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Short Communication

Learning from Ebola: Interprofessional practice in the Nebraska Biocontainment Unit



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ABSTRACT

Caring for patients with Ebola virus disease (EVD) in the Nebraska Biocontainment Unit (NBU) has necessitated and enabled extensive interprofessional relationships and the creation of a collaborative care model. Critical aspects of NBU functionality include a constructive leadership environment, staff inclusion and consideration during protocol development, and a culture of partnership and communication.

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Introduction

The Nebraska Biocontainment Unit (NBU), located in Omaha, Nebraska, opened in 2005 and represents a collaboration between Nebraska Medicine, the University of Nebraska Medical Center (UNMC), and Nebraska Department of Health and Human Services. The NBU is designed to address the unique challenges associated with caring for patients with highly infectious diseases (e.g., viral hemorrhagic fevers, smallpox, MERS-CoV). Whether dispersed by natural transmission or through targeted bioterrorist attack, the NBU balances providing comprehensive medical care for patients infected with extremely hazardous pathogens while protecting health care personnel, other hospital patients, and the public.

The ongoing 2014–2015 Ebola virus disease (EVD) outbreak concentrated in the African countries of Sierra Leone, Liberia, and Guinea has resulted in more than 27,000 reported cases.¹ Over

11,000 fatalities have been confirmed, at least 500 of which have been health care personnel (as of June 21, 2015).¹ Twenty aid workers volunteering in West Africa have been internationally evacuated by air ambulance after contracting EVD to highly infectious patient care units in the United States such as the NBU, National Institutes of Health (NIH), Emory University, and various European high-level isolation units. Since September 5, 2014, three patients infected with Ebola virus were medically evacuated from Africa to receive medical care in the NBU. The successful operation of the NBU can be attributed to a myriad of factors, but the impact of concerted, interprofessional teamwork and excellent communication between the diverse staffing personnel cannot be understated.

NBU team

The NBU team is comprised of professionals across the spectrum of health care (Table 1). Approximately half of the nursing staff are trained and experienced in critical care, while the remaining regularly work in other areas including the operating room, medical-surgical floors, emergency services, or pediatrics. Respiratory therapists are integral to managing the airways of

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Table 1
Nebraska Biocontainment Unit team roles, clinical and professional backgrounds, and partners in the care of patients with Ebola virus disease.

NBU staff	Professional areas of expertise	Nebraska Medicine/UNMC internal partners	External partners
- Physicians	- Infectious diseases	- Administration and management	- U.S. Department of State
- Registered nurses	- Critical care	- Dept. of infection control	- State and local health departments
- Care technicians	- Nephrology	- Center for clinical and translational research	- Centers for Disease Control and Prevention
- Respiratory therapists	- Anesthesiology	- Campus security	- Food and Drug Administration
- Emergency medical technicians	- Internal medicine	- College of public health	- Other biocontainment patient care units
- Laboratory Technicians	- Surgery	- Public relations	- Other academic medical centers
- Doctorate level (PhD) researchers	- Pathology	- Public affairs	- Pharmaceutical companies
- Behavioral health provider	- Pediatrics	- Nebraska public health laboratory	- Local and federal emergency management agencies
	- Obstetrics	- Core clinical laboratory	- Emergency medical services
	- Emergency medicine	- Environmental services	- Local air force base
	- Clinical research	- Medical supplies	- Local airport
	- Infection control	- Facilities	
	- Behavioral health		
	- Concierge nursing		
	- Emergency preparedness		
	- Industrial hygiene		
	- Laboratory sciences		

critically ill patients with EVD as well as serving as a second caregiver in the room if needed. Patient care technicians support care activities and assist with waste management via operation of the in-unit autoclave in the NBU. All NBU staff members are cross trained to serve in various roles within the unit. Operational EVD care has necessitated a multidisciplinary physician team, with emphasis on expertise in infectious diseases and critical care medicine. NBU relationships with other physician specialties such as pediatrics, obstetrics, and surgery have also been established for care consultation as needed and suggested by consensus from the European Network of Infectious Diseases (EUNID).² Infectious disease physicians monitor and manage infection progression and oversee administration of experimental drugs.³ An expert in clinical research coordinates regulatory aspects related to the Food and Drug Administration's approval of Emergency Investigational New Drug use, obtaining the new drugs through pharmaceutical companies, transfusion specialists for convalescent plasma, the Pharmacy & Therapeutics committee, an Institutional Review Board, and the Clinical Research Center team. Additionally, laboratory and pathology staff support clinical care with point-of-care testing instruments through the in-unit BSL-3 laboratory, the Nebraska Public Health BSL-3 laboratory, and the core laboratory.⁴

The core functionality of the NBU centers around the multidisciplinary leadership team comprised of the unit medical director and associate medical director, nursing director, lead clinical nurse, research director and environmental specialist, associate research director and transportation specialist, education director, and clinical research specialist.³ In leadership team formation and performance, unique professional skills from critical areas in health care were specifically drawn upon to oversee the operation of the NBU, incorporating medical and nursing care and treatment, unit administration, environmental infection control, emergency planning, and training/continuing education. Each NBU competency represented is crucial for safe, comprehensive unit functionality.

