Amplification of Viral Hemorrhagic Fever Viruses in Health Care Settings

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Viral Hemorrhagic Fever (VHF) Viruses

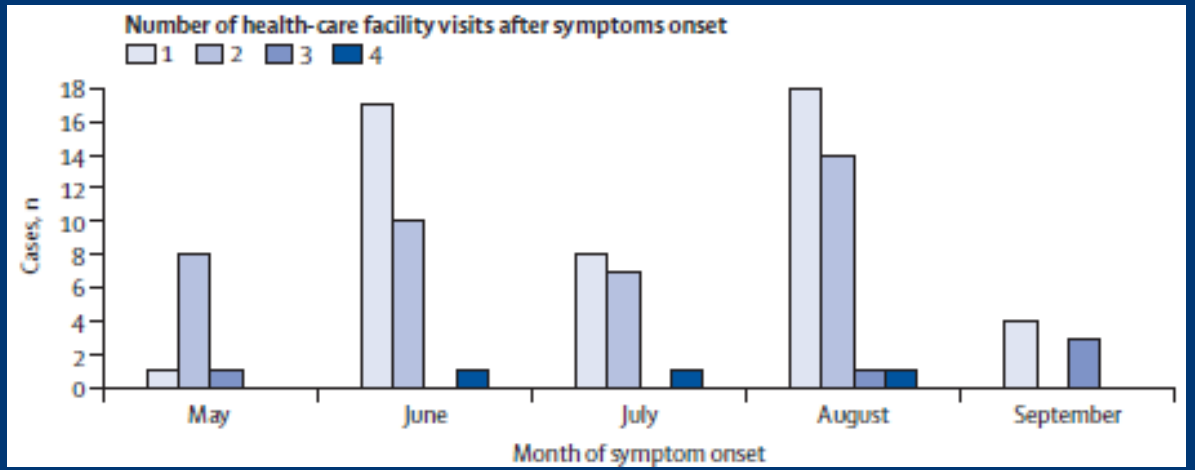
- Zoonotic viruses, spread person-to-person
- Frequently cause illness resulting in severe morbidity or mortality
- Have no or limited medical countermeasures
- Fever, malaise, fatigue, muscle/joint pain → vomiting/diarrhea → +/- hemorrhage, multi-system organ failure, shock → death
- Examples: filoviruses, arenaviruses

Amplification of VHFs in Health Care Settings

- **Amplification in health care settings is common in VHF outbreaks**
- **Cluster of illness among healthcare workers (HCWs) is often the first indication of a VHF outbreak**
  - Cluster of illness in 17 individuals in Democratic Republic of Congo (DRC); initially attributed to typhoid fever => Ebola virus
  - Cluster of illness in 5 individuals (including 3 HCWs) in La Paz, Bolivia => Chapare virus

Factors Contributing to VHF Amplification in Health Care settings: Care Seeking Behavior

- **VHF patients exhibit high care-seeking behavior because they have an illness that cannot be adequately treated by their usual sources of care**



Factors Contributing to VHF Amplification in Health Care settings: Infection Prevention and Control (IPC)

- **Poor IPC practices have propagated VHF outbreaks**
  - 1976 Yambuku DRC: outbreak spread through the reuse of needles at a medical clinic
  - 2018 North Kivu DRC outbreak: poor IPC practices contributed to nosocomial transmission of Ebola virus and prolongation of the outbreak
- **Insufficient quantities of personal protective equipment**

Factors Contributing to VHF Amplification in Health Care settings: VHFs are difficult to diagnose

- **Rare diseases**
  - DRC: 15 filovirus outbreaks/48 years
  - Last 5 Marburg outbreaks occurred in countries who have never previously reported cases
  - Imported VHF cases to the U.S: **14** (4 Ebola, 1 Marburg, 9 Lassa)
- **Rare diseases occurring in countries where diseases with similar signs and symptoms are endemic**
  - DRC: 27 million malaria cases/year
  - DRC: ~300,000 typhoid cases/year

Factors Contributing to VHF Amplification in Health Care settings: VHFs are difficult to diagnose

- **No single sign or symptom is pathognomonic**
  - Hemorrhage seen in <50% of cases
  - Key to diagnosis is eliciting risk factors
- **Patients may not recognize or acknowledge VHF risk factors**
  - Unrecognized exposures/PPE breach
  - Misinformation

Factors Contributing to VHF Amplification in Health Care settings: VHFs are difficult to diagnose

