Supplement to *Hospital Infection Control* and *Hospital Employee Health*

BIOTERRORISM WATCH

Preparing for and responding to biological, chemical and nuclear disasters

AHC Media LLC

IN THIS ISSUE

Financial Disclosure:
Editor Gary Evans, Associate Publisher Coles McKagen, and Consulting Editors Patrick Joseph, MD, and Katherine West report no consultant, stockholder, speaker's bureau, research, or other financial relationships with companies having ties to this field of study.

SPRING 2007
VOL. 6, NO. 2 • (pages 9-16)

The fire next time: Pandemic flu, bioterrorism, and ghost of SARS

Whether from man or nature, one calamity informs the next

Although the various scenarios are markedly different, the massive national effort to meet the threat of pandemic influenza the last few years has generally better prepared public health and the medical system against bioterrorism, experts note.

The possibility that avian influenza A (H5N1) may mutate into a strain easily transmissible between humans has forced the health care system to look at critical issues like surge capacity, infection control measures, educating staff, allaying fears and dealing with shortages of critical equipment such as mechanical ventilators.

"People have had to do a lot of work preparing for a pandemic and that will serve bioterrorism preparedness as well," says **Eric Toner**, MD, senior associate at the Center for Biosecurity at the University of Pittsburgh Medical Center (UPMC). "The issues raised for pandemic flu with regards to protecting health care workers with additional protective equipment [e.g., N95 respirators] would be applicable to some bioterrorist agents that are contagious such as smallpox, viral hemorrhaghic fevers, or pneumonic plague."

In addition, there is some overlap with regard to the need to cohort patients and enforce respiratory etiquette at the triage level. "All of those infection control measures would apply to any respiratory contagious illness, whether flu or bioterrorism," he says. "In addition, all of the issues related to surge capacity — at least surge capacity within the walls of the hospital — apply."

Regardless of the agent and its origin, tough questions remain about how to expand the number of hospital beds, ensure adequate staff to provide care and accumulate the necessary stockpiles of medication and supplies.

"These issues all overlap," Toner says. "The difference is that we would expect in most bioterrorism scenarios the whole country would not be affected at one time. With a pandemic, we do expect that more or less the whole country will be affected simultaneously. It makes some of the surge capacity issues a little bit different, but nonetheless there is a lot of similarity."

Indeed, even the most dire bioterrorism scenarios usually envision some initial local event, holding out the hope of containment in a city or area that is presumably already suspected to be on the prime target list for terrorists. But even a pedestrian seasonal flu virus — let alone a pandemic bug for which there is likely to be no direct vaccine match initially — can appear in disparate regions with near simultaneity. That means even the least desired target on our bioterrorists' list is about as likely to face pandemic flu as the next locale. If all are vulnerable, all must be ready. Therein lies the problem.

"Hospitals have done a lot of work in preparing for a pandemic, but there is an awful lot yet to be done," Toner says. "Some of the problems are insufficient funding and just that hospitals are overwhelmed on a day-to-day basis just managing a flood of patients with meager resources. Some of it has been that there hasn't been sufficient guidance that's really practical at the ground level. Progress is being made at a pretty good rate, but if a severe pandemic were to hit it would still be catastrophic." **(See related story, p. 12.)**

True enough no doubt, but some places will be much more prepared than others for an unusual reason. They have — to borrow the term made famous by the novel *The World According to Garp* — been "pre-disastered." What group of hospitals, for example, is more prepared to deal with pandemic flu than those in Toronto? The hard lessons learned there have been shared with all in the stinging final report on severe acute respiratory syndrome (SARS), but clinicians and public health workers there have been through a fierce trial that no drill can simulate. Game speed — not practice speed — the coaches call it.

"Any time professionals and decision makers go through an actual emergency, they are gaining real-life experience that can be redeployed in a new situation that they hadn't envisioned in the first place," says **Monica Schoch-Spana**, PHD, senior associate at the Center for Biosecurity at UPMC.

