Pandemic preparedness and response: The role of medical interventions

Ann Peterka, DO, MPH

The tragedies of 9/11 and Hurricane Katrina—and the threat of future nuclear or biological terrorist incidents—serve as stark reminders that the challenges facing emergency managers and first responders in the 21st century differ markedly from those in the past. Perhaps nothing illustrates the magnitude of the new world of emergency response management more than the threat of an avian flu pandemic.

The influenza virus is inherently unpredictable, and, as a result, the timing of the next pandemic and the strain that will cause it remain uncertain.[1] The H5N1 avian influenza virus has been ravaging Asian poultry stocks since late 2003, and, in recent months, it spread to birds in Germany and France.[2] While human infections have been relatively rare, they are occurring regularly in certain areas of the world. Indonesia, in particular, has struggled to contain the virus and leads the world in the number of deaths: 81 people in Indonesia have died after contracting H5N1 as of July 11, 2007.[3] Just this year, the fatality rate for bird flu cases in Indonesia rose to 87 percent—four out of every five people infected with H5N1 in Indonesia died from the virus. Worldwide it has infected 318 people, killing 192 of them (as of July 11, 2007),[3] and more than 200 million birds have died from it or have been killed to prevent its spread.

The H5N1 virus' continued ability to infect new poultry and to cause more human fatalities despite massive attempts to eradicate it has led many health experts to agree that it appears to be the most likely culprit to cause the next pandemic.[1] The potential certainly exists for the virus to mutate into a form that can be passed easily among people, which could lead to a worldwide pandemic and millions of deaths.[1]

The United States has so far been spared from the H5N1 virus, but while it has not yet hit our shores, it is inaccurate to assume that we are at low risk of being struck by a pandemic. The spread of H5N1 avian influenza to 59 countries in the past 4 years has brought the world closer to another pandemic than at any time since 1968, when the last of the previous century's three major outbreaks occurred, world health experts say.[4] According to Nigel Curtis, an associate professor of pediatrics at the University of Melbourne, who has authored studies on the threat of a pandemic, the fact that H5N1 has not been more widespread among humans in the United States and Europe does not mean the risk has diminished: "The incorrect conclusion people draw from that is maybe it's never going to happen, whereas history tells us that there is an inevitability of a pandemic at some point; it's just a question of when, where and how large."[5]

In comparison with previous eras and pandemics, we are at an even more enhanced risk of a pandemic because of certain societal characteristics. The global population is much denser, more mobile, and exponentially larger today than it was during the time of any of the previous pandemics.[6] Because of advances in medical care, we have an aging population[7] that includes greater numbers of immunocompromised hosts.[8] More mothers work outside the home for social and economic reasons, and consequently, more children than ever before are in daycare.[9] We also travel much more extensively than previous populations,

increasing the possibility of viruses being carried around the globe in a matter of weeks, as opposed to previous pandemics, which typically swept across the world in 6 to 9 months.[10]

No amount of traditional emergency training will be adequate when the next pandemic strikes. In some ways, emergency preparedness and pandemic preparedness are independent of one another because of the unique characteristics that set pandemics apart from other types of emergencies. These include the following:

- Duration: Natural disasters are typically singular, short-lived events. A pandemic, on the contrary, operates on a long-term timeframe lasting as long as 18 months, with a series of waves lasting anywhere from 6 to 8 weeks—in contrast to the brief intervals that characterize typical emergencies.

- Geographic Spread: Events such as earthquakes and tornadoes usually strike one specific region, allowing unaffected parts of the world to provide relief for affected areas. This type of assistance will likely be prohibited or weakened during an influenza pandemic because the virus outbreaks will be widespread and multiple locations will be dealing with the spread of the highly contagious illness. In other words, emergency managers and first responders must be prepared to sustain their own communities using their own resources during a pandemic.

- Strain on Healthcare System: Leading health experts are in agreement that the healthcare system is at risk of buckling during a pandemic, with massive shortages expected among healthcare workers,[11] who typically work hand-in-hand with first responders. According to a recent survey of US healthcare workers, 42 percent said "maybe" when asked if they would report to work in the event of a bird flu pandemic, while 8 percent said "no, even if I would lose my job."[12] Only 44 percent of nurses indicated that they would report to work. Space in hospitals is also likely to be severely limited—the Trust for America's Health report found that half of the states would run out of hospital beds within 2 weeks of a moderate flu pandemic.[13]

Despite—perhaps because of—these unique characteristics, many of the questions that emergency managers and first responders have about pandemic flu remain largely unanswered. According to Charlie Dickinson, acting assistant administrator of the US Fire Administration, such questions include the following[14]:

- How will first responders prepare their families?

- What is the risk to their families when EMS providers are exposed to the pandemic virus and then return home?

- How will firefighters and policemen who typically assemble at their stations continue their operations when social distancing measures are recommended?

- When hospitals run out of beds, what alternatives will be available to house and treat the sick?

In addressing such questions, this much is clear: It is imperative that the emergency managers who are responsible for developing plans to protect their communities and the first responders who will implement those plans fully understand the medical interventions that will play a crucial role in the weeks and months during and after a pandemic. Familiarity with these interventions will increase first responders' confidence about their individual safety, thereby helping them better ensure the safety of their families and communities.

