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High consequence infectious diseases – what are they and why do they matter?

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- No conflicts of interest.

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Objectives

- Understand the significance and key features of high consequence infectious diseases (HCIDs)
- Understand approaches to prompt recognition of and initial management of HCIDs

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Outline

1. Importance of preparing for high consequence infectious diseases (HCIDs)
2. Definition of an HCID
3. Key considerations for prompt recognition and initial management of HCIDs
4. Models of care for management of HCIDs

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A case

May 2015

- 55 year-old man recently returned from a trip to West Africa.
- Underwent entry screening at US airport and was afebrile.
- One day after return, he presented to a hospital with fever, chills, myalgias, and sore throat.

Life threatening	Treatable	Transmissible
Malaria Meningococcemia Bacterial sepsis Dengue fever High consequence infectious disease	Malaria Typhoid and paratyphoid fever Rickettsial infections Meningococcemia Bacterial pharyngitis Influenza COVID-19	Tuberculosis Measles Varicella High consequence infectious disease

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A case

- Exposures: worked in a diamond mine in Liberia, had direct contact with rodents and rodent excreta

Exam

- T 103.1 ^{o}F, BP 159/79, HR 101 bpm, RR 20 breaths/min
- Pharyngeal erythema with exudates
- Tender cervical lymphadenopathy

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Day after initial medical evaluation	Max temp (°F)	WBC count (cells/mm^3)	Platelet count (cells/mm^3)	Potassium (mEq/L)	BUN (mg/dL)	Creatinine (mg/dL)	ALT (U/L)	AST (U/L)	INR
0	103.1	9,100	153,000	3.8	14	1.1	88	219	–
3	102.6	5,100	189,000	3.5	9	1.0	600	1,347	–
4	100.6	8,700	198,000	3.9	9	0.7	822	1,956	–
5	102.5	11,800	247,000	3.7	9	0.7	1,998	4,952	1.3
6	104.7	26,700	224,000	3.9	22	2.3	2,154	6,620	2.2
7	102.8	41,300	95,000	2.9	71	6.0	–	–	–

ALT = alanine aminotransferase; AST = aspartate aminotransferase; BUN = blood urea nitrogen; date of patient expiration = day 7 after initial medical evaluation; INR = international normalized ratio; Max temp = maximum temperature; WBC = white blood cell.

Microbiological workup

- Streptococcus pyogenes rapid test negative
- Monospot negative
- Malaria blood smear and antigen negative
- HIV Ab/Ag negative
- Hepatitis A-E negative
- Blood cultures no growth

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Viral hemorrhagic fever testing by RT-PCR sent to CDC

- Ebola virus negative
- Marburg virus negative
- Crimean-Congo hemorrhagic fever virus negative
- **Lassa virus positive**

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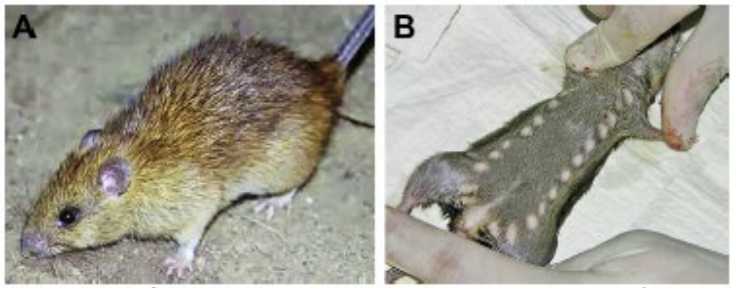
Exposure investigation

Description of contacts of Lassa fever case-patient by type and risk level — New Jersey, May 2015

	High risk	Low risk	Total
Type of contact			
Family or community members	13	13	26
Health-care personnel	2	149	151
Total	15	162	177

Source: Kulkarni PA et al. Am J Trop Med Hyg 2018;99(5):1062-1065.

Lassa fever



Animal reservoir: *Mastomys* rodent

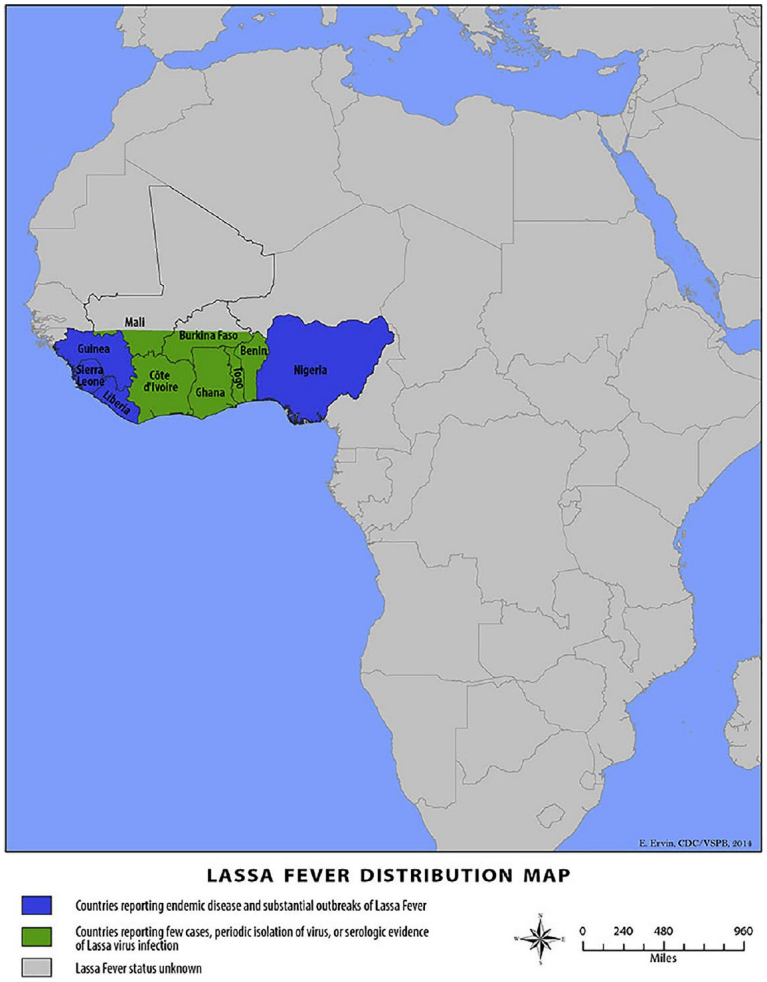


Fig. 1. Map of Africa – geographic distribution of Lassa fever. (*Courtesy of* the Centers fo Disease Control. Lassa fever CDC. http:/www.cdc.gov/vhf/lassa/outbreaks. Accessed 6th August 2019.)

