

# Nebraska Biocontainment Unit

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University of Nebraska  
Medical Center



Nebraska  
Medicine

# Nebraska Biocontainment Unit

- Housed within the University of Nebraska Medical Center (UNMC) campus in Omaha, Nebraska
  - 627 licensed beds
  - 25,000 inpatient admissions per year
  - Level I trauma center
  - NCI designated cancer care
- The Nebraska Public Health Laboratory (level 3) is also located on-campus
- Eppley airport and Offutt Air Force Base are both within 10 miles of the UNMC campus



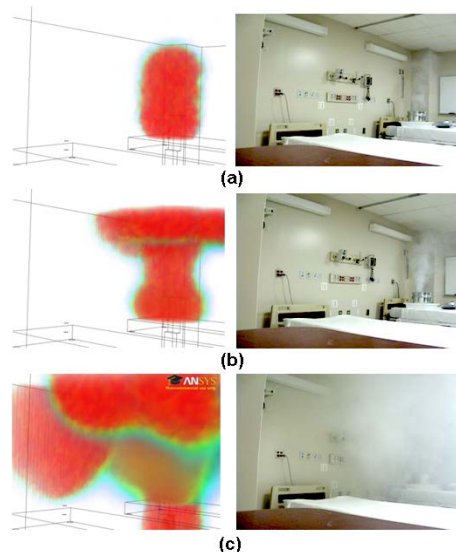
# Nebraska Biocontainment Unit

- Opened in 2005
  - Joint venture between the hospital and the State Health Dept.
- 4,100 square feet
- 5 patient care rooms with the capacity of up to 10 beds
- Sealed fixtures and outlets
- Cleanable wall paint and ceiling tiles
- Vinyl flooring with welded seams
- Impact-resistant glass (tornadoes)



# Research

- Multiple research initiatives
  - Decontamination
  - Mathematical modeling of pathogen trajectory
  - Infrared imaging for fever screening
  - Appropriate usage of personal protective equipment
  - Experimental drugs



# Nebraska Biocontainment Unit

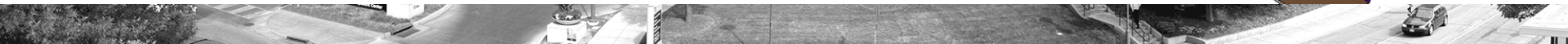
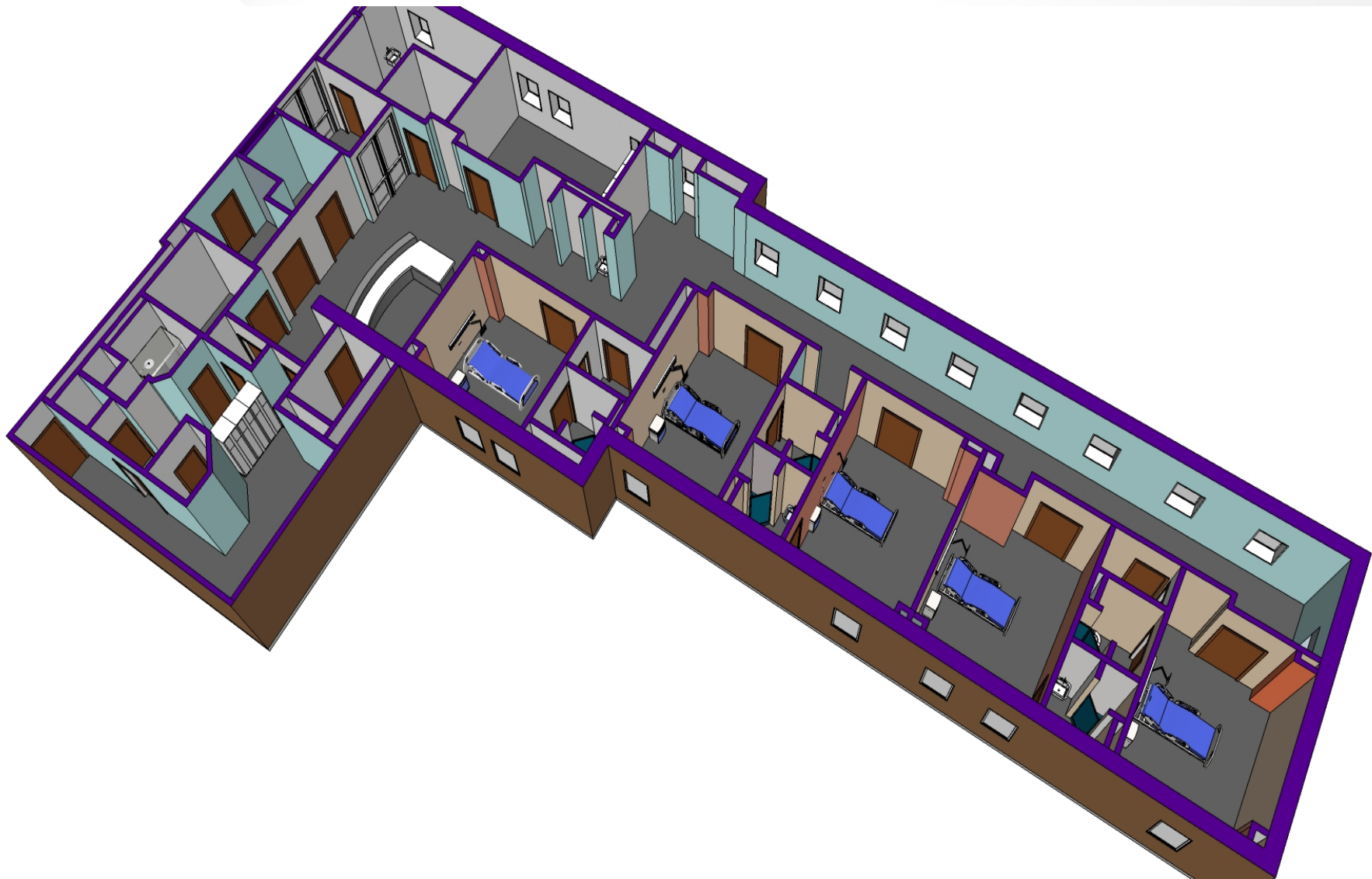
- Separate air handling system with no re-circulated air
- Negative air pressure – entire unit
  - Digital monitoring
  - >15 air exchanges per hour
  - HEPA Filtered Dual Exhaust Fans
- Air locked entrances
- HEPA filtration – exhausted air