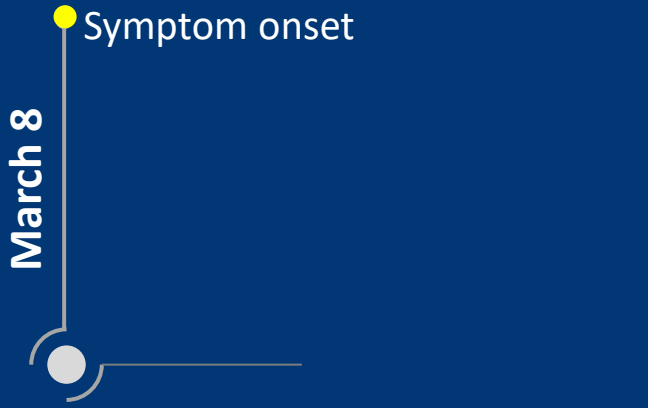
- **Disease is rapidly fatal without treatment**
  - Filoviruses: illness onset to death is 7-10 days
  - Arenaviruses: illness onset to death is 10-14 days
- **Limited VHF testing capacity**
  - Centralized testing
  - No in-country testing capacity

Identifying Patient Zero

- **39 orthoebolavirus outbreaks consisting of >1 confirmed case***
- **Patient Zero reported for 16/38 (41%)**
  - All patient zeros were identified retrospectively
  - Median time from symptom onset for Patient Zero to outbreak declaration: 45 days (range:6-118 days)

*Excluding laboratory accidents;

Marburg Virus Transmission — 44-year-old Male



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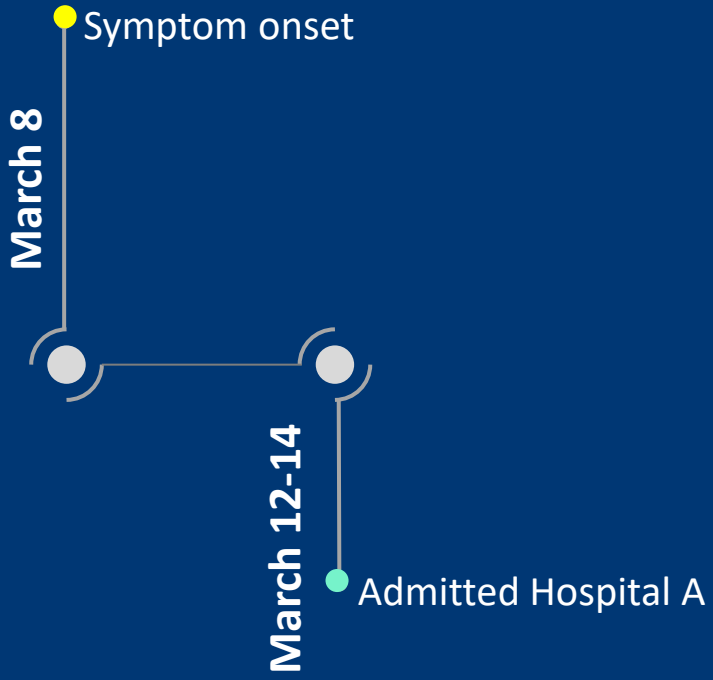

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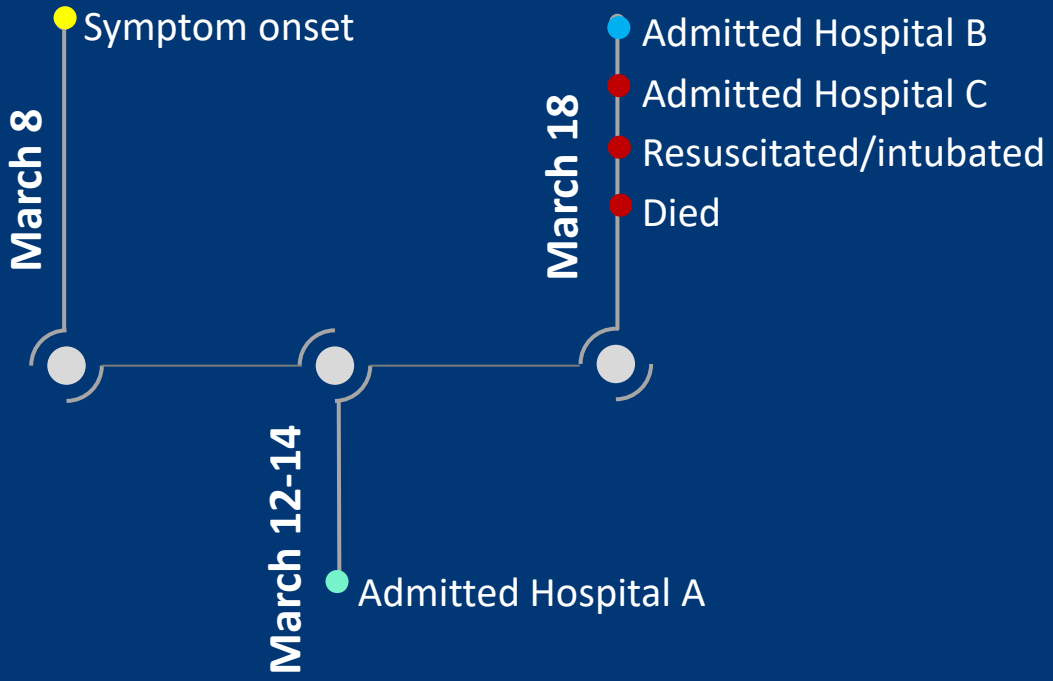