VACCINES

Vaccination is regarded as the most important medical intervention for preventing influenza. However, the unpredictable nature of the flu is a major hurdle for vaccine developers. It is impossible to develop a vaccine that is tailored to the pandemic strain until that strain emerges and begins to spread. Experts say it could take 6 to 9 months to develop, manufacture, and distribute the vaccine that targets the pandemic strain.

In April, the Food and Drug Administration (FDA) approved the first "prepandemic" vaccine for use in protecting humans against the H5N1 influenza virus. While this represents an important milestone, the approved vaccine has several drawbacks. Results from a clinical trial show that the two-shot series of the vaccine appears to provide protection for only 45 percent of adults who received the highest dose.[15] The bird flu vaccine requires two injections 28 days apart, which could slow the response during a fast-moving flu outbreak. It also is administered in large 90-μg doses, which limits the number of injections that could be produced during a pandemic.[16]

FDA officials and advisers recognize the vaccine's limitations. Approval of the vaccine followed the recommendation of FDA advisers who described it as "better than nothing," and Norman Baylor, director of the FDA's vaccine office, said the vaccine was "sort of an interim measure" until better ones are developed.

The vaccine is being purchased by the federal government for inclusion in the US Strategic National Stockpile. While the government plans to buy enough for 20 million people, the current federal stockpile contains only enough vaccine to cover 6.5 million people.[17] According to John Agwunobi, assistant secretary for health, a working group led by the White House is considering who should get first access to the vaccine stockpile during a pandemic, with the likeliest candidates being workers who are essential to a pandemic response or whose jobs put them at direct risk of infection.

ANTIVIRAL MEDICATIONS

In the absence of an effective vaccine, antiviral medications represent the first line of defense against an influenza pandemic. The World Health Organization (WHO) uses antivirals, particularly Tamiflu, as the primary intervention against H5N1 influenza. Research indicates that Tamiflu is active against the H5N1 virus in laboratory studies and in animals infected with the H5N1 strain taken from humans.[18] The WHO currently advises that in suspected cases of human infection with H5N1 influenza, Tamiflu should be prescribed as soon as possible, ideally within 48 hours of symptom onset, to maximize its therapeutic benefits.

World flu authorities recommend stockpiling enough antivirals to treat a quarter of a country's population, or 75 million Americans. When it comes to antivirals, the challenge is having the medications available when and where they are needed, and the federal government acknowledges that it alone cannot provide protection for the entire country. For this reason, the National Strategy for Pandemic Influenza puts a great deal of responsibility for responding to a pandemic on state and local officials.[19]

The federal government is in the process of buying enough courses of antiviral medications to treat 44 million people and will hold each state's share in a national stockpile. States are encouraged to buy enough doses of antivirals to treat the remaining 31 million people needed to achieve the recommended 25 percent level.

As of July 2007, only 15 states have purchased their full allotments of antivirals, with an additional 22 states ordering a portion of their allocations. These numbers indicate that some states appear to be leaning on the federal government to supply antivirals to protect their citizens, gambling that they will receive enough from the federal stockpile. South Carolina is an example of a state that has chosen to err on the side of caution. In summing up their decision to purchase antivirals, the spokesman for South Carolina Governor Mark Sanford said it best: "We figure it is certainly better to do it and move forward with the purchase and hope we never have to use it than not and wish that we had."

One of the most difficult questions that arises is who should be given first priority to receive the medications. The vast majority of health experts agree that vaccine makers and medical personnel should be among the first to be treated, given that they will then

be able to save more lives. Federal agencies, however, have faced considerable debate about which groups should come next in order of priority. In 2006, two advisory panels to the federal government recommended that the priority list consist of the elderly, patients with at least two high-risk conditions, people with a history of severe pneumonia, pregnant women, first responders, and key government leaders, in that order.

Developing stockpiles and priority lists are just two components of an overall plan for the use of antivirals. Distribution plans are also essential, and according to a federal assessment cited in a report by the Trust for America's Health, only 15 states were prepared as of December 2006 to receive and distribute their share of the medicines and supplies in the Strategic National Stockpile.[16]

While pandemics are global in nature, their effects are felt on the local level, which makes it all the more important for states, counties, cities, and communities to be as prepared as possible for the next pandemic. Without adequate local preparedness, the consequences could be devastating. As Health and Human Services Secretary Michael Leavitt said, "Any community that fails to prepare and expects the federal government will come to the rescue is tragically wrong."[20]

Emergency managers' confidence in their ability to handle the types of emergencies they confront every day—fire, crime, car accidents, medical events—stems from their previous experience. Whether it is extinguishing flames, creating triage centers, or transporting victims to hospitals, they and their personnel have done it before. Therein lies the real challenge of a pandemic: emergency managers and first responders have never experienced one.

It is tempting to assume that emergency preparedness equals pandemic preparedness, but an influenza pandemic is unique. Perhaps the one commonality that a pandemic shares with other emergencies is that it requires planning, and the time for that planning is now.

Ann Peterka, DO, MPH, Director, Employee Health Services, Roche, Nutley, New Jersey.

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