# Nebraska Biocontainment Unit

- All volunteer staff
  - Extensive interview process
  - On-call 24 hours/day
  - Pager notification system
- Training and maintenance of skills
  - Initial training
  - Monthly staff meetings
  - Quarterly drills







# Biocontainment Unit

10 CC beds/5 rooms  
Air locked entrances  
HEPA filter exhaust  
>15 air exchanges/hr.

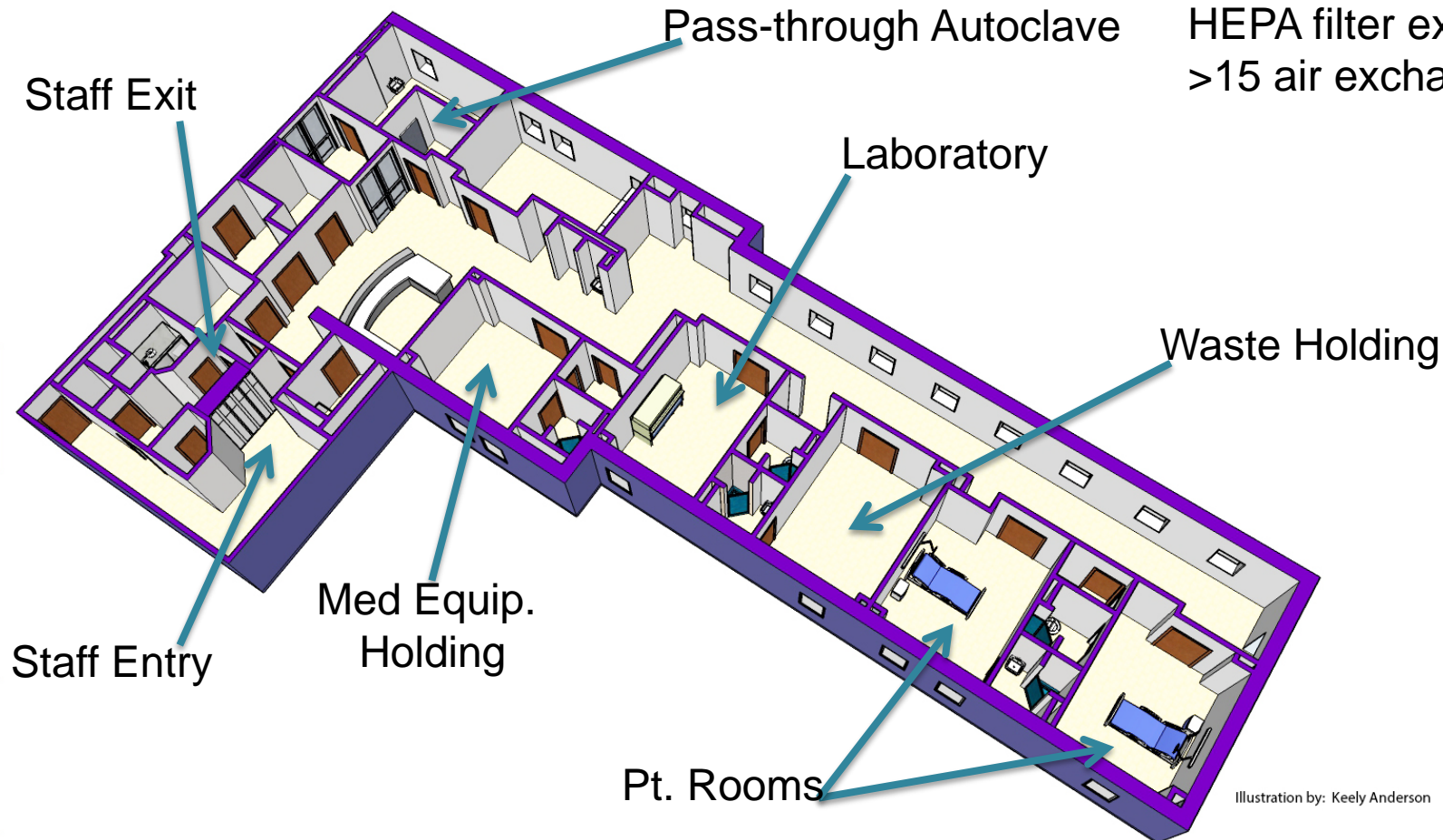


Illustration by: Keely Anderson





# Special Report

## An Integrated Approach to Laboratory Testing for Patients with Ebola Virus Disease

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Beginning in 2003, the Nebraska Medical Center in Omaha developed a laboratory capability plan in conjunction with the creation of a biocontainment unit (BCU) for treatment of patients harboring emerging infectious organisms. The laboratory response planning involved experts at the Nebraska Public Health Laboratory (NPHL), University of Nebraska Medical Center (UNMC), the Nebraska Department of Health and Human Services (DHHS), and the Centers for Disease Control and Prevention (CDC). Special emphasis was placed on diagnostic testing for highly contagious and

pathogenic organisms, including *Francisella tularensis* and high consequence viruses causing avian influenza and hemorrhagic fevers such as Ebola.

Due to the recognition that certain organisms and conditions would need to be ruled out, preparations also included the capability to test specimens for other diseases, including malaria and tuberculosis. Originally, a limited number of point