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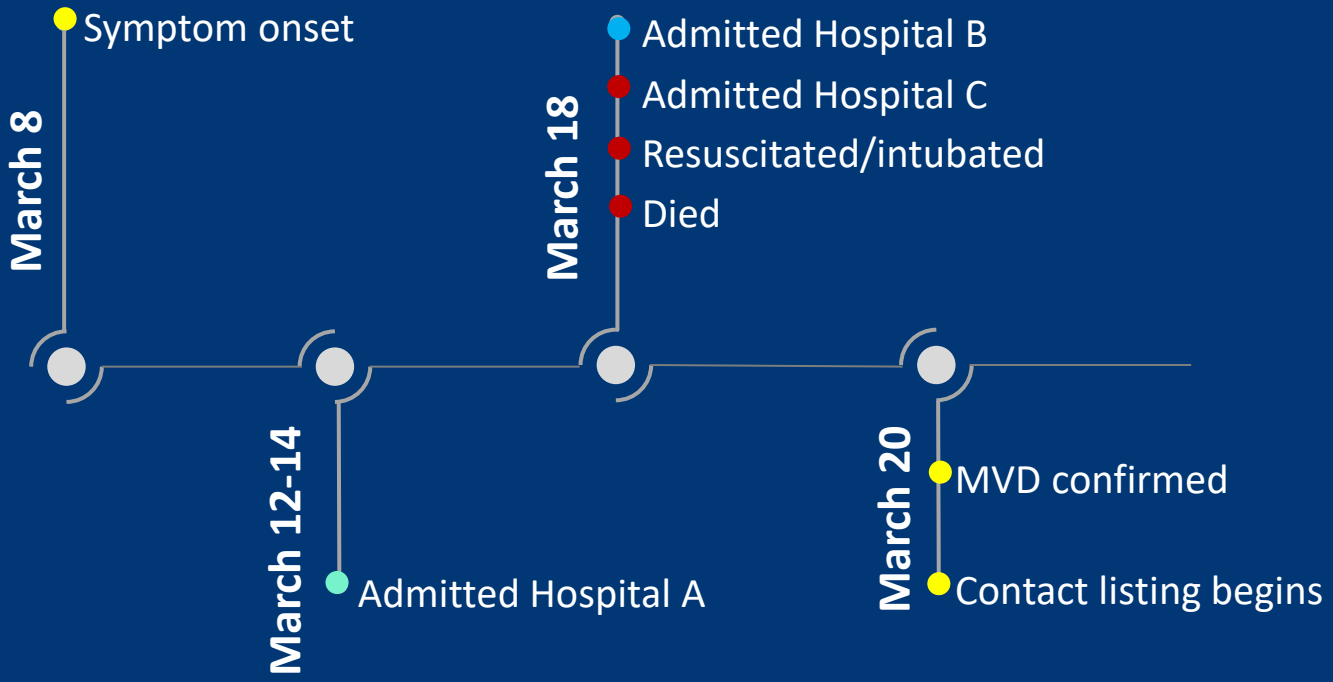

