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## America's Emergency Care System and Severe Acute Respiratory Syndrome: Are We Ready?

**James J. Augustine, MD**

**Arthur L. Kellermann, MD, MPH**

**Jeffrey P. Koplan, MD, MPH**

*From the Department of Emergency Medicine (Augustine, Kellermann), School of Medicine, Emory University, and the Woodruff Health Sciences Center of Emory University (Koplan), Atlanta, GA.*

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To date, severe acute respiratory syndrome (SARS) has sickened at least 8,400 individuals and killed more than 820 worldwide. Before public health officials in China recognized the significance of the initial outbreak of this new disease, infected travelers had sparked secondary outbreaks in several Asian nations and in Toronto, Ontario, Canada. The severity of the ensuing illness and its ready transmissibility severely challenged the medical care systems of affected countries.<sup>1-4</sup> Although much has been learned about SARS since the disease was first identified, many questions are unanswered. It is not yet known, for example, if the disease is seasonal, how it may be transmitted, and why certain individuals are "superspreaders" of infection.<sup>5,6</sup>

SARS is characterized by a high degree of infectivity among close personal contacts, including treating health care workers.<sup>7,8</sup> To date, SARS infection has not produced a random pattern of contagious spread.<sup>1-3,9,10</sup> The virus can contaminate buildings, fixtures, and

patient care areas, but details of how contamination takes place and the persistence of infectious material are unknown.<sup>4</sup> As yet, no antimicrobial agent (alone or in combination with other drugs such as corticosteroids) has been established as effective.

Worse yet, the disease is highly virulent. Despite widespread provision of intensive care, including endotracheal intubation and mechanical ventilation, the disease produced a case-fatality rate among hospitalized patients of 10% to 15%.<sup>11-13</sup> Aggressive respiratory care increased the risk of disease transmission to treating health care workers.<sup>7,8,14,15</sup> The combination of ready transmissibility and virulence makes SARS a particularly dangerous disease, one that resembles the Class A bioterrorism agents (Table).

Because the first outbreaks of SARS and deaths occurred outside the United States, public concern in this country was intense, but short-lived. When the worldwide incidence of SARS declined this past spring, officials quickly declared victory. The June 18, 2003 edition of *USA Today* announced, "Experts: SARS Is Stopped."<sup>5</sup>

This statement may be regretfully premature. It is extremely difficult to predict the course of a new epidemic disease, particularly one that is still being characterized. Anthony Fauci, head of the National Institute of Allergy and Infectious Diseases at the National Institutes of Health, offered a cautionary note. "We still have the same conditions in China that led to the emergence of this epidemic, so there's no reason to believe it's not going to happen again," he observed. "We're just one case from the disease reappearing."<sup>5</sup>

There are also historical reasons to worry. The influenza pandemic of 1918 to 1919 was a global disaster. First identified in Spain in February 1918, the disease was named "Spanish flu" or "La Grippe." The initial outbreak in the United States occurred at a Kansas army camp in March 1918. Like many viral respiratory diseases, Spanish flu subsided with the onset of summer. Only isolated cases were identified over the next few months.

The disease reemerged with explosive force in the autumn of 1918. The first major outbreaks in the United States occurred in Boston, MA, and Philadelphia, PA. By the time the Spanish flu ran its course, more than 25% of the US population had fallen ill, and 675,000 Americans had died. Worldwide, Spanish flu

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killed at least 20 million people, making it the most deadly global pandemic in history.<sup>16,17</sup>

With an estimated case-fatality rate of 2.5%, Spanish flu was 25 times more deadly than a typical outbreak of influenza, which kills only one tenth of 1% of infected individuals.<sup>11</sup> SARS is less contagious than influenza, but it is readily transmitted to close contacts, including health care workers wearing personal protective equipment.<sup>18</sup> More disturbingly, SARS is more virulent than any known strain of influenza, including the Spanish flu of 1918.

If SARS returns this winter, or at any time in the future, it could pose an enormous threat to the US public. If past experience is any predictor of future events, the disease will strike with particular force at health care workers who provide "first contact" care to acutely ill patients, namely, providers of emergency medical services (EMS) and hospital emergency department (ED) staff. For various reasons, these individuals are already stretched to their operating limits.<sup>19,20</sup>

When SARS was first identified, US hospitals were able to screen ED patients by asking those with acute respiratory symptoms and fever if they had a history of recent travel to a SARS-endemic area or contact with someone from an endemic area. This strategy worked because SARS was entering the United States from a relatively small number of Asian countries and the city of Toronto. If SARS ever becomes established in the United States, these questions will lose their specificity. Once that happens, it will be extremely difficult to differentiate early cases of SARS from the broad variety of respiratory illnesses that cause fever, cough, and myalgias.<sup>21,22</sup> In a normal fall or winter, millions of Americans experience these symptoms.