of care (POC) hematology and chemistry tests were planned, to monitor patients who harbored a high consequence pathogen. This testing was to be performed in the biosafety level 3 (BSL-3) laboratory within the NPHL at UNMC, which is within 1 city block from

# Safety Considerations in the Laboratory Testing of Specimens Suspected or Known to Contain Ebola Virus

Peter C. Iwen, PhD, D(ABMM),<sup>1,2</sup> Philip W. Smith, MD,<sup>3</sup> Angela L. Hewlett, MD,<sup>3</sup> Christopher J. Kratochvil, MD,<sup>4</sup> Steven J. Lisco, MD,<sup>5</sup> James N. Sullivan, MD,<sup>5</sup> Shawn G. Gibbs, PhD, CIH,<sup>6</sup> John J. Lowe, PhD,<sup>6</sup> Paul D. Fey, PhD, D(ABMM),<sup>1</sup> Vicki L. Herrera, MS,<sup>2</sup> Anthony R. Sambol, MA,<sup>2</sup> James L. Wisecarver, MD,<sup>1</sup> and Steven H. Hinrichs, MD<sup>1</sup>

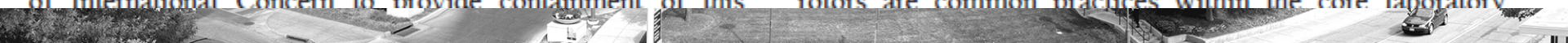
From the <sup>1</sup>Department of Pathology and Microbiology, College of Medicine, University of Nebraska Medical Center, Omaha; <sup>2</sup>Nebraska Public Health Laboratory, Omaha; <sup>3</sup>Department of Internal Medicine, Division of Infectious Diseases, University of Nebraska Medical Center, Omaha; <sup>4</sup>Department of Psychiatry, College of Medicine, University of Nebraska Medical Center, Omaha; <sup>5</sup>Department of Anesthesiology, Division of Critical Care, University of Nebraska Medical Center, Omaha; and <sup>6</sup>Department of Environmental, Agricultural, and Occupational Health, College of Public Health, University of Nebraska Medical Center, Omaha.