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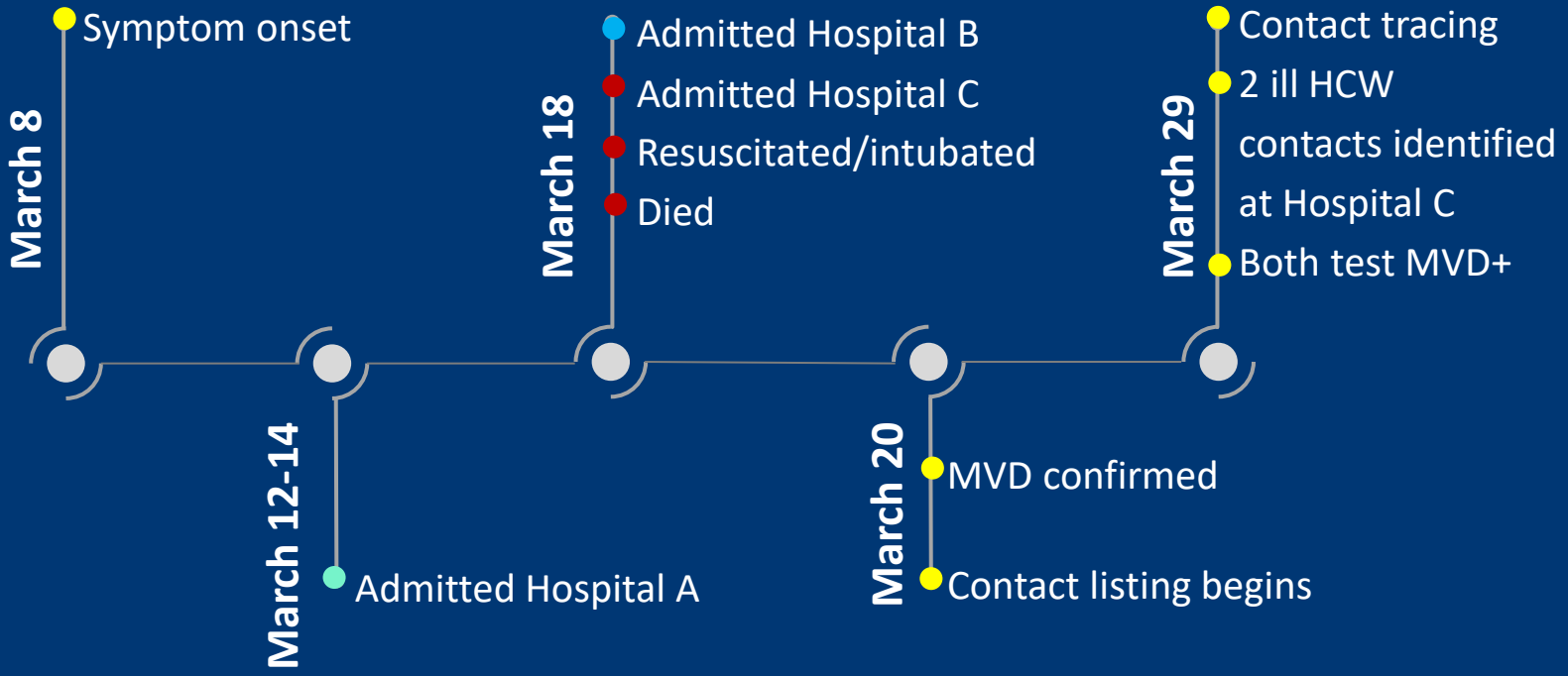

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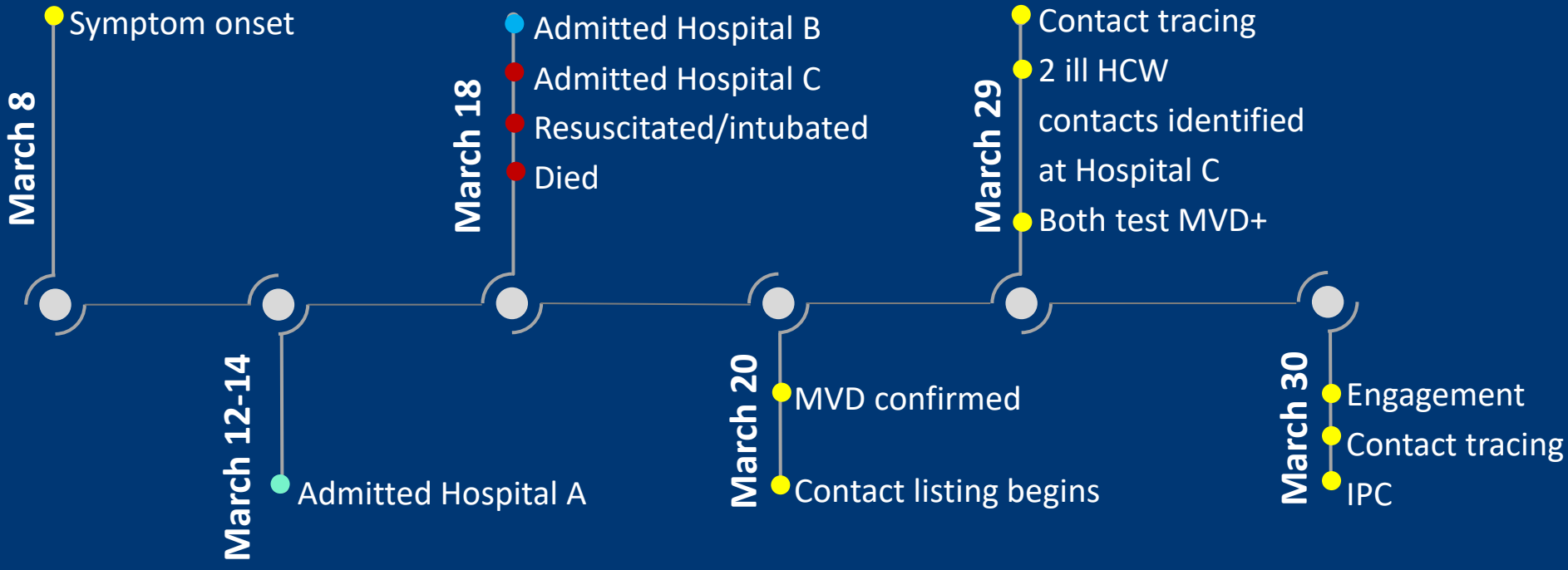