The roles of NBU support staff vary extensively. A public information officer (PIO) responds to external media requests by transparently delivering accurate, timely information to the local, national, and international audience. A behavioral health specialist monitors and facilitates the mental well-being of the patient, patient's family, and NBU staff. The concierge nurse arranges the logistics of patient family's travel plans such as lodging and transportation during their stay in Omaha, coordinates needs of the family, and serves as a communication liaison to the team. Ebola waste management requires coordination between NBU

environmental specialists, Nebraska Medicine Environmental Services, and the medical waste vendor.⁵ All NBU solid waste is autoclaved inside the unit prior to disposal. Medical facilities without an autoclave would be required to obtain a Department of Transportation (DOT) Category A infectious substance special permit in conjunction with their designated medical waste vendor to transport and remove Ebola waste.⁵ The NBU liquid waste disposal process involving exposure to hospital grade disinfectant before toilet flushing was discussed with local public works and plumbing organizations to alleviate concern for Ebola contamination via hospital plumbing.⁵ Multiple supporting departments within Nebraska Medicine and UNMC as well as external partners were necessary to maintain functionality of the NBU before, during and after activation (Table 1).

As illustrated, the expanse of NBU team members, supporters, and stakeholders reaches far beyond the traditional health care paradigm. This interprofessional model incorporates expertise from countless individuals and organizations in health care to safely protect and enable personnel to deliver complex clinical care to patients with highly infectious diseases.

Collaborative NBU model

Throughout the past 10 years prior to activation, the NBU developed policies and procedures in the care of highly infectious patients based on agreed consensus, experience in exercising and drilling, and feedback from the biocontainment unit team. Policy development is an ongoing and fluid process, and the policies are created by the interdisciplinary NBU leadership team and vetted for improvement and quality assurance by the NBU staff. The policies are also drilled and refined by the NBU team. After caring for a patient with EVD, the NBU team collectively scrutinizes, evaluates, and redevelops protocol details to modify best practices based on first-hand experience. The NIH and Emory University have also relied on varied perspectives of interdisciplinary teams to meticulously develop procedures.⁶ Likewise, the EUNID professional backgrounds comprising the consensus group included infectious diseases, intensive care, infection control, pulmonary medicine, occupational health, or public health to contribute distinctive views on highly infectious patient care recommendations.²

NBU culture of safety

The NBU utilizes a collaborative model with a minimized hierarchical structure.⁷ Every individual involved in the NBU team,

regardless of profession, is responsible for the health and safety of his or her co-workers, particularly during procedures such as donning and doffing (i.e., putting on and removing) personal protective equipment (PPE). Thus, all staff are encouraged and expected to immediately notify their coworkers if they notice any potential breach in protocol or PPE during patient care. Bringing attention to an error in the NBU is viewed as lifesaving, rather than a criticism of the staff member. Additionally, given the risks of working in the biocontainment setting and importance of following rigorous environmental infection control, the NBU staff members are responsible for all environmental services tasks within the NBU such as waste management and routine room cleaning during the stay of a patient with EVD. Many of the clinical care providers spend a portion of each shift in the NBU performing tasks that are not in their usual job description, including bleach wiping surfaces in the patient room and patient bathroom, mopping the patient room and hallway floors, removing solid waste by autoclave, etc. A similar model of shared maintenance duties between the care team was recommended by EUNID, in which biocontainment unit staff are cross-trained in areas such as phlebotomy, food service, and housekeeping to minimize the number of personnel in contact with the patient and put at risk of disease transmission.²

NBU health professionals are educated in fundamental infection control practices and use their knowledge of biocontainment unit execution to adjust procedures as necessary to maintain maximum safety. For instance, health providers regularly using PPE may recognize a problem associated with prolonged or repeated wearing and suggest modifications to enhance safety. Most importantly, the NBU leadership team recognizes the importance of the voice of the direct care providers and values their input in creating and modifying protocols.

During activation, daily huddles with the patient care team and support staff were used to encourage input from the NBU staff and update all team members on any minor revisions in protocols. The varied NBU team cares for highly infectious patients in an unusual setting, so the majority of the team does not work together on a

daily basis when the unit is not activated. Scheduling regular trainings and exercises familiarizes NBU personnel to working with one another and supports internal trust and team building.

The culture of safety and reputation of staff camaraderie within the NBU has translated into efficient recruiting for additional care provider volunteers, and the NBU team has added multiple new members since the arrival of the first patient with EVD. Successfully caring for patients with EVD or other highly infectious diseases in the biocontainment unit is made possible through intensive planning, significant attention to detail, and an interprofessional, collaborative team approach.

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