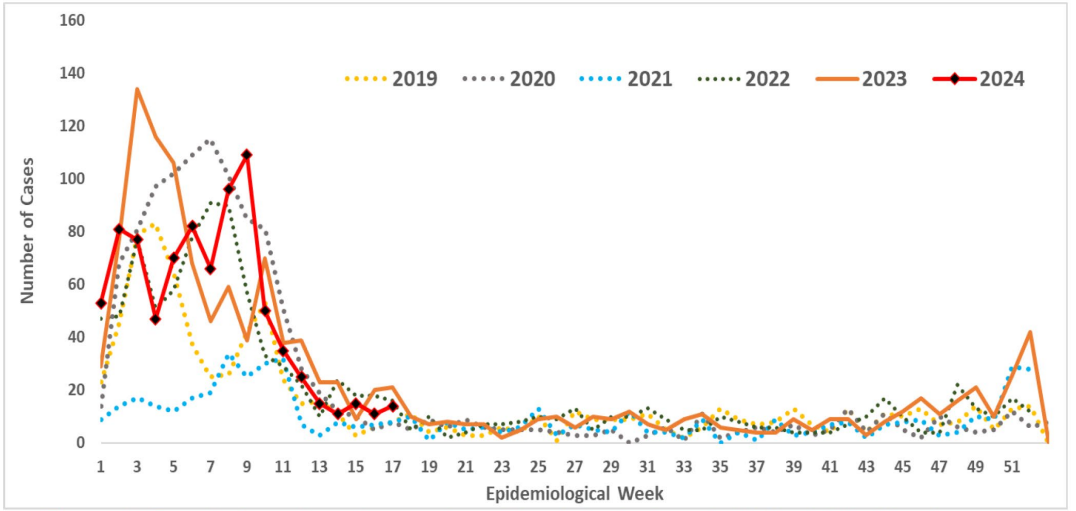


Figure 6: Trend of confirmed cases by epidemiological week, 2019– 2024, Nigeria

- Endemic to West Africa
- 500,000 cases, 10,000 deaths annually
- Peak during transition from dry (Nov-Apr) to wet (May-Oct) season
- Difficult to distinguish from other causes of fever in returning traveler (malaria, typhoid, dengue, yellow fever)

Source: Nigeria CDC; Asogun DA. Infect Dis Clin North Am 2019;33(4):933-951.

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Lassa fever outside of West Africa, 1969-2016

- 33 patients traveling to 9 countries
  - 11 healthcare workers with known or suspected exposure to Lassa fever patients in West Africa
  - 4 with known exposure to rodents or history of travel to rural West Africa
  - **8 with no specific risk factor other than living/traveling in West Africa**
- Time from healthcare contact to suspicion of Lassa fever, **median 5 days** (range 1-22)
- Time from healthcare contact to isolation, **median 7 days** (range 1-25)
- Case fatality rate 39%
- Of 17 patients with available data → 3,420 contacts were followed (median 173 contacts per patient, range 3-552)
  - 2 cases of secondary transmission

Source: Kofman A et al. Emerg Infect Dis 2019;25(2):245-248.

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Importance of preparing for high consequence infectious diseases (HCIDs)

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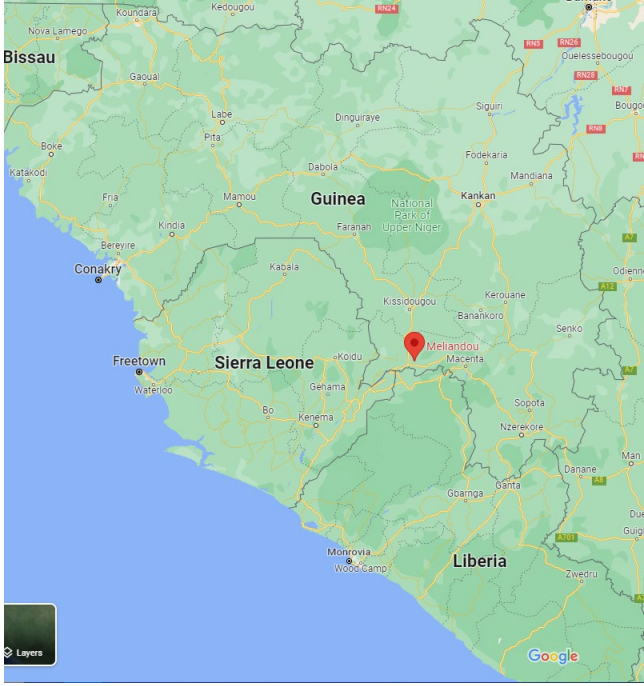
2014-2016 Ebola outbreak in West Africa



December 2013 – 18-month-old boy (index patient) in Meliandou, Guinea, was exposed to bats.

