



## NATIONAL HIGH-LEVEL PATIENT CAPACITY

*Prepared by: Matthew P. Shearer*

### BACKGROUND

In 2014, the response to domestic cases of Ebola virus disease (EVD) stemming from the 2013-2016 West Africa Ebola epidemic illustrated significant gaps in domestic healthcare preparedness for high-consequence infectious disease (HCID) patients. While initial risk messaging touted the ability of “essentially any hospital” to effectively identify, isolate, and treat an EVD patient,<sup>1</sup> the transmission of Ebola virus infection to 2 healthcare workers treating an EVD patient highlighted the need for specialized training and facilities to safely manage these diseases.<sup>2</sup>

In the wake of the domestic cases of EVD, the US Department of Health and Human Services—specifically, the Centers for Disease Control and Prevention (CDC) and the Office of the Assistant Secretary for Preparedness and Response (ASPR)—initiated an effort to formally develop a tiered hospital system that could ensure that the appropriate level of national capacity exists to safely and effectively identify, isolate, and treat high-consequence infectious disease patients. It is unreasonable to expect every facility to invest the time and resources that would be necessary to establish and maintain the required level of capabilities, so a tiered system could optimize the allocation of limited resources. This program began with interim guidance for what were initially labeled as frontline healthcare facilities, Ebola assessment hospitals, and Ebola treatment centers (ETCs).<sup>3</sup>

The CDC formally announced the designation of 35 Ebola treatment centers in December 2014,<sup>4</sup> steadily expanding to a total of 55.<sup>5</sup> This program evolved in June 2015, when the CDC designated 9 of these facilities—including 3 facilities that treated confirmed EVD patients—as what would eventually come to be known as Regional Ebola and Special Pathogens Treatment Centers (RESPTCs). The tenth RESPTC was added in June 2016, ultimately corresponding to the 10 FEMA regions.

The Regional Ebola and Special Pathogens Treatment Centers are:<sup>6,7</sup>

1. Massachusetts General Hospital (Boston)
2. New York City Health and Hospitals Corp./HHC Bellevue Hospital Center (New York City)
3. Johns Hopkins Hospital (Baltimore)
4. Emory University Hospital and Children's Healthcare of Atlanta/Egleston Children's Hospital (Atlanta)
5. University of Minnesota Medical Center (Minneapolis)
6. University of Texas Medical Branch at Galveston
7. Nebraska Medicine-Nebraska Medical Center (Omaha)
8. Denver Health Medical Center
9. Cedars-Sinai Medical Center (Los Angeles)
10. Providence Sacred Heart Medical Center and Children's Hospital (Spokane)



## HIGH-LEVEL ISOLATION PATIENT CAPACITY

The requirements for RESPTCs include the ability to handle at least 2 viral hemorrhagic fever patients simultaneously and the capacity to implement respiratory/negative pressure isolation for a minimum of 10 patients simultaneously. These facilities are also charged with maintaining the capacity to accept patients within 8 hours of notification.<sup>8</sup>

In 2015, the National Ebola Training and Education Center (NETEC) conducted a survey of the 55 treatment centers, including the 10 RESPTCs. Among a range of other topics, the survey collected data on the bed capacity for viral hemorrhagic fever (VHF) patients. Based on 47 responses (of the 55 total treatment centers), the study found a total national capacity of 121 beds, 84 of which could support the care of an adult patient and 91 of which could potentially be used for pediatric patients. These include 24 total beds available, 17 of which could support pediatric care, across the 7 RESPTCs that responded. The average bed capacity for patients with viral hemorrhagic fever among the nonregional treatment centers was 2.4, and the RESPTCs had an average capacity of 3.4 beds. Extrapolating these figures across the 45 nonregional treatment centers and the 10 RESPTCs, we can estimate a nationwide total of 142 total beds for patients with viral hemorrhagic fever.<sup>8</sup>

If we assume that all 10 RESPTCs have established and maintained the required capacity to isolate and treat 10 respiratory patients simultaneously, this provides 100 total airborne isolation beds across these facilities. Further assuming that the ratio of viral hemorrhagic fever beds per facility (2.4 nonregional treatment beds to 3.4 RESPTC beds) also holds for airborne isolation patients, we can estimate that a total of 317 airborne isolation beds are available across the 45 nonregional treatment centers. Accounting for a small margin of error, an estimate of **400 high-consequence infectious disease airborne isolation beds** is a reasonable approximation for our existing national capacity under nearly ideal conditions.