If and when SARS returns, protecting our nation's health care workers should be a top priority. EMS and hospital employees were heavily represented among the early victims of the first SARS outbreaks. Several became "superspreaders" of infection to other patients, fellow health care workers, and close family contacts. Once news of these cases surfaced, many health care workers, including those who were neither infected nor placed in quarantine, reported that other members of the community avoided them.<sup>18,23</sup> As fellow staff members fell ill or were quarantined, those that remained were forced to work long hours in uncomfortable personal protective equipment. Changing directives over use of protective gear heightened fears of occupational infection. These factors placed health care workers in affected cities under tremendous physical and emotional stress.<sup>18,23</sup>

To avoid a replay of problems encountered around the globe, immediate steps should be taken to enhance the nation's capacity to control this highly lethal disease. There are many reasons to do so above and beyond betting on whether SARS will ever return. SARS resulted from a confluence of natural events,<sup>24,25</sup> but it shares many characteristics with bioterrorism agents (Table). Therefore, rapid adoption of processes and procedures to safely identify and control SARS will not only safeguard public health, they will enhance national security.<sup>26,27</sup>

Ironically, despite ongoing fear of bioterrorism, it can be argued that key elements of our health care system today are less capable today of containing a biologic threat than they were before September 11, 2001.<sup>19,20,27</sup> There are many explanations for this paradox. As a result of progressive cuts in third-party reimbursement and a shortage of trained staff, US hospitals shed 103,000 staffed hospital beds and 7,800 medical/surgical ICU beds during the decade of the 1990s.<sup>28</sup> Fewer beds mean longer waits before unscheduled admissions from the EDs can reach an inpatient unit.<sup>19,20</sup> Boarding of admitted patients in the ED is the factor most commonly associated with crowded conditions and subsequent diversion of inbound ambulances—practices that heighten the risk of disease transmission. These are

**Table.**  
*A comparison of properties of agents of bioterrorism and SARS.*

Characteristic	SARS	Bioterrorism Agent
The ability to cause serious illness or death	Yes	Yes
Person-to-person transmission	Yes	Yes
Prevented or treated with antibiotics, vaccines, or toxin antagonists if promptly diagnosed	Not as yet	Yes
A rapid or unusual increase (hours to days) in the number of previously healthy persons with similar symptoms (eg, fever, respiratory, gastrointestinal, rash complaint) seeking care	Not as yet	Yes
A cluster of previously healthy persons with similar symptoms who live, work, or recreate in a common geographic area	Yes	Yes
Lower incident rates in those persons who are protected (eg, confined to home, no exposure to large crowds)	Yes	Yes
High infectivity rate	Yes	Some agents
Any patient arriving with known bioterrorism agent not present by natural dissemination (eg, smallpox, anthrax)	No	Yes
An increase in reports of dead animals	Not as yet	Some agents
Ease of cultivation, storage, and dissemination	No	Some agents
An increased number of patients who die within 72 hours after admission to the hospital	Yes	Yes

more than theoretical concerns. When the second victim of SARS in Toronto presented to a hospital for treatment of what was thought at the time to be "community acquired pneumonia," he was held in the ED for a protracted period of time until an inpatient bed became available.<sup>29</sup> During his lengthy ED stay, he infected several patients and members of the hospital staff, some of whom subsequently died. The Toronto outbreak ultimately cost the Canadian economy more than \$1.3 billion dollars.

This is why the articles in this issue of *Annals* are so important.<sup>30-34</sup> Observations gleaned from the initial outbreaks of SARS may offer important insights into what we can do to effectively contain a future outbreak of this deadly disease. Although this information will be helpful, it will do little good unless policymakers recognize the need to take immediate steps to provide our nation's EMS systems, EDs, and hospitals with the protective equipment, training, and facilities they need to safeguard the public's health. Most of the funds that were publicly pledged to strengthening the nation's defenses against bioterrorism have not yet reached their target groups. As a result, we are woefully unprepared for a reemergence of SARS this winter.

Considering the nationwide shortage of nurses and other skilled health care workers, protecting our health care workforce must be a top priority. This entails immediate provision of training and decision support systems, rapid distribution of personal protective equipment, and rigorous oversight of infection control measures. Failure to adopt these measures may result in the widespread occupational exposure and subsequent quarantine of large numbers of health care workers. This would devastate the staffing plans of hospitals and EMS services at the outset of an epidemic, precisely when these personnel are most needed.

Likewise, a major outbreak of SARS in the United States will disrupt the day-to-day care that consumes most hospitals. It could even incapacitate multiple hospital campuses. This occurred in Canada and China.<sup>8,29</sup> If even one hospital becomes contaminated with SARS, subsequent decontamination will be costly and time-consuming. Given evidence that the number of inpatient beds in many large metropolitan areas is inadequate to meet the needs of the community, the loss of even a single hospital would be a matter of grave concern.

If SARS has been stopped "dead in its tracks," as some assert, these worries are moot.<sup>5</sup> If, however, the world has been granted little more than a seasonal

respite, we have scant time to prepare. The measures needed to promptly identify and control the next outbreak of SARS are the same ones needed to control the next pandemic strain of influenza or the intentional release of a bioterrorism agent. They should be adopted as quickly as possible.

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**Address for correspondence:** James J. Augustine, MD, Department of Emergency Medicine, Emory University, 1365 Clifton Road, NE, Atlanta, GA 30322; 404-486-1157; E-mail [jaugust@emory.edu](mailto:jaugust@emory.edu).

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