Marburg Virus Transmission — 9-year-old female

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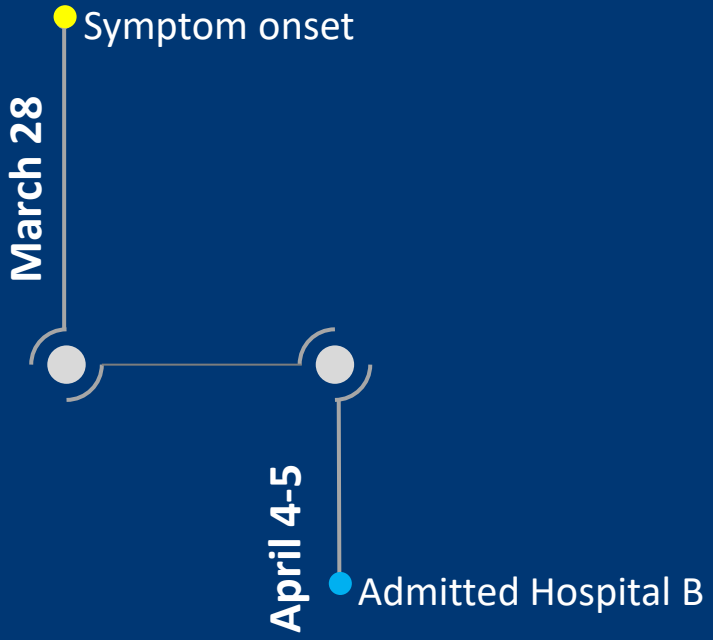

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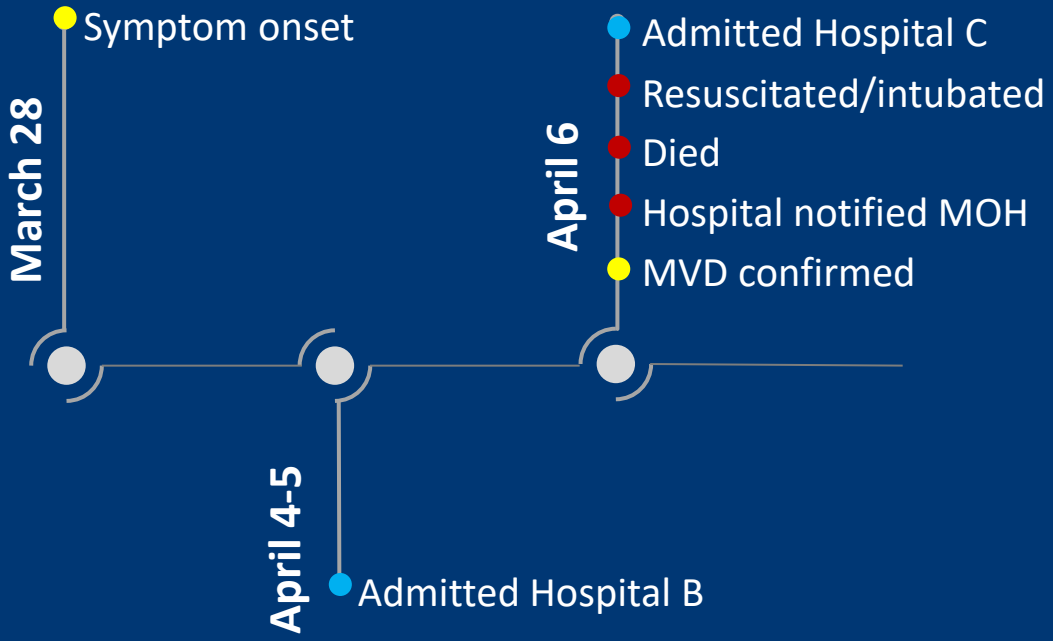

