EMERGING INFECTIOUS DISEASE (EID) FRONTLINE FACILITY TRAINING

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OBJECTIVES

- 1. Explore emerging infectious diseases of concern that may warrant treatment in a biocontainment unit (BCU)
- 2. Be familiar with the Three-tiered Approach and LA County's EID Activation and Response Plan
- 3. Develop systems to mitigate the potential spread of an emerging, highly infectious disease when a patient self presents to a frontline healthcare facility
- 4. Learn waste management procedures for Category A substances
- 5. Learn PPE donning and doffing principles for viral hemorrhagic fevers

DISCLAIMER

The information presented here was taken from ASPR TRACIE's Frontline Hospital Planning Guide for Special Pathogens developed to assist frontline facilities to effectively Identify, Isolate, and Inform when a suspected case presents to an acute care facility. I, nor the authors of the guidebook, take no responsibility and bear no liability for any clinical care outcomes, provider injury/illness, or inaccuracies in or resulting from this training.

EMERGING INFECTIOUS DISEASE/SPECIAL PATHOGENS

Diseases that are:

- Recognized in the human host for the first time
- Reappear after apparent control or elimination
- Infectious, highly hazardous, and communicable



Pathogens that might warrant care in the BCU or other specialized care areas



- Airborne Agents Causing Severe Respiratory Syndromes Eg. SARS, MERS, novel influenza
- Certain Orthopoxviruses
 - Smallpox, monkeypox
- A Few Miscellaneous Pathogens (Nipah, Hendra)
- Pathogens Raising Political or Assuredness Concerns
- Andromeda... the unknown pathogen

2017-2019 SPECIAL PATHOGEN OUTBREAKS



Global travel means the next special pathogen is a flight away



MODE OF TRANSMISSION

Contact or Fomites:

Ebola Marburg Lassa Other VHFs Variola Monkeypox MERS? SARS?



Droplets: Ebola? Influenza SARS Monkeypox? MERS Marburg? Nipah Hendra?

Droplet Nuclei: Variola SARS? MERS?

VIRAL HEMORRHAGIC FEVERS

Filoviruses	Arenaviruses	Bunyaviruses	Flaviviruses
Ebola Marburg	Lassa Lujo Junin Machupo Guanarito Sabia	CCHF Hantaviruses	RSSE CEE TBE Complex Kyasanur Forest Omsk

Red = transmissible from PTP; Green = transmissible only via rodents or arthropod vectors

Viral Hemorrhagic Fever



Source: WRAIR Operational Clinical Infectious Diseases Course, 2016.

VHF Misconceptions

Misconception

They all have the same features

Misconception

They all spread easily

Misconception

They are easily recognizable

Misconception

Bleeding is the primary cause of death



EBOLA IN THE DEMOCRATIC REPUBLIC OF THE CONGO (DRC)



Confirmed and probable Ebola virus disease cases by week of illness onset, data as of December 2019



WHAT DO WE KNOW ABOUT EBOLA?

- Average mortality rate in Africa is 50%¹
 - Lack of supportive care and technological medical advancements
 - Resource poor nations
- Spread through direct contact
- Symptoms usually appear 8-10 days after exposure, but the incubation period can span up to 21 days
- People are not infectious until they develop symptoms
- Virus remains persistent even after recovery

1. World Health Organization, Fact Sheets Ebola Virus Disease, http://www.who.int/news-room/fact-sheets/detail/ebola-virus-disease

Table 1. Common symptoms, signs, and laboratory test abnormalities in Ebola virus disease*

Symptoms	Signs	Laboratory Test Abnormalities
Fever (87%)	Elevated temperature	Leukopenia→leukocytosis, atypical lymphocytosis
Fatigue (76%)	Pulse temperature dissociation	Thrombocytopenia
Vomiting (68%)		Transaminitis (AST>ALT)
Diarrhea (66%)		Hyponatremia
Loss of appetite (65%)		Hypokalemia
Headache (53%)		Hypocalcemia
Abdominal pain (44%)		Elevated BUN and creatinine
Arthralgias (39%)		Lactic acidosis
Myalgias (39%)		Prolonged INR and PTT
		Hypoalbuminemia

Source: Annals of the American Thoracic Society, Clinical Presentation and Management of Severe Ebola Virus Disease, 2014.