*Am J Clin Pathol* January 2015;143:4-5

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Reference to the Ebola virus causes concern among all individuals, whether from the public or within the medical community. Realization that patients with Ebola virus disease (EVD) have now been recognized in the United States in response to the major outbreak occurring in West Africa has heightened this fear. Recently, the World Health Organization declared the Ebola epidemic to be a Public Health Emergency of International Concern to provide containment of this

patients.<sup>3</sup> In our risk assessment, we determined that the core laboratories where chemistry and hematologic testing takes place do not have facilities that can safely handle specimens suspected of containing or known to contain Ebola virus. For example, the processing of open tubes without the availability of a biosafety cabinet and the centrifugation of specimens without safety cups or sealed rotors are common practices within the core laboratory



# Items Added

- Added laboratory space within the Unit
- Added clean equipment holding room
- Added waste holding room
- Outside of Unit had family waiting area





# CONSIDERATIONS FOR SAFE EMS TRANSPORT OF PATIENTS INFECTED WITH EBOLA VIRUS

John J. Lowe, PhD, Katelyn C. Jelden, BS, Paul J. Schenarts, MD, Lloyd E. Rupp, Jr., EMT-P, Kingdon J. Hawes, NREMT-P, Benjamin M. Tysor, NREMT-P, Raymond G. Swansiger, PA-C, MPAS, Shelly S. Schwedhelm, RN, MSN, Philip W. Smith, MD, Shawn G. Gibbs, PhD, CIH

## ABSTRACT

The Nebraska Biocontainment Unit through the Nebraska Medical Center in Omaha, Nebraska, recently received patients with confirmed Ebola virus from West Africa. The Nebraska Biocontainment Unit and Omaha Fire Department's emergency medical services (EMS) coordinated patient transportation from airport to the high-level isolation unit. Transportation of these highly infectious patients capitalized on over 8 years of meticulous planning and rigorous infection control training to ensure the safety of transport personnel as well as the community during transport. Although these transports occurred with advanced notice and after confirmed Ebola virus disease (EVD) diagnosis, approaches and key lessons acquired through this effort will advance the ability of any EMS provider to safely transport a confirmed or suspected patient with EVD. Three critical areas have been identified from our experience: ambulance preparation, appropriate selection and use of personal protective equipment, and environmental decontamination. **Key words:** Ebola; EMS; transport

PREHOSPITAL EMERGENCY CARE 2014;Early Online:1–5

Lowe, John J., Katelyn C. Jelden, Paul J. Schenarts, Lloyd E. Rupp, Kingdon J. Hawes, Benjamin M. Tysor, Raymond G. Swansiger, Shelly S. Schwedhelm, Philip W. Smith, and Shawn G. Gibbs. "Considerations for Safe EMS Transport of Patients Infected with Ebola Virus." *Prehospital Emergency Care* (2014).

<http://dx.doi.org/10.3109/10903127.2014.983661>



# Transport and Management of Patients with Confirmed Ebola Virus Disease

Alexander Isakov, MD, MPH, Wade Miles, Shawn Gibbs, PhD, CIH, John Lowe, PhD, Aaron Jamison, Raymond Swansiger, PA-C, MPAS

Annals of Emergency Medicine 2014; In Press

In 2002, Emory University partnered with the Centers for Disease Control and Prevention to develop a capability for the evaluation and management of individuals with serious communicable disease. This partnership included Grady EMS, for the development of a team with the requisite competencies necessary to transport and manage these patients in the out-of-hospital setting. In 2005, a similar clinical isolation unit was developed at the University of Nebraska, where partnership with EMS professionals were initiated for provision of safe transport and management of patients accepted at that facility. The objective of these hospital and prehospital collaborations were to close education, training and practice gaps to best facilitate the care for patients with serious communicable disease while assuring the safety of the medics and the general public through meticulous implementation of infection control practices as recommended by CDC. The description of practices implemented by EMS teams in these communities for the transport of patients with confirmed EVD is shared so that others might more readily implement these practices, policies and procedures as applicable to their mission requirements and system design.