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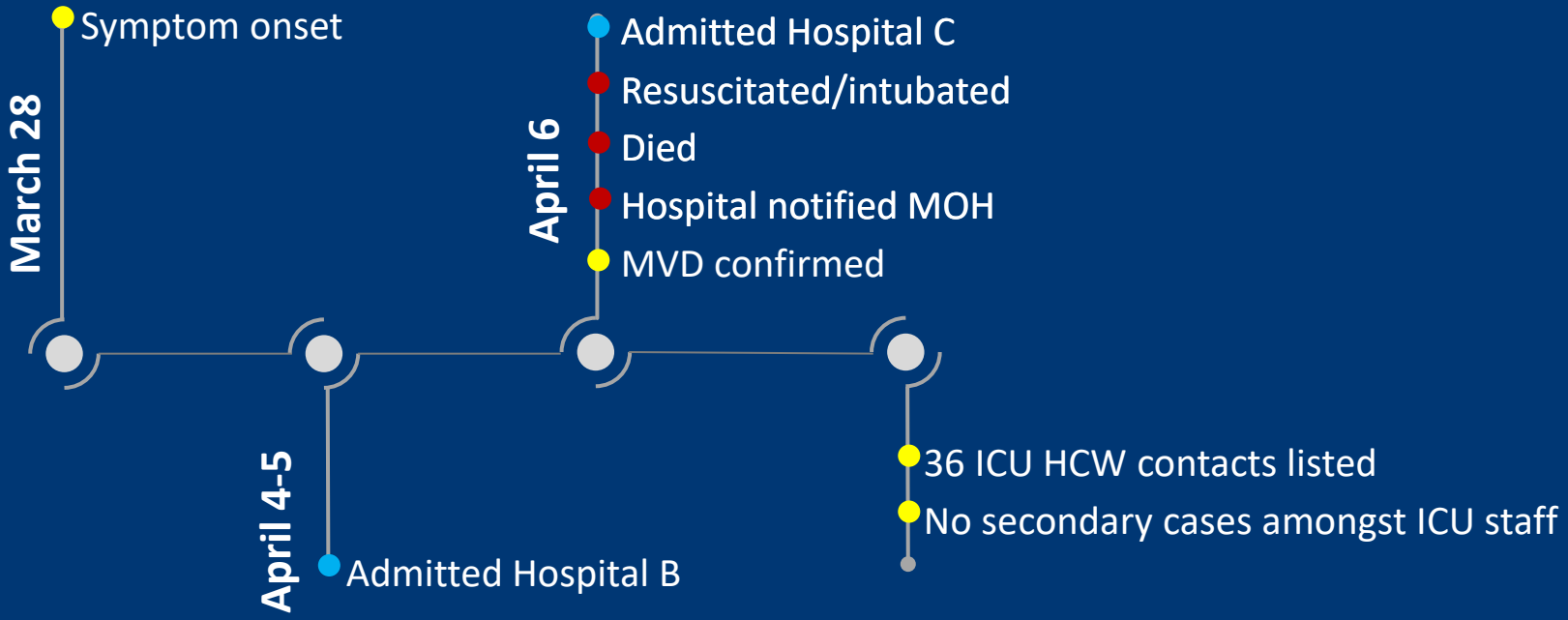

Compare and Contrast

Characteristic	44 year-old male	9 year-old female
Awareness of ongoing MVD outbreak?	No	Yes
Awareness of MVD?	No	Yes
Identified MVD risk factors in patient?	No	No

Conclusions

- Amplification in health care settings is common in VHF outbreaks
- Factors contributing to VHF amplification in health care settings is mult-factorial
- Identifying Patient Zero is challenging
- Awareness about VHFs and ongoing outbreaks plays a key role in the early recognition of cases
- Strict adherence to standard precautions is critical when caring for any patient

Thank You

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 cdc.gov
Follow us on X (Twitter) @CDCgov & @CDCEnvironment

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the U. S. Centers for Disease Control and Prevention.