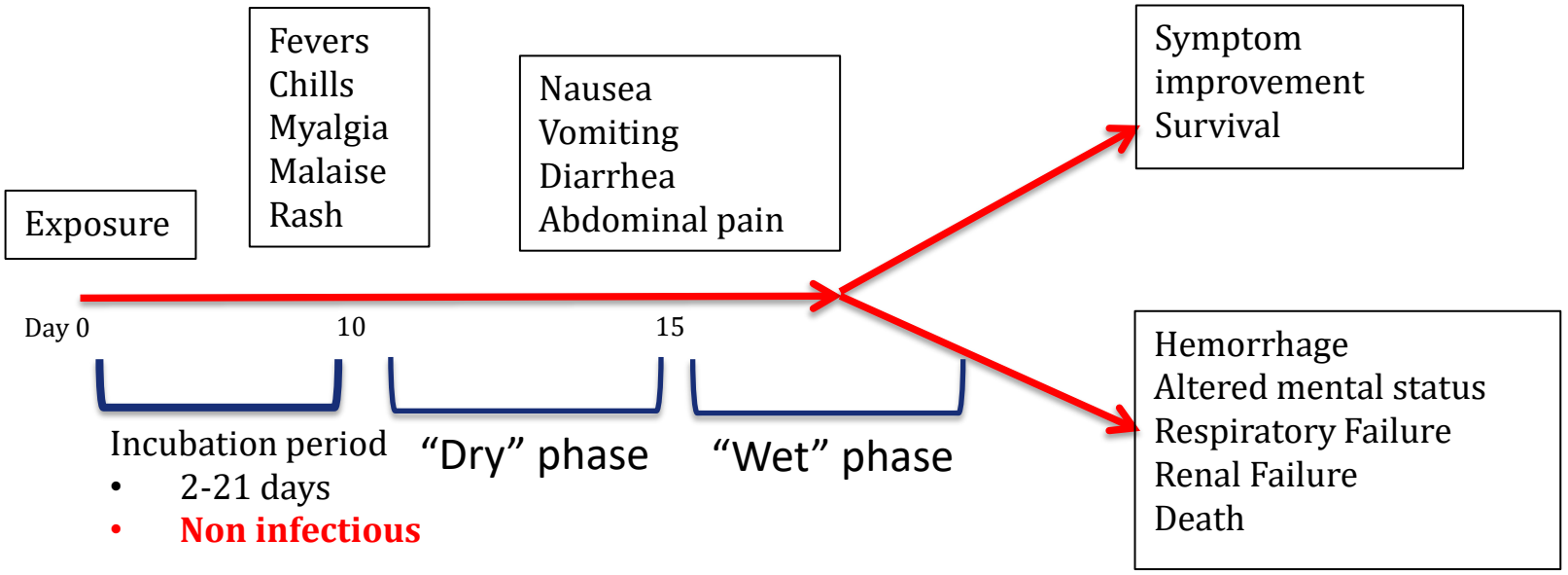
February 1, 2014 – Infections spread to Conakry, Guinea.

March 23, 2014 – WHO declared outbreak of Ebola Virus Disease (EVD).

July 2014 – outbreak spread to Liberia and Sierra Leone

June 10, 2016 – WHO declared the outbreak over.

Ebola virus disease (EVD): Clinical Presentation



Note: Clinical presentation similar for most viral hemorrhagic fevers (VHF)

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Ebola Epidemic in West Africa

	Died due to Ebola	
	General population (%)	Healthcare worker (%)
Guinea	0.02	1.45
Liberia	0.11	8.07
Sierra Leone	0.06	6.85

Country	Cases	Deaths
Liberia	10,666	4,806 (45%)
Sierra Leone	14,122	3,955 (28%)
Guinea	3,804	2,536 (67%)
Nigeria	20	8 (40%)
Mali	8	6 (75%)
Total	**28,620**	**11,311 (40%)**

Cases	Locally-diagnosed	Medically-evacuated
United States	4	7
United Kingdom	1	2
Spain	1	2
Italy	1	1
Germany		3
France		2
Netherlands		1
Norway		1
Switzerland		1
TOTAL	**7**	**20**

Source: Evans DK et al. Lancet Glob Health 2015;3(8):e439-e440.

First case in US, Sept 2014

September 19

- 42-year-old Liberian man travelled rom Liberia to Dallas, Texas. Asymptomatic en route.
- Had helped to carry a young woman who was ill with Ebola weeks earlier.

September 24

- Presented to a Dallas area acute care community hospital
- Abdominal pain, headache, and oliguria x 2 days. Temp 37.8 ^{o}C.
- Patient disclosed he had recently been in Africa, but did not report sick contacts.
- Diagnosed with sinusitis and discharged with antibiotics.

September 26

- Returned to hospital in worse clinical condition. Isolated.
- Underwent dialysis and endotracheal intubation.

September 30

- CDC lab confirmed *Zaire ebolavirus.*

October 8

- Patient died from multi-organ failure.

- Two nurses who took care of this patient tested positive for Ebola.
- Texas public health monitored 48 confirmed and possible contacts of the patient.

"The care of Ebola can be done safely, but it is hard to do it safely. It requires meticulous and scrupulous attention to infection control, and even a single inadvertent innocent slip can result in contamination."

-- Tom Frieden, former director of CDC

Source: McCarthy M. BMJ 2014;349:g6145; McCarthy M. BMJ 2014;349:g6200.

