.g. emergency intubation)
Ebola Virus Transmission

Direct Contact
• Through broken skin or unprotected mucous membranes with an Ebola-infected patient’s blood or body fluids
• Contact with the remains of a person who died of Ebola

Possible/Probable Contact
• From contact with semen from a man who has recovered from Ebola (for example, by having oral, vaginal, or anal sex)
• From contact with amniotic fluid in a woman who is currently infected or who has recently recovered

Indirect Contact
• Sharps injury with Ebola virus-contaminated needle or other sharp
• From an infected patient’s blood or body fluids via a contaminated object (soiled linens or used utensils)
2014 Ebola Outbreak in West Africa – Case Counts

- Countries with former widespread transmission and current, established control measures (as of January 10, 2016)

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Cases (Suspected, Probable, and Confirmed)</th>
<th>Laboratory-Confirmed Cases</th>
<th>Total Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guinea</td>
<td>3804</td>
<td>3351</td>
<td>2536</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>14122</td>
<td>8704</td>
<td>3955</td>
</tr>
<tr>
<td>Liberia</td>
<td>10675</td>
<td>3160</td>
<td>4809</td>
</tr>
<tr>
<td>Total</td>
<td>28601</td>
<td>15215</td>
<td>11300</td>
</tr>
</tbody>
</table>
# 2014 Ebola Outbreak in West Africa – Case Counts

- Previously affected countries (as of November 1, 2015)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Cases (Suspected, Probable, and Confirmed)</th>
<th>Laboratory-Confirmed Cases</th>
<th>Total Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nigeria</td>
<td>20</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>Senegal</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Spain</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>United States</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Mali</td>
<td>8</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Italy</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>36</strong></td>
<td><strong>34</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

**A country is considered to be free of Ebola virus transmission when 42 days (double the 21-day incubation period of the Ebola virus) has elapsed since the last patient in isolation became laboratory negative for EVD.
Traveler Health Monitoring - Timeline

- October 22, 2014 CDC announced that public health authorities will begin monitoring of travelers coming to the U.S. from West African Countries affected by the Ebola outbreak
- Travelers from those countries were directed to enter the country through one of five designated U.S. airports of entry New York JFK, New Jersey Newark, Washington Dulles, Atlanta, and Chicago O'Hare
- Travelers were screened upon departing the West African Country and upon entry into the United States
- Determine potential risk of Ebola Exposure Temperature/symptom check
- Collect contact information CARE (Check and Report Ebola) Kit
Traveler Health Monitoring - Timeline (cont’d)

• May 9, 2015 WHO declared the end of Ebola virus transmission in Liberia
• November 7, 2015 WHO declared the end of Ebola virus transmission in Sierra Leone
• December 29, 2015 WHO declared the end of Ebola virus transmission in Guinea
• CDC no longer recommended active monitoring for these travelers arriving in the United States
• Travelers in general from these countries are still screened upon departing the West African Country
Case Definitions

Person Under Investigation (PUI)

- A person who has both consistent signs or symptoms and risk factors as follows should be considered a PUI
- Elevated body temperature or subjective fever or symptoms, including severe headache, fatigue, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage

AND

- An epidemiologic risk factor within the 21 days before the onset of symptoms

Confirmed Case

- Laboratory-confirmed diagnostic evidence of Ebola virus infection

http://www.cdc.gov/vhf/ebola/hcp/case-definition.html
http://www.cdc.gov/vhf/ebola/hcp/international/case-definitions.html
Early Clinical Presentation

Acute onset

• Typically 8-10 days after exposure (range 2-21 days)

Signs and symptoms

• Initial: Fever, chills, myalgia, malaise, anorexia
• After 5 days: GI symptoms, such as nausea, vomiting, diarrhea, abdominal pain

Others

• Headache, conjunctivitis, hiccups, rash, chest pain, shortness of breath, confusion, seizures
• Hemorrhagic symptoms in 18% of cases (usually occur late)

Other possible infectious causes of symptoms

• Malaria, typhoid fever, meningococcemia, dengue, influenza, Lassa fever and other bacterial infections (e.g., pneumonia) - all very common in Africa
Diagnosis

Available diagnostic tests include:

- Polymerase chain reaction (PCR)
- Enzyme-linked immunosorbent assay (ELISA)
- IgM/IgG antibodies
- Virus isolation
- Immunohistochemistry testing (post-mortem exam: liver, spleen)
- It can take up to 3 days after onset of initial symptoms (usually fever) to detect the virus
Clinical Management of Ebola: Supportive but Aggressive

- Hypovolemia and sepsis pathophysiology
- Aggressive intravenous fluid resuscitation
- Hemodynamic support and critical care management if necessary
- Electrolyte and acid-base abnormalities
- Aggressive electrolyte repletion
- Correction of acid-base derangements

Symptomatic management of fever and gastrointestinal symptoms

- Avoid NSAIDs, aspirin
- Anti-emetics and antidiarrheal agents may be needed
- Multisystem organ failure can develop and may require
- Oxygenation and mechanical ventilation
- Correction of severe coagulopathy
- Continuous renal replacement therapy

Patient Recovery

• Case-fatality rate between 50%-70% in the 2014 Ebola outbreak
• Case-fatality rate is likely much lower with access to intensive care
• Patients who survive often have signs of clinical improvement by the second week of illness
• Associated with the development of virus-specific antibodies
• Antibody with neutralizing activity against Ebola persists greater than 12 years after infection

