

High-Containment Pathogen Preparation in the Intensive Care Unit



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KEYWORDS

- Preparedness • Supportive critical care • High-containment pathogens
- Biocontainment unit

KEY POINTS

- Providing state-of-the-art critical care to patients with highly infectious diseases presents unique challenges to health care providers and hospitals.
- Specialized biocontainment units or modification of existing care environments are needed to facilitate the delivery of safe and effective high-containment care.
- Multidisciplinary teams, protocol development, appropriate staffing, and training optimize the likelihood of a successful clinical outcome, including prevention of health care worker infections.
- Coordination at the local, state, regional, and national level is required to care for patients infected with high-containment pathogens.

INTRODUCTION

The recent Ebola virus disease (EVD) outbreak in West Africa in 2014 to 2016 highlighted the capabilities of dedicated biocontainment units (BCUs) at the National Institutes of Health (NIH), Emory University, and the Nebraska Medical Center to provide care for patients with highly infectious diseases.¹⁻³ In order to increase national capacity, the Centers for Disease Control and Prevention (CDC) called for the creation

Disclosure Statement: None of the authors are aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review. The Intramural Research Programs of National Institutes of Health (Clinical Center, Critical Care Medicine Department) supported this work. The content of this publication does not necessarily reflect the views or policies of the US Department of Health and Human Services; mention of trade names, commercial products, or organizations does not imply endorsement by the US government.

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Infect Dis Clin N Am 31 (2017) 561-576
<http://dx.doi.org/10.1016/j.idc.2017.05.008>
0891-5520/17/Published by Elsevier Inc.

id.theclinics.com

of a tiered network of US hospitals, including frontline hospitals, assessment hospitals, and Ebola Treatment Centers (ETCs).⁴ The Office of the Assistant Secretary for Preparedness and Response (ASPR) also funded the creation of 10 Regional Ebola and Special Pathogen Treatment Centers (RESPTCs).⁵

There are no definitive guidelines outlining the optimal environment of care for patients with highly infectious diseases.⁵ Several of the RESPTCs and some of the ETCs built new stand-alone BCUs.⁶ Other hospitals, such as Bellevue Health Center in New York City, transitioned existing intensive care unit (ICU) or other patient-care space into high-containment areas to be used on an as-needed basis.⁷ Regardless of the chosen solution, there are several core principles that underlie the creation of containment areas that can provide care for patients with highly infectious diseases^{3,8} (Box 1). In this article, the authors review the key aspects of high-containment care and provide a framework for successful critical care in this environment.

THE ENVIRONMENT

The physical structure of the care space is critical to ensuring health care worker, staff, and patient safety in the context of highly infectious diseases. The European Network of Infectious Diseases as well as a group from US centers with experience in highly infectious diseases have published consensus guidelines on the design and operation of BCUs.^{3,8} Lessons learned from the 2014 to 2016 EVD outbreak have further informed design considerations.⁶

Location of the Unit

The ideal containment area should be located away from other clinical areas with secured entry and exit points. This location will limit unnecessary traffic through the space. There should also be clearly identifiable transport routes into and out of the unit to allow entry of new patients and to evacuate patients and staff in the event of an emergency.³

Layout of the Care Space

The layout of the unit needs to support infection control practices, such as the donning and doffing of personal protective equipment (PPE) as well as the prevention of cross-contamination of clean areas. At a minimum, each patient room should have an

Box 1

Common features of biocontainment units

- Secure entry and exit points
- Onsite laboratory
- Advanced air-handling system for airborne and droplet transmission
- Highly trained nurse and clinician provider team
- Critical care capabilities
- Onsite portable radiology and ultrasound
- Advanced telecommunication capabilities
- Pass-through autoclaves for waste management
- Dedicated donning and doffing areas
- Unidirectional flow of staff through patient care areas where possible

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