A study based on these survey results indicates that the national treatment center bed capacity would likely be adequate for controlling a nationwide EVD outbreak; however, it would be much more challenging for a pathogen that exhibits airborne transmission. Most treatment center facilities have features such as negative pressure isolation rooms, anterooms, and Category A waste sterilization capabilities, but not all are fully functional yet. Additionally, even with an ideal setup, staffing would likely be a challenge for this many patients.<sup>8</sup>

A recent conversation with a representative from NETEC provided additional insight regarding the true availability of high-level isolation capacity for respiratory pathogens. The number of true high-consequence infectious disease airborne beds at the RESPTCs is far short of the 100 required. Some have legitimate capacity and protocols in place to handle 10 airborne patients, but most cite available negative-pressure rooms located throughout their facility and do not necessarily have concrete protocols to use them for high-consequence infectious disease patients. Most of these rooms are spread throughout the hospital and do not have features such as anterooms that would be expected for a high-level isolation unit. Similarly, these facilities may not have readily available waste disposal capability or laboratory capabilities, communications, and remote patient monitoring equipment for patient beds outside of their formal high-level isolation area. The NETEC representative agreed that **400 high-level airborne isolation beds** is a reasonable estimate for the best-case high-level isolation capacity for respiratory disease patients. However, the actual national capacity likely falls far short of this number. A number of the initial 45 nonregional treatment centers are no longer able to function in this capacity due to lack of funding, and even if all 400 respiratory isolation beds



did exist, it is unlikely that these facilities could adequately supply and staff them to manage this number of patients simultaneously.

We have decided to use 400 beds as our baseline high-level isolation capacity for Clade X patients, but we explicitly note during the exercise that this is the best-case scenario and that actual capacity is likely a fraction of this number.

## REFERENCES

1. US Centers of Disease Control and Prevention. CDC telebriefing: CDC update on first Ebola case diagnosed in the United States, 10-02-2014 [transcript]. CDC website. October 2, 2014. <https://www.cdc.gov/media/releases/2014/t1002-ebola-in-us-update.html>. Accessed May 6, 2018.
2. Carome M. Outrage of the month: CDC Director's false assurances on Ebola. *Huffington Post* October 29, 2014. <https://www.huffingtonpost.com/michael-carome-md/outrage-of-the-month-cdc-b-6054500.html>. Accessed May 6, 2018.
3. US Centers of Disease Control and Prevention. Preparing for Ebola—a tiered approach. CDC website. Updated January 22, 2015. <https://www.cdc.gov/vhf/ebola/healthcare-us/preparing/index.html>. Accessed May 2, 2018.
4. US Centers of Disease Control and Prevention. Safe Healthcare Blog. 35 U.S. hospitals designated as Ebola treatment centers. CDC website. December 2, 2014. <https://blogs.cdc.gov/safehealthcare/35-u-s-hospitals-designated-as-ebola-treatment-centers/>. Accessed May 2, 2018.
5. US Centers of Disease Control and Prevention. Hospital preparedness: a tiered approach. CDC website. Updated February 20, 2015. <https://www.cdc.gov/vhf/ebola/healthcare-us/preparing/current-treatment-centers.html>. Accessed May 6, 2018.
6. 9 hospitals named regional Ebola, other special pathogen treatment centers. Becker's Hospital Review website. June 15, 2015. <https://www.beckershospitalreview.com/quality/9-hospitals-named-regional-ebola-other-special-pathogen-treatment-centers.html>. Accessed May 6, 2018.
7. HHS adds Cedars-Sinai to regional Ebola treatment center network. Becker's Hospital Review website. June 15, 2016. <https://www.beckershospitalreview.com/quality/hhs-adds-cedars-sinai-to-regional-ebola-treatment-center-network.html>. Accessed May 6, 2018.
8. Herstein JJ, Biddinger PD, Kraft CS, et al. Current capabilities and capacity of Ebola treatment centers in the United States. *Infect Control Hosp Epidemiol* 2016;37(3):313-318.

*Date: May 2, 2018*