Resources

- About Viral Hemorrhagic Fevers | Viral Hemorrhagic Fevers (VHFs) | CDC
- Outbreak History | Ebola | CDC
- Guide for Clinicians Evaluating an Ill Person for VHF or Other High-Consequence Disease | Viral Hemorrhagic Fevers (VHFs) | CDC
- Infection Prevention and Control Recommendations for Patients in U.S. Hospitals who are Suspected or Confirmed to have Selected Viral Hemorrhagic Fevers (VHF) | Viral Hemorrhagic Fevers (VHFs) | CDC
- Guidance for Personal Protective Equipment (PPE) | Viral Hemorrhagic Fevers (VHFs) | CDC

Extra Slides

THINK EBOLA IF YOU SEE:

1

Fever and bleeding.

Unexplained bleeding and death.

Several seriously ill patients from the same family or social group.

ASK YOUR PATIENTS:

2

Hunter?

Contact with or ate bush meat?

Work in a mine?

Contact with a sick or dead person?

Contact with personal items of a sick or dead person?

Went to a burial or touched a dead body?

Recovered from Ebola in the past?

Sexual contact with someone who recovered from Ebola?

ACT QUICKLY.

Isolate patients.

Notify public health officials:

3

If there is a death of a suspect Ebola patient:

- Close the area to ensure nobody comes in contact with the body.
- Do not give the body to the family. It may still be very contagious.
- Do not reuse objects that were in contact with the body (gloves, bed linens, and needles).