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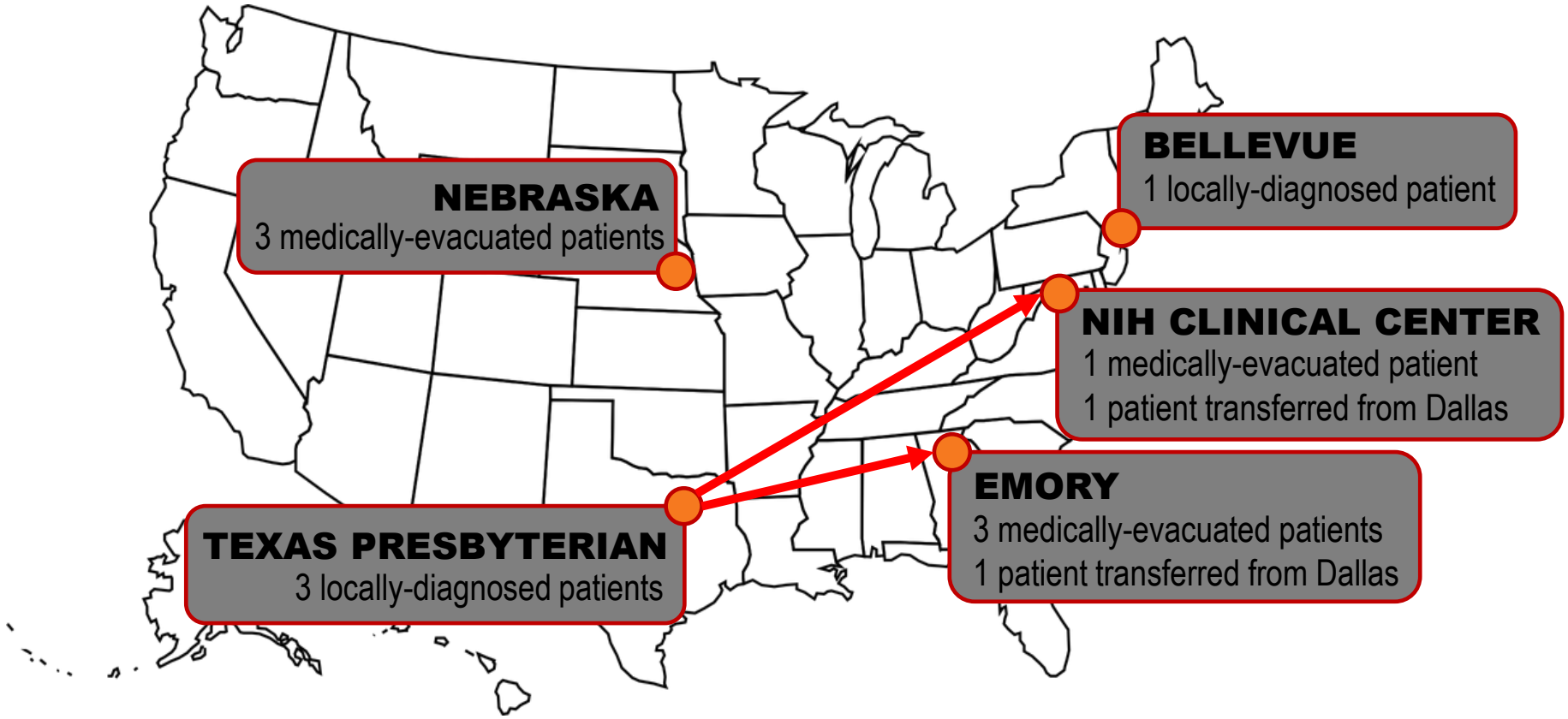
Ebola Epidemic in U.S.



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Most recent Ebola Virus Outbreaks				
Country	Cases	Deaths	Species	Year
Liberia, Sierra Leone, Guinea and others	28646	11323	Zaire ebolavirus	2013-2016
Dem Rep of Congo (DRC)	66	49	Zaire ebolavirus	2014
DRC	8	4	Zaire ebolavirus	2017
DRC	54	33	Zaire ebolavirus	2018
DRC, Uganda	3470	2287	Zaire ebolavirus	2018-2020
DRC	130	55	Zaire ebolavirus	2020
DRC, Guinea	28	18	Zaire ebolavirus	2021
DRC	4	4	Zaire ebolavirus	April 2022
	1	1	Zaire ebolavirus	August 2022
Uganda	164	55	Sudan ebolavirus	September 2022-January 2023

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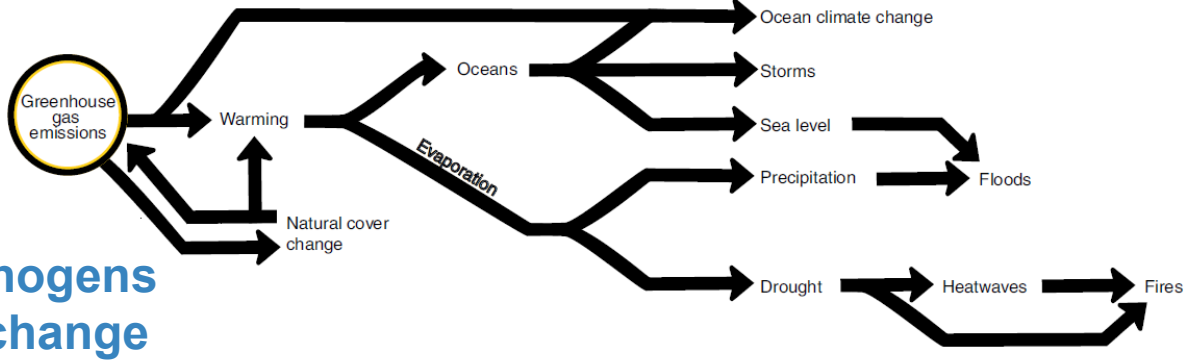
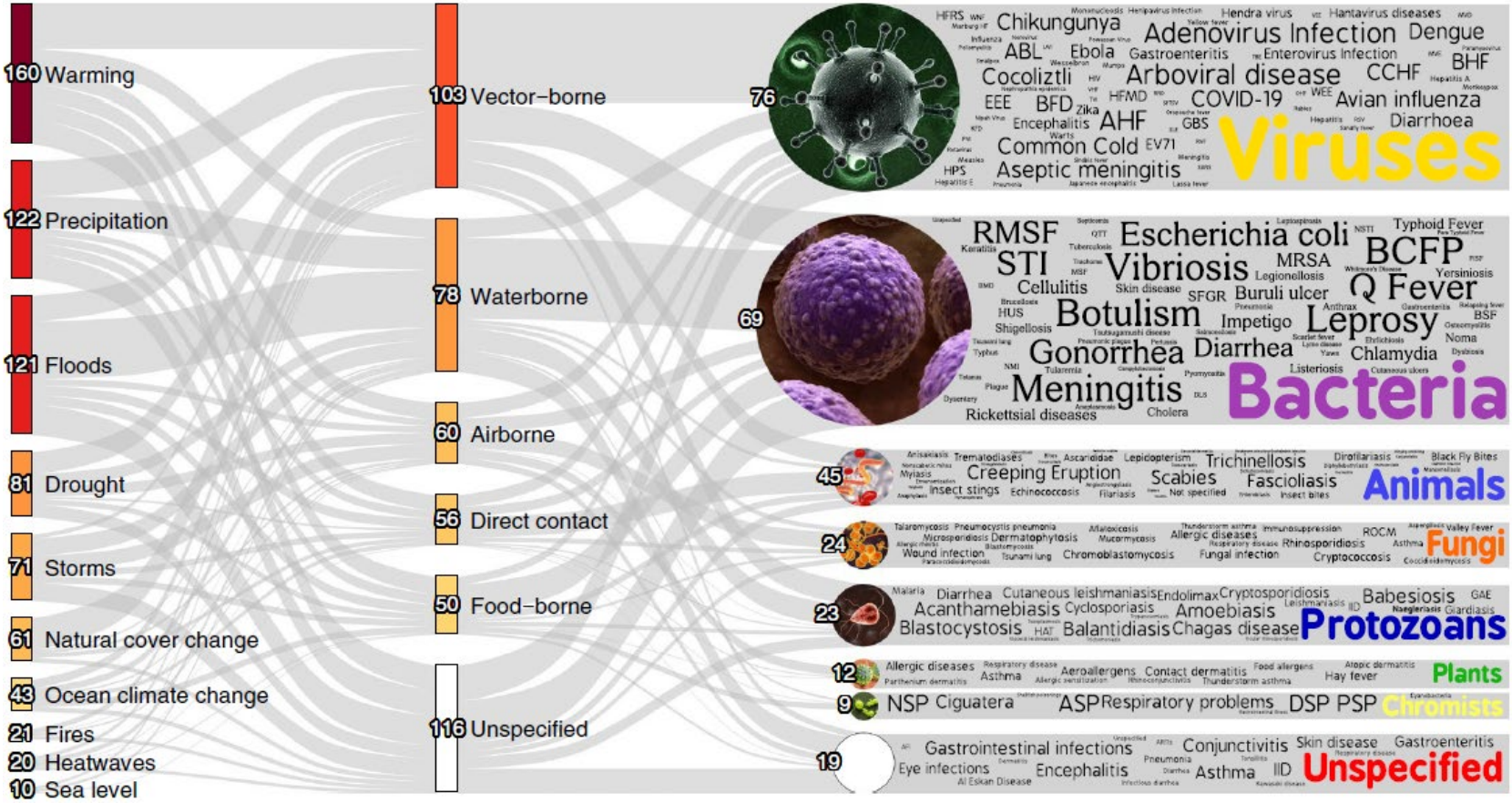