## Commentary

## Nebraska Biocontainment Unit perspective on disposal of Ebola medical waste



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Clinical practices surrounding the current Ebola epidemic have been center stage in discourse concerning research and practice of care. As the medical community becomes more sophisticated in understanding the many facets of treating and containing this virus, the Nebraska Biocontainment Unit has identified Ebola medical waste disposal as a key area of concern for U.S. hospitals. The requirements for processing Ebola medical waste stand to impact most U.S. hospitals currently preparing readiness plans to receive and treat patients with suspected or confirmed Ebola virus disease (EVD).

The U.S. Centers for Disease Control and Prevention (CDC) has issued recommendations to guide health care facilities in preparing to isolate potential or confirmed EVD patients, and hospitals have established plans to isolate and care for these patients.<sup>1,2</sup> The CDC's guidance includes facility and provider EVD preparedness checklists to aid the U.S. health system in preparing to prevent the spread of the virus within the United States.<sup>3</sup> Hospitals are undertaking multiple measures to minimize the risk of EVD, including estab-

Two high-level isolation facilities located at the University of Nebraska Medical Center and Emory University have treated EVD patients in the U.S. These units are ideally equipped for treating patients in high-level isolation because each unit is staffed with HCWs rigorously trained in donning and doffing PPE, and the facilities have been specifically engineered for high-level isolation with in-unit waste processing capability.<sup>4</sup> The Nebraska Biocontainment Unit's strategy for waste management uses a pass-through autoclave to process all medical waste exiting the high-level isolation unit. Through discussions with health care entities planning for EVD patients, first-hand knowledge gained by treating EVD patients transported to the United States, and review of current guidance, we provide insight into key logistical and regulatory considerations for management of EVD medical waste in facilities without in-unit waste sterilization capabilities.

## EBOLA MEDICAL WASTE

Lowe, J.J., **Gibbs, S.G.**, Schwedhelm, S., Nguyen, J., Smith, P.W. 2014. Nebraska Biocontainment Unit Perspective on Disposal of Ebola Medical Waste. American Journal of Infection Control. 42:1256-1257. [http://www.ajicjournal.org/pb/assets/raw/Health%20Advance/journals/ymic/YMIC\\_3269.pdf](http://www.ajicjournal.org/pb/assets/raw/Health%20Advance/journals/ymic/YMIC_3269.pdf)





# Waste Handler PPE

UNMCheroes.org

- Biocontainment Unit staff handle all waste processing: Nurses, Medical Technicians, & Industrial hygienists

	Containers	Cubic Feet	Weight (lbs)
Event 1	101	464.4	1011.5
Event 2	88	387.2	1806.5
Event 3	34	156.4	880.2



Healthcare and Emergency Responder Organization Education Through Simulation. Personal Protective Equipment: Biological Level-C Doffing. Omaha: University of Nebraska Medical Center, 2010 Available at 2014.

<http://app1.unmc.edu/nursing/heroes/mpv.cfm?updateindex=53&src=yt> Accessed October 29, 2014



# Nebraska Biocontainment Unit

- Specimen dunk tank
- Pass-through Autoclave
- Transportation system
- Videoconferencing system





Contents lists available at ScienceDirect

# American Journal of Infection Control

journal homepage: [www.ajicjournal.org](http://www.ajicjournal.org)

AJIC  
American Journal of  
Infection Control

## Commentary

### Nebraska Biocontainment Unit patient discharge and environmental decontamination after Ebola care



Katelyn C. Jelden BS<sup>a</sup>, Shawn G. Gibbs PhD<sup>a,b</sup>, Philip W. Smith MD<sup>b,c</sup>,  
Michelle M. Schwedhelm MSN<sup>b,d</sup>, Peter C. Iwen PhD<sup>e</sup>, Elizabeth L. Beam MSN<sup>b,f</sup>,  
A. Kim Hayes RN<sup>g</sup>, Nedra Marion MPA<sup>g</sup>, Christopher J. Kratochvil MD<sup>h</sup>,  
Kathleen C. Boulter BA<sup>b</sup>, Angela L. Hewlett MD<sup>b,c</sup>, John J. Lowe PhD<sup>a,b,\*</sup>