CDC

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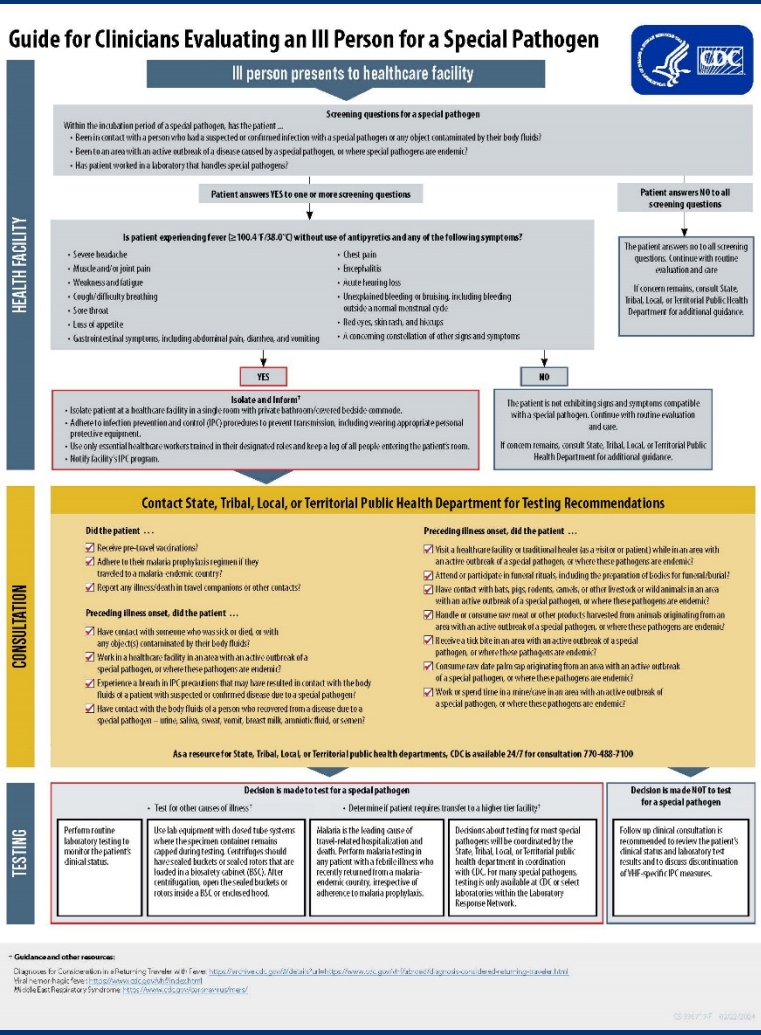
Guide for Clinicians Evaluating an Ill Person for a Special Pathogen
CDC
HEALTH FACILITY
Ill person presents to healthcare facility
Screening questions for a special pathogen
Within the incubation period of a special pathogen, has the patient ...
• Been in contact with a person who had a suspected or confirmed infection with a special pathogen or any object contaminated by their body fluids?
• Been to an area with an active outbreak of a disease caused by a special pathogen, or where special pathogens are endemic?
• Has patient worked in a laboratory that handles special pathogens?
Patient answers YES to one or more screening questions
Patient answers NO to all screening questions
Is patient experiencing fever (≥ 100.4 °F/38.0°C) without use of antipyretics and any of the following symptoms?
• Severe headache
• Muscle and/or joint pain
• Weakness and fatigue
• Cough/difficulty breathing
• Sore throat
• Loss of appetite
• Gastrointestinal symptoms, including abdominal pain, diarrhea, and vomiting
• Chest pain
• Encephalitis
• Acute hearing loss
• Unexplained bleeding or bruising, including bleeding outside a normal menstrual cycle
• Red eyes, skin rash, and hiccups
• A concerning constellation of other signs and symptoms
The patient answers no to all screening questions. Continue with routine evaluation and care
If concern remains, consult State, Tribal, Local, or Territorial Public Health Department for additional guidance.
YES
NO
Isolate and Inform†
• Isolate patient at a healthcare facility in a single room with private bathroom/covered bedside commode.
• Adhere to infection prevention and control (IPC) procedures to prevent transmission, including wearing appropriate personal protective equipment.
• Use only essential healthcare workers trained in their designated roles and keep a log of all people entering the patient's room.
• Notify facility's IPC program.
The patient is not exhibiting signs and symptoms compatible with a special pathogen. Continue with routine evaluation and care.
If concern remains, consult State, Tribal, Local, or Territorial Public Health Department for additional guidance.
CONSULTATION
Contact State, Tribal, Local, or Territorial Public Health Department for Testing Recommendations
Did the patient ...
Receive pre-travel vaccinations?
Adhere to their malaria prophylaxis regimen if they traveled to a malaria-endemic country?
Report any illness/death in travel companions or other contacts?
Preceding illness onset, did the patient ...
Have contact with someone who was sick or died, or with any object(s) contaminated by their body fluids?
Work in a healthcare facility in an area with an active outbreak of a special pathogen, or where these pathogens are endemic?
Experience a breach in IPC precautions that may have resulted in contact with the body fluids of a patient with suspected or confirmed disease due to a special pathogen?
Have contact with the body fluids of a person who recovered from a disease due to a special pathogen – urine, saliva, sweat, vomit, breast milk, amniotic fluid, or semen?
Preceding illness onset, did the patient ...
Visit a healthcare facility or traditional healer (as a visitor or patient) while in an area with an active outbreak of a special pathogen, or where these pathogens are endemic?
Attend or participate in funeral rituals, including the preparation of bodies for funeral/burial?
Have contact with bats, pigs, rodents, camels, or other livestock or wild animals in an area with an active outbreak of a special pathogen, or where these pathogens are endemic?
Handle or consume raw meat or other products harvested from animals originating from an area with an active outbreak of a special pathogen, or where these pathogens are endemic?
Receive a tick bite in an area with an active outbreak of a special pathogen, or where these pathogens are endemic?
Consume raw date palm sap originating from an area with an active outbreak of a special pathogen, or where these pathogens are endemic?
Work or spend time in a mine/cave in an area with an active outbreak of a special pathogen, or where these pathogens are endemic?
As a resource for State, Tribal, Local, or Territorial public health departments, CDC is available 24/7 for consultation 770-488-7100
TESTING
Decision is made to test for a special pathogen
• Test for other causes of illness*
• Determine if patient requires transfer to a higher tier facility†
Perform routine laboratory testing to monitor the patient's clinical status.
Use lab equipment with closed tube systems where the specimen container remains capped during testing. Centrifuges should have sealed buckets or sealed rotors that are loaded in a biosafety cabinet (BSC). After centrifugation, open the sealed buckets or rotors inside a BSC or enclosed hood.
Malaria is the leading cause of travel-related hospitalization and death. Perform malaria testing in any patient with a febrile illness who recently returned from a malaria-endemic country, irrespective of adherence to malaria prophylaxis.
Decisions about testing for most special pathogens will be coordinated by the State, Tribal, Local, or Territorial public health department in coordination with CDC. For many special pathogens, testing is only available at CDC or select laboratories within the Laboratory Response Network.
Decision is made NOT to test for a special pathogen
Follow up clinical consultation is recommended to review the patient's clinical status and laboratory test results and to discuss discontinuation of VHF-specific IPC measures.
* Guidance and other resources:
Diagnoses for Consideration in a Returning Traveler with Fever: https://archive.cdc.gov/#/details?url=https://www.cdc.gov/ncezid/dpd/medical-diagnosis-considered-returning-traveler.html
Viral hemorrhagic fever: https://www.cdc.gov/vhf/index.html
Middle East Respiratory Syndrome: https://www.cdc.gov/coronavirus/mers/

CDC
@CDCgov

The Ebola Exposure Window Calculator, an app created by CDC and the @JohnsHopkins Applied Physics Lab, guides #DRC #Ebola case investigations by reliably calculating when a patient was likely to have been exposed to the virus. Available on iOS & Android: bit.ly/2vkzPgO.