Over half of known human pathogens can be aggravated by climate change



Mora C et al. Nat Clim Chang 2022;12(9):869-875.

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Urbanization can enhance transmission of emerging infectious diseases

UN estimated 57% of world's population live in urban centers.

- Poor housing → insect and rodent vectors
- Poor sanitation and waste management
- Poor indoor ventilation
- Density of inhabitants
- Encounters with wildlife and zoonotic diseases
- **Hub of transportation to the world**

Source: Neiderud CJ. Infection Ecology & Epidemiology 2015;5(1):27060.

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Definition of a high consequence infectious disease (HCID)

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Terminology

- highly infectious pathogen
- highly hazardous pathogen
- high consequence pathogen
- special pathogen
- high consequence infectious disease

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What are high consequence infectious diseases (HCIDs)?

- No master list of pathogens; list evolves
- Important characteristics
  - Acute infection
  - Pathogen with high morbidity and/or mortality
  - May be difficulty to recognize and detect rapidly
  - Pathogen with high likelihood of secondary cases (person-to-person spread)
  - No effective vaccine, prophylaxis or treatment
  - Requires enhanced individual, population, and systems response

Sources: UK Health Security Agency; https://www.gov.uk/guidance/high-consequence-infectious-diseases-hcid

What are high consequence infectious diseases?

Broad Categories:

- Viral hemorrhagic fevers
- Severe (highly-pathogenic) respiratory infections
- Pox viruses

Viral Hemorrhagic Fevers

Family	Viruses	Past outbreak or endemic areas
Arenaviruses	Lassa virus	Nigeria, Guinea, Sierra Leone, Liberia
Bunyaviruses	Crimean-Congo Hemorrhagic Fever (CCHF)	Africa, Middle East, Asia, southeastern Europe
Filoviruses	Marburg Ebola	2023 outbreak: Equatorial Guinea, Tanzania Recent outbreaks: Democratic Republic of Congo, Guinea, Uganda

WHO Outbreak Alerts: www.who.int/csr/don/en/

Highly Pathogenic Respiratory Infections

Family	Species	Past outbreak or endemic areas
Influenza	Avian influenza A (H5N1 and H7N9)	Isolated cases in several countries. 2024: US, Cambodia, Vietnam
Coronaviruses	MERS	Arabian Peninsula
Paramyxoviruses	Nipah	Southeast Asia: Bangladesh, India, Malaysia, Singapore, Philippines

Pox Viruses

Family	Viruses	Past outbreak or endemic areas
Pox viruses	Variola (Smallpox)	Eradicated, potential bioterrorism agent
	Mpox, clade I	Democratic Republic of the Congo, the Republic of Congo, the Central African Republic, Cameroon, Gabon

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Key considerations for prompt recognition and initial management of HCIDs

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Challenges associated with initial management of HCIDs

- Delays in clinical recognition, diagnosis, and isolation:
  - Clinical findings often non-specific
  - Travel history and risk factors may not be reliably elicited
  - Rare infection often not endemic to a traveler's destination country

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How do we identify patients with suspected HCIDs?

Case definition: a set of uniform criteria that defines a disease

Clinical Criteria

Signs
Symptoms

Epidemiological Risk Factors

Travel (within known incubation period)
Exposure

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Ebola Virus Disease: Suspected Case has **both:**

Consistent signs or symptoms + Risk factors

Signs or symptoms include:

Elevated body temperature or subjective fever		**Fatigue**
Muscle pain	**Abdominal pain**	**Vomiting**
Unexplained hemorrhage	**Diarrhea**	**Severe headache**
Thrombocytopenia	**Erythematous maculopapular rash followed by desquamation**	

https://ndc.services.cdc.gov/case-definitions/viral-hemorrhagic-fever-2022/

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Ebola Virus Disease: Suspected Case has **both :**

Consistent signs or symptoms + Risk factors

An Epidemiologic risk factor within
the 21 days prior to the onset of symptoms

- Contact with blood or body fluids from a person who is sick with or has died from Ebola Virus Disease (EVD)
- Work in a lab that handles Ebola specimens
- Work in a lab that handles bats, rodents, or primates from an area with active transmission
- Semen from a man who has recovered from EVD
- Travel to or residence in geographical area where EVD is known to be present

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Identify, Isolate, Inform (I/I/I)

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Travel Screening Country List – July 2023

This document is not meant to be an exhaustive list but is focused on select, current special pathogen disease outbreaks that require prompt identification, isolation and/or specialized evaluation and management.

