

## VIRAL OUTBREAKS IN AN AGE OF GLOBAL CITIZENSHIP

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**T**he 2014 West Africa Ebola outbreak is the most recent highly publicized viral outbreak to challenge the health care community, but Ebola Viral Disease (EVD) has not been our first challenge and it will not be the last. Infectious diseases have always carried risks for health care providers, and there have always been dedicated healers ready to face the fight.

A roadside marker near Elliston, Virginia, testifies that neither outbreaks nor their effects on those who bravely step forward to care for the sick are new. The marker's inscription reads, "Near here stood Montgomery White Sulphur Springs, popular resort area of 19th century America. During the Civil War the resort was converted into a military hospital staffed by Catholic nuns. Several hundred victims of smallpox including nurses and soldiers are buried nearby."<sup>1</sup> Today, we might do well to take a moment to contemplate the sacrifices of contemporary health workers on the West African frontlines who also have been buried alongside patients they sought to save.<sup>2</sup>

As we rise to meet present challenges, a pragmatic reflection on previous outbreaks can assist health care providers to react more effectively to these and

future challenges. Of course, these kinds of outbreaks are of particular concern to critical care providers because a relatively large proportion of patients affected have become critically ill. Caring for these patients involves risk of exposure and transmission to others.

### Viral Disease in the Global Village

In the previous decade, health care providers worldwide have wrestled with several viral diseases that posed potentially serious threats, including Middle Eastern Respiratory Syndrome (MERS), Severe Acute Respiratory Syndrome (SARS), and the 2009 H1N1 influenza pandemic. To date there have been relatively small numbers of EVD, MERS, or SARS patients treated in the United States, but the H1N1 influenza pandemic taught us that viral diseases do not respect international boundaries. The Table illustrates how quickly diseases that originate elsewhere can affect the United States. It behooves us to pay attention to global health care problems and to be ready to respond. We are global citizens, and we cannot view illnesses as geographically distinct problems that don't concern us.

Two imported cases of MERS, in health care providers who were infected while working in Saudi Arabia, were documented in the United States in

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**Table**  
**Characteristics of recent viral outbreaks**

Disease	Viral cause	Index case	First imported US case	References
West Africa Outbreak: Ebola Viral Disease, Ebola Hemorrhagic Fever	Ebola virus (family <i>Filoviridae</i> , genus <i>Ebolavirus</i> )	Guinea, December 2013	September 2014	8, 9, 11
Middle Eastern Respiratory Syndrome (MERS)	MERS-corona virus (MERS-CoV)	Saudi Arabia, June 2012	May 2014	3, 4
H1N1 Pandemic influenza	Influenza A (H1N1)	Mexico, February 2009	March 2009	6, 7
Severe Acute Respiratory Syndrome (SARS)	SARS-associated coronavirus	Asia, November 2002	March 2003	4, 5

May 2014.<sup>3,4</sup> These were the first reports of MERS in the United States, but MERS has received much less publicity than EVD. Unlike EVD, MERS did not spread to the health care workers who treated the 2 imported cases, and did not generate widespread concern among the public.

SARS caused a global outbreak in 2003, and although no deaths occurred in the United States, 29 states reported probable cases.<sup>4,5</sup> Breaches in the use of personal protective equipment were linked to infections in health care providers. SARS subsided as mysteriously as it began, and there have been no known cases of SARS anywhere in the world since 2004.

Our familiarity with seasonal influenza may make us less likely to think about pandemic influenza as a serious risk. However, the CDC estimated that the 2009 pandemic influenza outbreak involved approximately 60.8 million cases and more than 12 000 deaths in the United States alone.<sup>6</sup> In a review of the 2009 influenza pandemic, Fineberg stated, “In terms of persistence, versatility, potential severity, and speed of spread, however, few viruses rival influenza virus.”<sup>7(p1335)</sup>

## Ebola Outbreaks in Africa

The first reported outbreak of Ebola occurred in 1976, and thus far all EVD outbreaks have originated

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in Africa.<sup>8</sup> The 2014 West African outbreak is the largest ever reported, and it occurred concurrently with an unrelated Democratic Republic of Congo outbreak. At the end of October 2014, the World Health Organization reported more than 10 000 probable, confirmed, and suspected cases in West Africa, with almost 5000 deaths, and the reported number of cases was doubling every 15 to 20 days in Liberia.<sup>9</sup>

In September 2014, the Centers for Disease Control and Prevention (CDC) published an Ebola Response modeling tool to estimate the potential number of future cases and how additional control measures might affect the number of cases.<sup>10</sup> Extrapolating from existing data, they estimated that if no additional interventions to control the spread were instituted, Liberia and Sierra Leone would have approximately 550 000 EVD cases (and an estimated 1.4 million cases when corrected for underreporting) by January 2015. Further modeling predicted that if 70% of EVD cases were treated under conditions that limited transmission (including safe burial of patients who succumb to EVD), the outbreak would be nearly over by the end of January 2015. These astonishing figures highlight the importance of interrupting transmission.

## New Pathogens Are Unpredictable

Because outbreaks involve novel pathogens, they challenge our thinking. Although experience serves as an initial rough guide for responses to outbreaks, novel pathogens are unpredictable and often defy conventional wisdom. Research is difficult to conduct during an outbreak. Resources are scarce, and the focus is appropriately on the urgent needs of reducing the spread of disease and providing

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supportive care to victims. Despite the difficulties, research to develop novel diagnostic strategies, therapies, and vaccines is crucial and offers broad potential benefit to future patients. Interestingly, all of the viral pathogens in Table 1 have zoonotic connections. Research that improves our understanding of animal sources and zoonotic transmission, as well as surveillance of viral pathogens in animals, is underdeveloped and underfunded, but it is vital to prevention of future outbreaks.

Outbreaks reinforce the importance of critical care knowledge, skill, and teamwork in uncertain situations. Prevention and supportive therapy, which seem simple, require high levels of infrastructure and of provider knowledge and skills. These elements are already part of the critical care tool kit, but outbreaks highlight the importance of the basics as a foundation for clinical practice. For example, infection control practices are one of the first skill sets that nurses and physicians learn, but they are also some of the most difficult skills to perform well and consistently.

Containing the spread of EVD, MERS, SARS, and influenza requires standard and contact precautions. Airborne infection isolation is recommended for MERS, SARS, and influenza; although EVD is not spread by airborne transmission, it can be spread by aerosolized secretions. In order to be effective, infection control measures must begin at the first point of contact with a potentially infected person. The recent Ebola outbreak reminds us that hand washing, personal protective equipment, and pristine technique are essential. Practice makes perfect. Safety requires both individual effort and exceptional teamwork, including taking accountability for helping each other adhere to infection control protocols.

### Knowledge Mitigates Risk

The very nature of clinical care brings nurses, physicians, and other members of the health care team into close proximity with patients at the most infectious period of their illness. Today's risks are mitigated by better understanding of pathogenesis and transmission, by the availability of personal protective equipment, and by the exceptional knowledge and skills of critical care providers. But caring for outbreak victims will never be completely free of risk.

Our duty is to use all our knowledge and skills to protect ourselves, our patients, and the public, and to be ready for the next challenge. History has shown there will always be dedicated health care providers ready to take evidence-based practice and basic human compassion to the frontlines of these battles.

The statements and opinions contained in this editorial are solely those of the coeditors.

### FINANCIAL DISCLOSURES

None reported.

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