Thus, whether designed by man or formed in nature, the current calamity informs the next. "[In 2001,] there was a major fire in a train tunnel in the city of Baltimore," she says by way of example. "That crisis brought together public health, emergency management, and the mayor and his staff in a way that equipped them much better to deal with the [subsequent] anthrax letter attacks. So it's building up those trusting relationships, getting more experience communicating with a concerned public and the media that are directly transferable across different extreme events."

A medical anthropologist, Schoch-Spana notes that it was no coincidence the federal government recently decided to use hurricane rankings to classify future pandemics. **(See related story, p. 14.)** "The decision by federal health officials to characterize pandemic flu in terms of severity like a hurricane is driven by historical events," she says. "Americans, even those who don't live in hurricane-prone regions, came to understand just how strong an effect a hurricane could have through Katrina. I think that they were trying to find a way to define the range of possibilities to an American public most of whom have not lived through even a moderate pandemic flu. They seized on a familiar metaphor."

To take the comparison between bioterrorism and pandemic flu full circle, it must be noted that some have argued that influenza would make an ideal biological weapon.[1] This concern became less theoretical last year, when researchers successfully reassembled the legendary 1918 influenza viral

Bioterrorism Watch (ISSN# 1543-0243) is published bimonthly by AHC Media LLC, 3525 Piedmont Road, Building Six, Suite 400, Atlanta, GA 30305. Telephone: (404) 262-7436. Periodicals postage paid at Atlanta, GA 30304.

Subscriber Information

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genome and published the results for consideration by friend and foe alike.[2,3] **(See *Hospital Infection Control,* December 2006, p. 139.)** Among those questioning the wisdom of that decision was **Kenneth Alibek**, MD, PhD, DSc, former chief scientist and deputy director of bioweapons research in the former Soviet Union. Now in the department of molecular and microbiology at the National Center for Biodefense at George Mason University in Washington, DC, Alibek says the Soviets were always interested in weaponizing 1918 flu. It has been argued that influenza would not make a good bioweapon since it could not be controlled once released, and even if you developed a vaccine the weaponized virus still would be subject to ongoing mutation. Nevertheless, Alibek says the sheer virulence and transmissibility of the 1918 strain make it attractive as a bioweapon.

Still, influenza is not likely at the top of anyone's list of bioterrorism concerns, particularly since it a seasonal killer that we face annually with a striking complacency. In any case, preparing for a pandemic flu essentially takes the origin question out of the equation, Schoch-Spana adds. "Conversations about influenza mostly turn on it being a naturally occurring outbreak, simply because pandemic flu is a regular occurrence," she says. "The origin doesn't really matter; it's the management challenges that are extreme if it is a novel strain. Pandemic flu is a great example of an extreme public health emergency. There are certain scenarios that could involve release of a biological agent among civilians that could create a similar effect."

In a published analysis applying the historical lessons of the 1918 pandemic to bioterrorism, Schoch-Spana argues that it is critical to characterize the outbreak accurately and promptly.[4] In 1918, poor disease reporting systems seriously hampered the ability of public health officials to keep the public informed and to manage the outbreak. Influenza was not a reportable condition before the outbreak, and no well-developed system existed through which federal, state, and local health entities could sketch the course of the disease, she found.

"The question of whether things are getting worse or better is a constant for everyone, including the professionals who are trying to control the crisis and the people who are living through it," she says. "The more capacity that we have to describe the crisis as it is unfolding, resolving or fully ending the better."

Another lesson from 1918 is to earn public confidence in emergency measures, preferably before an event occurs. In the 1918 pandemic, some community members embraced public health measures to control flu, but others resisted orders seen as inconsistent, burdensome, or contrary to common sense or deeply held values, she found.

"Whether you are talking about an act of bioterrorism, pandemic flu or any other large-scale outbreak of infectious disease, you will always get a higher degree of collaboration, understanding, and even forgiveness for how things turn out if there has been more upfront interaction with the public," she says. "Starting pre-event makes a great deal of sense. Apart from mass communications, you also want to be reaching out to civil society institutions — communities of faith, professional societies of all kinds, trade unions — all of the different organizations that people belong to in their local and work communities. Include those institutions in emergency planning, [outlining] what will be required of the government and what will be required of community groups."