Country	*Diseases with Active Cases*	*Surveillance Window* (max time from exposure to symptom onset)	*Case Definition and Guidance*	*PPE/Precautions*

Sources: Chea N et al. Am J Infect Control 2015;43(11):1244-5.

Initial Patient Screening Algorithm for Infectious Diseases for EDs

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LOCATION	ROLE	ACTIVITY	NOTES
Registration Desk	Greeter/ Triage RN	1. Ask patient: In the past week have you had fever, have you had a cough, have you had a rash? YES → Give patient surgical mask and ask to use alcohol-based hand sanitizer NO → Stop screening process, and proceed with patient registration 2. Ask patient: have you traveled outside the country within the past 30 days OR had contact with someone that has traveled and is sick within the past 30 days?"? YES NO → Stop screening process, and proceed with patient registration 3. Notify Triage RN to report travel/symptoms	Instruct patient how to put on mask If patient has yes to any fever, cough or rash escort patient to private room if available and continue patient assessment
Triage/Clinic	RN/ Provider	4. Conduct initial assessment and travel history: ask what country(s) patient has traveled to OR had contact with someone that has traveled and is sick in the past 30 days? YES NO 5. Go to Infectious Disease Dashboard (found on special pathogen intranet page). Type disease or country(s) traveled. If positive for travel areas with active highly infectious disease transmission YES NO 6. Escort patient with surgical mask on to isolation room keeping a distance of 3 feet away of patient. 7. Post "Screening in Progress" sign on door, place Special Pathogen Cart outside room and, notify provider of travel/symptom(s) Stop screening process and continue patient assessment per appropriate procedures	Recommended triage PPE: mask & gloves Special Pathogen Intranet page: http://hhcinsider.nychhc.org/corpoffices/Special-Pathogens/Pages/Index.aspx Note: highly infectious diseases may be considered even in the absence of specific travel alerts and consider domestic infectious disease outbreaks. If available, contact your facility infectious disease/ infection control department(s) for guidance. Recommended escort PPE: mask & gloves
Patient Room	Provider	8. Provider to put on appropriate PPE ensemble if entering patient's room or perform evaluation remotely 9. Conduct patient assessment and determine exposure risk. Is there a concern for a highly infectious disease? YES NO → Stop screening process and continue patient assessment per appropriate procedures 10. Notify infection control to discuss case 11. Document evaluation in EMR 12. Call NYCDOHMH Provider Access Line: 866-692-3641 to discuss case. After consultation with NYCDOHMH if patient is suspected to have a special pathogen and is classified as a person under investigation (PUI) immediately notify Facility's Medical Director & Central Office Special Pathogens Program: 646-864-5442	Special Pathogen Level 1 PPE: N95, 2 pairs of gloves, impermeable gown, face shield Special Pathogen Level 2 Viral Hemorrhagic Fever (VHF) : N95, face shield, coverall, 2 pairs of gloves, hood, shoe cover, apron (level 2 for all VHF suspected cases) Refer to special pathogen intranet page for additional guidance Call to NYCDOHMH Be prepared to provide patient demographic information, travel and symptom information (e.g., dates and locations of travel, date of symptom onset), comorbidities, and any additional epidemiological linkages

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Initial isolation – patient placement

- Single occupancy room
- Private bathroom
- Door closed
- Use airborne infection isolation room if available, and especially if aerosols likely to be generated

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Inform

- Facility point of contact: infection control and departmental leadership
  - Clarify required PPE ensemble and other infection control measures
- Public health authority (DOHMH provider access line)

Vulnerabilities for I/I/I

Mpox Exposure on a Congregate Inpatient Psychiatry Unit – Description of the Investigation and Outcomes, New York City 2022

Waleed Malik, MD[1], Simon Dosovitz, MD[2], Clyde Gilmore, MD[3], Jeanne Cosico, RN[3], Justin Chan, MD, MPH[1]
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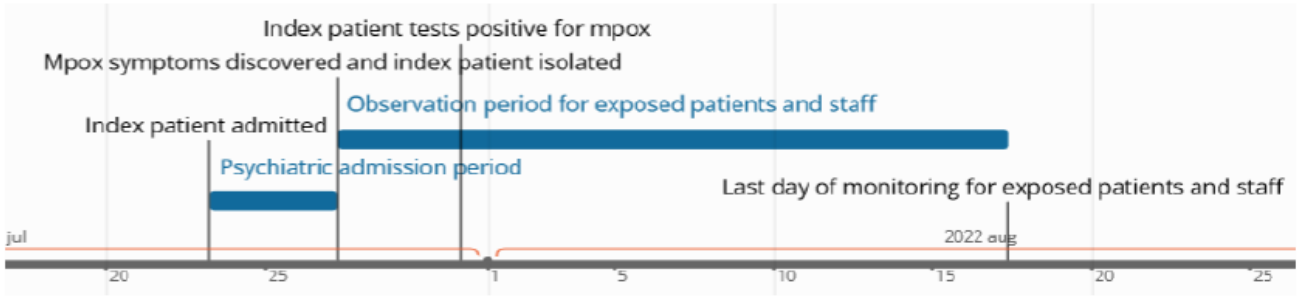

Figure 1: Timeline of Events

- Think carefully about vulnerable points of entry
  - Patients with altered consciousness
  - Uncooperative patients
  - Staff who are not trained in internal medicine
  - Congregate settings (behavioral health, correctional facilities)
  - Admission during incubation period
  - Pediatrics
- Consider enhanced screening protocols or serial screening during outbreaks of HCIDs

Monkeypox outbreak 2022: "See one, do one, teach one" no longer the rule

Sapha Barkati MD, MSc, DTM&H[1,2,3], Luke B Harrison MD, PhD[1]

- Frontline staff faced with double challenge
  - Unfamiliar infectious disease
  - Atypical clinical presentation
- Frontline educational content and screening tools need continuous review and updates

Sources: Barkati S et al. J Associ Med Microbiol Infect Dis Can 2022;7(3):157-158; Federal Bureau of Prisons Interim Ebola Protocol: https://www.bop.gov/resources/pdfs/BOP_Ebola_Protocol_2015.pdf; Malik W et al. SHEA Spring 2023, Seattle WA.