# Interim Guidance for Monitoring and Movement of Persons with Ebola Exposure

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Public Health Action</th>
<th>Monitoring</th>
<th>Restricted Public Activities</th>
<th>Restricted Travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH risk</td>
<td>Direct Active Monitoring</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>SOME risk</td>
<td>Direct Active Monitoring</td>
<td>Case-by-case assessment</td>
<td>Case-by-case assessment</td>
<td></td>
</tr>
<tr>
<td>LOW risk</td>
<td>Active Monitoring for some; Direct Active Monitoring for others</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>NO risk</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Traveler Health Monitoring - Michigan Summary as of January 20, 2015 (n=414)

- Monitoring begins on all travelers referred to MDHHS from the CDC.
- Once travelers are identified as having zero risk the monitoring is discontinued.
- Travelers who are identified as zero risk are included in the active monitoring totals.

Monitoring Type

- Active: 401
- Direct-Active: 13
Traveler Health Monitoring - Michigan Summary as of January 20, 2015 (n=414)
Defining Michigan Hospital Tier Levels

CARE OF PATIENTS WITH POTENTIAL EBOLA AND CONFIRMED EBOLA VIRUS DISEASE

TIER 1 – Identify, Isolate, Test, Treat, Receive Transfers

TIER 2 – Identify, Isolate, Test, Treat Ebola-positive Patient; May Receive Transfers from In-Network Facilities

TIER 3 – Identify, Isolate, Test, Care While Awaiting Results, TRANSFER Ebola-positive Patient

TIER 4 – Identify, Isolate, TRANSFER for Testing
Traveler Evaluation and Monitoring Program - Michigan

• As of December 29, 2015 Traveler Evaluation and Monitoring in Michigan has been discontinued
  • 414 total travelers were referred to Michigan’s Traveler Health Monitoring program
  • No traveler in Michigan was lost to follow-up
  • No traveler in Michigan was a Person Under Investigation (PUI)
  • No traveler in Michigan was tested for Ebola
Special Pathogens Response Network

- Provide technical assistance for Ebola Virus Disease and other special pathogens
  - Schedule site visits to all hospitals with Emergency Departments
  - Review 12 domains in CDC assessment guide
- Facility is able to access grant funds after site visit
- Continue technical assistance to assure CONOPS development, assure hospital protocols are maintained/updated, facility exercise completion
- Provide support to exercise planning, educational conferences

★★ Fall 2015 Technical Site Visits
Pre-Hospital, EMS, ED Preparedness

• Screen for travel, symptoms
  • Isolate immediately
• Protocols for patient transfer
• EMS protocols: entry points, care of ambulance, transfer protocols
• Personal Protective Equipment
  • Based on clinical status
  • Log of isolation entry/egress
Staffing, Training and Monitoring

- Identify a team
- Develop training, schedule of training
- Create staffing schedule
  - Tier 1, 2 for patient length of stay
  - Tier 3 for 96 hours
  - Tier 4 for 24 hours
- Develop worker safety program
  - Post exposure protocol
  - Personnel work restrictions
Patient Placement

- Define transport route and plan
- Identify patient care area
  - Room with toilet/commode
  - Negative air
  - Lab area
  - Area to don/doff PPE
  - Emergency evacuation of patient
Personal Protective Equipment (PPE)

based on patient’s clinical status

- Compliance with MIOSHA
- Hospital scrubs, remove personal items, washable footwear
- Completely cover skin; wear respirator if aerosolization
- “Buddy” or trained observer to assist with don/doff PPE
Laboratory Safety and Capacity

- Complete a site specific risk assessment
- Develop phlebotomy protocol
- Testing for Malaria, flu, CBC, lytes, liver enzymes, coags
- Defined transport plan for lab specimen
  - In building
  - To state
- Use Biosafety cabinet
Environmental Infection Control

- EPA registered disinfectant
- Training for team
- Post discharge cleaning protocol
  - Log all items cleaned
- Linen and food trays in waste stream
Management of Waste

**Solid**
- Limited handling
- Define safe transfer route
- Define separate storage area
- Autoclave/incinerator
- Waste contractor permit

**Liquid**
- Per local regulations
- Add bleach per protocol if necessary
- Develop protocol if using Bedside commode
Communications

- Patient
  - Communication with family
- Defined HIPPA compliance method
- Employees
  - Ways to disseminate new plans, communications
  - Scripting communication with patients
  - Communication to patient
- Media
Special Care

• Care of the deceased
  • Family
  • Body identification
  • Body seal; implanted devices remain
  • Hand off to morticians
  • Cremation

• Special Populations
  • OB, Peds
  • Surgical Intervention
  • Dialysis
  • Behavioral Health
Summary

- Travel screening is important
- Develop protocols for all domains
- Site manager plays major support role
- Continue staff training
- Contact Local Public Health early
References

- [www.michigan.gov/ebola](http://www.michigan.gov/ebola)
- [www.cdc.gov/ebola](http://www.cdc.gov/ebola)
- [www.who.int/ebola](http://www.who.int/ebola)
- [https://asprtracie.hhs.gov](https://asprtracie.hhs.gov)
- [http://netec.org](http://netec.org)
- Latest News
  - March 2016 2 Ebola related deaths in Guinea
  - Continue Screening
- What’s Next
  - [http://www.michigan.gov/emergingdiseases/](http://www.michigan.gov/emergingdiseases/)
THANK YOU!

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