CARING FOR VHF

Multidisciplinary team

- Pre-hospital care team
- Nurses
- MDs
- Infection Control/EVS/Lab/Respiratory therapists/Pharmacy
- Office of the Chief Medical Examiner
- Collaboration with infectious disease- NIH/CDC
- Department of Health

TREATMENT



- Early rehydration
- Oxygen therapy
- Supportive care
- Antibiotics to treat other infections
- Continuous renal replacement therapy (CRRT)
- Zmapp, Mab114, REGN-EB3
- Preventative ERVBO vaccine





BEYOND VHF: OTHER SPECIAL PATHOGENS

Family	Examples
Coronaviruses	SARS, MERS-CoV
Avian & Novel Influenza Viruses	H7N9
Henipaviruses	Nipah, Hendra
Orthopoxviruses	Smallpox, Monkeypox

RESPIRATORY ILLNESSES

The Coronaviruses



SEVERE ACUTE RESPIRATORY SYNDROME (SARS)

- Produces severe lower respiratory tract illness
- Appeared in China in 2002
- Ultimately affected 37 nations, including US & Canada
- No reported cases since 2004
- 8273 total cases recorded
 - 775 deaths
 - 27 US cases (no deaths)
- Overall mortality was 9.6%



CLINICAL MANIFESTATIONS OF SARS

- Incubation period 2-7 days
- Presents with flu-like symptoms with fever
 - > 100.4
- Headache
- Body aches
- Diarrhea
- Pneumonia







A new virus related to SARS is the culprit in China's mysterious pneumonia outbreak, scientists say



By Nectar Gan, CNN () Updated 5:38 AM ET, Thu January 9, 2020



2019 Novel Coronavirus (2019-nCoV)

Criteria	Symptoms	Additional Criteria
1	Fever <i>and</i> symptoms of respiratory illness (cough, SOB, etc)	-AND-
		History of travel to Wuhan within 14 days
		-OR-
		Within 14 days, close contact ¹ with <i>possible</i> 2019-nCoV patient while patient was ill.
2	Fever <i>or</i> symptoms respiratory illness (cough, SOB, etc)	-AND-
		Within 14 days, close contact ¹ with a <i>lab confirmed</i> 2019- nCoV patient while patient was ill.

¹Close contact: within 6 feet or within room of a 2019-nCoV case while not wearing PPE. Living with a case, visiting, sharing waiting room or room. Or contact with respiratory secretions.

MERS



http://www.who.int/csr/disease/coronavirus_infections/maps-epicurves/en/.

Novel Coronavirus Transmission



NOVEL INFLUENZA VIRUSES

- Four types: A, B, C, & D
- Type A & B seasonal epidemics during winter
- Type C cause mild illness
- Type D affect cattle and not humans
- Influenza A
 - H1N1, H7N9, H5N1, H3N2
 - Linked to flu pandemics: Spanish flu of 1918, H1N1 in 2009





Risk Factors for Novel Influenza Emergence

Pigs harbor human strains



Pigs harbor avian strains



Pigs thus serve as "mixing vessels"



Antigenic shift occurs in the pig



 The fear: a new virus with human affinity and avian mortality



HENIPAVIRUSES

- Hendra and Nipah Viruses
- Bats are reservior
- Incubation period 5-16 days
- Symptoms: Influenza-like
- Causes fatal encephalitis in humans



NIPAH

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ORTHOPOXVIRUSES: SMALLPOX AND MONKEYPOX





SMALL POX

- Dates back to Egyptian Empire 3rd century BC
- Last naturally occurring outbreak in 1977
- Declared eradicated since 1980 due to worldwide

vaccination campaign to eradicate the disease





MONKEYPOX

- Endemic to Central and West Africa
- Incubation period 7-14 days
- S/S begins with fever, headache, muscle aches, fatigue, swollen lymph nodes; rash develops 1-3 days after fever onset
- Transmission: contact & droplets
- 47 cases in the United States in 2003

Some would advocate admitting patients with Monkeypox to a BCU at least until Smallpox can be ruled out



Disease X (aka The Andromeda Strain)

Patients with unknown diseases could be admitted to a Biocontainment Unit



At the time of their initial outbreaks, these could have been "Andromeda Strains"

- Nipah
- Hendra
- SARS
- MERS
- Sin Nombre
- Many others

PERSONAL PROTECTIVE EQUIPMENT

Type of Precautions	PPE
Standard	gloves, gown, simple mask ¹ , goggles or face shield (exact ensemble determined by the type of clinical interaction with the patient and patient signs and symptoms) ^{2,3}
Contact	fluid-resistant gown, gloves ²
Droplet	simple mask, eye protection (eye protection not required but recommended by most sources) ²
Airborne	fit-tested N95 or equivalent/higher respirator or powered air-purifying respirator (PAPR) ^{2,4}



SPECIAL PATHOGEN LEVEL 1 PPE

- Fit tested N95 mask
- Fluid resistant gown that extends to mid-calf
- Nitrile gloves with extended cuffs 2 pairs
- Face shield
- Consider boot covers and head cover