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Clinical lab safety

Challenges:

1. Every specimen that arrives in a clinical lab is an unknown.
2. It is rare that a clinical lab gets advance warning that a specific pathogen is suspected.

Bacteria: Bacillus anthracis (anthrax*), Brucella species, Burkholderia species (melioidosis and glanders*), Clostridium botulinum (botulism), Coxiella burnetii (Q fever), Francisella tularensis (tularemia), Yersinia pestis (plague)

Fungi: Blastomyces dermatitidis, Coccidioides immitis, Histoplasma capsulatum

Viruses: Ebolavirus*, Eastern equine encephalitis virus, Western equine encephalitis virus, Lassa Virus*, Marburg Virus*, Rabies Virus, Variola virus (smallpox*),

Venezuelan Equine Encephalitis, Yellow Fever Virus

Table 1. Ten most frequently reported laboratory-associated infections worldwide.

Disease	No. of cases	No. of deaths
Brucellosis	426	5
Q fever	280	1
Hepatitis	268	3
Typhoid fever	258	20
Tularemia	225	2
Tuberculosis	194	4
Dermatomycoses	162	0
Venezuelan equine encephalitis	146	1
Psittacosis	116	10
Coccidioidomycosis	93	2

NOTE. Data are for the years 1976 [3] and 1978 [4].

Sources: Singh K. Clin Infect Dis 2009;49:142-147; Pentella MA. Clin Lab Med 2020;40(4):473-482; CDC Guidance for U.S. Hospitals and Clinical Laboratories on Performing Routine Diagnostic Testing for Patients with Suspected Ebola Disease https://www.cdc.gov/vhf/ebola/laboratory-personnel/safe-specimen-management.html

https://www.canada.ca/en/public-health/services/infectious-diseases/viral-haemorrhagic-fevers/interim-biosafety-guidelines-laboratories-handling-specimens-patients-under-investigation-ebola-disease.html

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Additional considerations

- Patient transport (within and outside of hospital)
- Visitor management
- Post-exposure plan (monitoring during incubation period, PEP, quarantine plans)
- Invasive procedures and surgery
- Special populations: pediatrics, pregnant persons

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Models of care for management of HCIDs

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National Special Pathogen System

NETEC

System of Care Levels Overview

To align more closely with the Trauma system, the NSPS will be organized by Levels and descriptors for the System of Care facilities.

LEVEL 4 – All Other Healthcare Facilities

Level 4 facilities can **identify, isolate, inform, & initiate stabilizing medical care**; **protect staff**; and **arrange timely patient transport** to minimize impact to normal facility operations.

LEVEL 3 – Assessment Centers

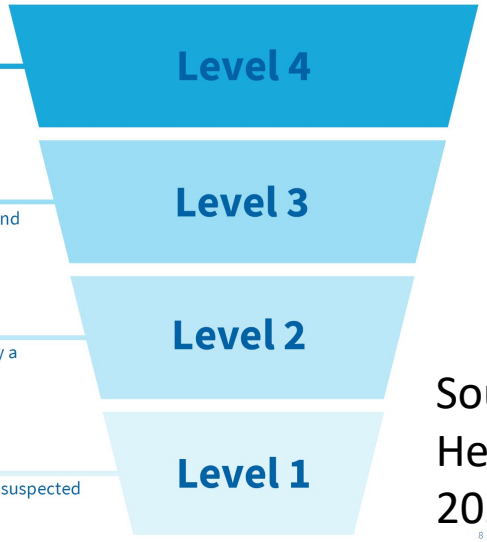
Level 3 facilities are widely accessible care delivery facilities, able to **conduct limited basic laboratory testing** and **stabilize** and **coordinate rapid patient transfer** to minimize impact to normal facility operations.

LEVEL 2 – Special Pathogen Treatment Centers or SPTCs

Level 2 facilities have the capacity to **deliver specialized care to clusters of patients** suspected of or infected by a special pathogen and serve as the primary patient care delivery center.

LEVEL 1 – Regional Treatment Centers or RESPTCs

Level 1 facilities will serve as **resource hubs for regions**, providing **highly specialized care delivery** to patients suspected of or infected by a special pathogen.



Source: Mukherjee V et al. Health Secur 2022;20(S1):S39-S48.

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Role of a Biocontainment Unit (BCU)

- A healthcare facility or unit designed to provide safe, secure, high quality and appropriate care with optimal infection prevention and control procedures to a small number of patients with suspected or confirmed HCID
- Keeps other patients, healthcare workers and the public safe
- Facilitates the use of techniques and standards that are above and beyond normal function in the hospital setting

Sources: (1) Bannister B et al. Lancet Infect Dis 2009;9(1):45-56; (2) Smith PW et al. Biosecur Bioterror 2006;4(4):351-65.

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Guidelines for design and operation of biocontainment units

- Strategically located so that patient and specimen transport times do not exceed 6 hours
- Close to major international ports of entry
- Co-located with a tertiary care facility for specialist support
- Have flexible use when not activated for HCID patient care

Sources: (1) Bannister B et al. Lancet Infect Dis 2009;9(1):45-56; (2) Smith PW et al. Biosecur Bioterror 2006;4(4):351-65.