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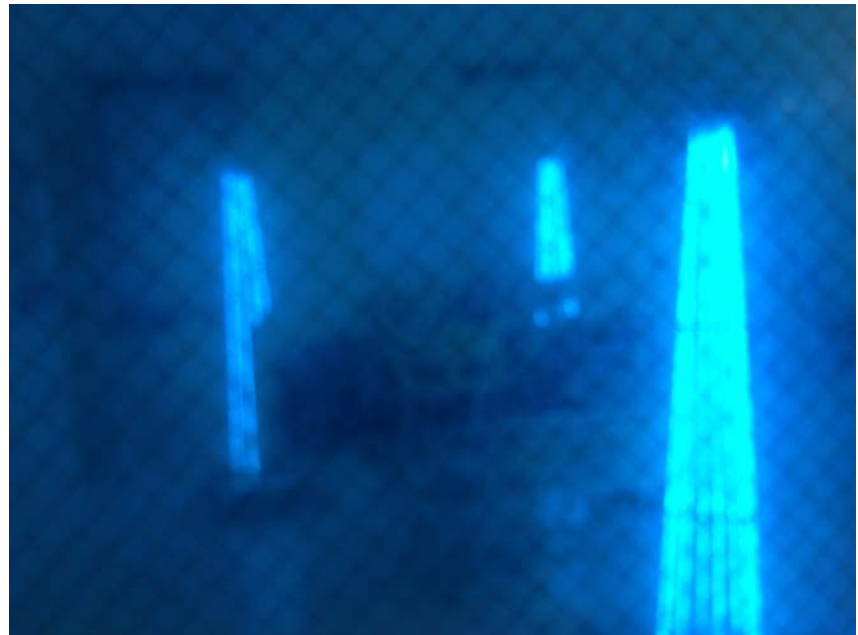
The Nebraska Biocontainment Unit (NBU), which operates through collaboration of Nebraska Medicine, the University of Nebraska Medical Center, and the Nebraska Department of Health and Human Services, recently treated patients with Ebola virus disease (EVD) evacuated from West Africa to the United States. EVD is transmitted by contact with infected blood or bodily fluids with

## DISCHARGE PROCESS FOR A PATIENT SUCCESSFULLY TREATED FOR EVD

Patients undergoing treatment for EVD are followed closely using both molecular and serologic tests to determine viral loads and antibody responses to the disease at specific time points.

# Decontamination

- Personnel
- Location
- Medical Devices
- Out of service time



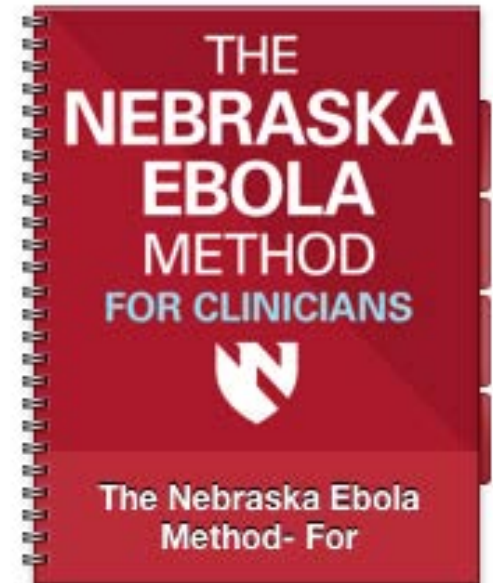
# Education

- Center for Preparedness Education
  - Preparedness symposia series offered at 4 locations across Nebraska annually
- UNMC College of Public Health
  - Masters degree in Emergency Preparedness
- HEROES website
  - 'Healthcare and Emergency Responder Organization Education through Simulation' on-line training videos
  - <https://app1.unmc.edu/nursing/heroes>



# Ebola Educational Initiatives

- Apple iTunes University
  - On-line preparedness information application
  - <http://www.unmc.edu/publichealth/news/ebola-community.html>
    - Clinicians, general public, Spanish translation





## Nebraska Biocontainment Unit Leadership Team

Phillip Smith MD Director, Angela Hewlett MD,  
Shelly Schwedhelm RN, Elizabeth Beam RN, Kate Boulter RN,  
Shawn Gibbs PhD CIH, John Lowe PhD

## Nebraska Biocontainment Unit Staff

23 RN, 6 RT, 4 CT, 11+ MD, 2 PhD

## Supporting Departments

Infection Control, Clinical Technology, Nebraska Public Health Laboratory, Core Clinical Laboratory, Public Affairs, Environmental Services, University & Hospital Facilities, Facilities Planning, and many more

## External Partners

U.S. Department of State, Stericycle, Omaha Fire EMS, State & County Public Health, Cardinal Health, Apple, Offutt AFB, Eppley Airport and many many more

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