FIGURE 1. BIOCONTAINMENT PATIENT CARE UNIT CONSENSUS TOPICS

I. The Role of Units in Overall U.S. Preparedness
   A. Definition of BPCUs
   B. The mission of BPCUs
   C. Integration of units into military and civilian preparedness
   D. National capacity for BPCUs
   E. Plans for capacity for hazardous diseases beyond the units
   F. Federal or local control of regulatory issues
II. Medical Care Issues
   A. Clinical services provided in the unit
   B. Consultants and other personnel
   C. Care issues
   D. Pathology issues
   E. Minimum diagnostic services and regulatory compliance
   F. Housekeeping and security
   G. Emergency evacuation
   H. Additional clinical issues
III. Infection Control Issues
   A. Personal protective equipment
   B. Biosafety program
   C. Occupational health program
   D. Environmental disinfection
   E. Large equipment disinfection
   F. Infectious waste
   G. Transportation of patients to the unit
   H. Visitor infection control issues
IV. Facility Issues
   A. Air-handling system
   B. General facility design criteria
   C. Unit design features
   D. Essential unit construction features
   E. Certification and commissioning
   F. Communication
   G. Additional facility issues
V. Psychosocial and Ethical Issues
   A. Patient psychosocial issues
   B. Staff psychosocial issues
   C. Ethical issues

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Key features of biocontainment units

Features in Common with Existing BCUs at NIH, Emory, and Nebraska	Unique Features of the JHH BCU
• Secure entry and exit points • Onsite laboratory • Advanced air-handling system for airborne and droplet transmission • Highly trained nurse and clinician provider team including adult, pediatric, and obstetrics capabilities • Critical care capabilities in each room • Onsite portable radiology and ultrasound • Advanced telecommunication capabilities • Pass-through autoclaves for waste management	• Unidirectional flow of staff through patient care areas • Dedicated donning and doffing rooms for all patient care areas • Ample physical space to accommodate obstetrics procedures including labor and delivery and cesarean sections • Ample physical space to allow for onsite, sterile procedures, including limited surgery • Main patient care room with two ICU headwalls to provide care for family (e.g., parent and child)

Definition of abbreviations: BCU = biocontainment unit; ICU = intensive care unit; JHH = Johns Hopkins Hospital; NIH = National Institutes of Health.

Source: Garibaldi BT et al. Ann Am Thorac Soc 2016;13(5):600-8.

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When Do We Utilize a BCU?

- Ideal for limited outbreaks of HCIDs
- Limited resource (2 beds at Bellevue, ~55 in U.S.)
- Capacity can quickly be overwhelmed by pandemics → surge capacity required

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Alternative models of care

Isolation System for Treatment and Agile Response for High-Risk Infections (ISTARI)

A revolutionary patient care system that dramatically increases safety, improves quality, and reduces cost for high-consequence infectious diseases.

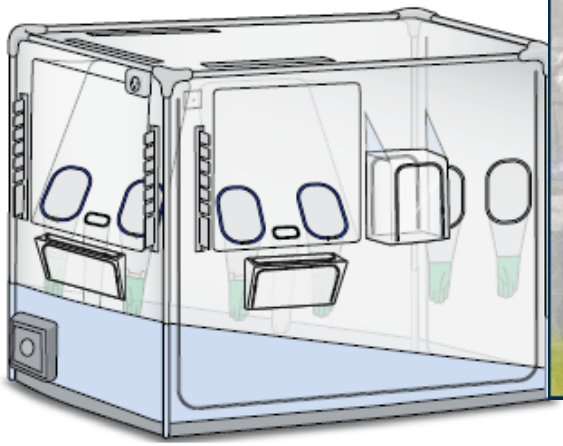
ISTARI MODEL 1B

Intended Use

Enclosure for low-acuity care and procedures for patients who require airborne, droplet, or contact isolation precautions in a temporary patient care setting (e.g. urgent care or emergency department).

KEY PRODUCT CHARACTERISTICS

- Suitable for onsite storage and rapid set-up (less than 15 minutes)
- Employs space and utilities of a typical emergency room hallway or bay
- Maintains and monitors negative pressure with airborne pathogen containment and appropriate air exchanges for airborne isolation



Source: University of Nebraska Medical Center – https://innovateipc.org/istari/

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Alternative models of care – virtual assessment

Returning traveler from a VHF outbreak area with symptoms*

Reported High-Risk Exposure

Present in designated Outbreak Area

WET

DRY

Present in outbreak country but not in designated outbreak area

Biocontainment Unit activation. Assessment and Management in BCU

Virtual Assessment Model (VAM)
-HITeam, EMS and RN home visit
- Video visit with ID and either Hospitalist vs. ED physician

Patient considered medically stable, can stay home with daily video monitoring

NO

YES

Proceed with sample collection
Patient "red flag" education
Arrange daily video/ home health monitoring

***Common Signs and Symptoms of VHFs**

DRY: Fever (≥100.4°F/38.0°C); Aches and pains, such as severe headache and muscle and/or joint pain; Weakness and fatigue; Sore throat; Loss of appetite

WET: Gastrointestinal symptoms including abdominal pain, diarrhea, and vomiting; Unexplained hemorrhaging, bleeding or bruising

OTHER: Red eyes, skin rash, and hiccups

HITeam = High Risk Infection Team

Source: Denver Health – https://www.denverhealth.org/services/regional-ebola-and-special-pathogen-treatment-center/biocontainment-unit

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The Isolation Communication Management System

A Telemedicine Platform to Care for Patients in a Biocontainment Unit

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Use of telemedicine

Reduce exposures by allowing communication and monitoring:

- Healthcare providers in the BCU
  - Observe for breaches in infection control
- Patient and staff outside BCU
  - Facilitate patient transfers
- Consultation by physician not trained in PPE
- Family and other services to provide remote support
- Allow students and learners to be involved

Source: Gossen A et al. Ann Am Thorac Soc 2020;17(6):673-678.

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Take home points

- HCIDs are acute transmissible infections with high morbidity/mortality and limited medical countermeasures; list will evolve with time
  - They pose a growing threat due to urbanization, ease of international travel, and climate change
  - They pose a risk to healthcare workers when there is delayed recognition and implementation of infection control measures
- Effective response requires understanding current epidemiology and implementing effective systems for prompt recognition of suspected cases
  - Every healthcare facility have a system to promptly “identify, isolate, and inform” for patients with suspected HCIDs, with special attention to vulnerable points of entry
- Biocontainment units (BCU) are a limited, high-cost resource used to manage a small number of HCID cases

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