Shadow of Katrina

In the aftermath of Hurricane Katrina, another lesson from 1918 seems particularly apt: Guard against discrimination and allocate resources fairly. Though there were many displays of sacrifice and courage, the 1918 pandemic also "pitted groups against one another in an effort to assign blame or to protect access to limited resources. Rumors circulated in the United States that German spies, some disguised as doctors and nurses, were spreading flu and that Bayer aspirin, a German product, was infected with flu germs," Schoch-Spana found.

Racial and class distinctions became an issue in the 2001 anthrax attacks, when questions arose about the perceived discrepancies in the measures taken to protect postal workers vs. U.S. senators. "We are now living in a post-Katrina context as well," she says. "These kind of large scale crises don't happen in a vacuum. We have longstanding concerns regarding health disparities in the United States. Past events really do shape people's levels of trust in the folks in charge of managing the crisis. I don't think nationally we have adequately publicly addressed these issues of disparity with regard to Katrina. I think that is going to be hanging over the heads of politicians and emergency managers in a pandemic flu context or any other [emergency]."

The social disparity issue — the "haves" and the "have-nots" if you will — could play out in another context with pandemic flu. Though some national supplies will be available, federal planners have essentially left it to individual states to stockpile

antivirals such as Tamiflu. Such drugs could lessen the severity of infections and protect key groups such as health care workers in the absence of a vaccine. Yet states have been left to their own devices — and budgets — in deciding how much of the drug they should stockpile. As a result, during a pandemic some states will be more adequately supplied than others.

"Some people have said that all of the stockpiles of Tamiflu ought to be national," Toner says. "That gets away from the states having to make the in-the-field decisions. I think there is merit to that argument but that is not the way it was set up. Right now, there is a relatively modest national stockpile, but the states have to pitch in and do their part. It's not just with stockpiling antivirals, it is also trying to organize their hospitals. Some states are quite proactive, others are coming along quite reluctantly. States that haven't prepared are going to be bad places to live and to be hospitalized in when a pandemic happens."

The situation is somewhat reminiscent of the Atlantic Storm bioterrorism exercise in 2005, which showed that world leaders with limited smallpox vaccine would be reluctant to share it after an attack ensued.

"I don't expect governors will share their state stockpiles [of Tamiflu]," Toner says. "I don't think it will happen. If a state has not stockpiled, they are going to be in trouble."

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Complacency could be deadly in pandemic

Hospitals are ill-prepared, reports say

Hospitals are ill-prepared to cope with even a mild pandemic and are likely to face shortages of staff, protective equipment, bed space, and other supplies, experts warn.[1]

The pressures that face hospitals daily would be magnified and health care systems would quickly become overwhelmed if there were a sudden influx of patients suffering from a novel influenza virus, according to a panel of preparedness and public health experts and hospital leaders convened by the Center for Biosecurity of the University of Pittsburgh Medical Center.

That conclusion echoes other warnings. Complacency could be deadly, says **William Charney**, DOH, a national occupational health consultant based in Seattle who compiled the recent book, *Emerging Infectious Diseases and the Threat to Occupational Health in the U.S. and Canada* (CRC Press, 2006). "We are taking for granted that our health care systems are going to be able to deal with thousands of sick and dying people, when in fact at the current level of preparedness they will be overwhelmed and chaos is quite predictable," Charney wrote.

About half of the nation's emergency departments (48%) function at or above capacity, according to the Center for Biosecurity report. About 30% of hospitals lose money, and the total number of hospital beds, hospitals, and emergency departments has been declining.

"We have a lot less surge capacity in our health care system now than we did even 20 or 30 years ago," says **Eric Toner**, MD, senior associate with the Center for Biosecurity and lead author of the report.

The pandemic of 1968 was one of the mildest on record. But Toner says, "I doubt we could handle a 1968 pandemic now. Our hospitals have trouble dealing with a bad flu season as it is."

One of the greatest areas of weakness involves the protection of the health care work force. Hospitals already struggle with staff shortages, particularly with respect to nurses or other licensed practitioners. Yet more than a third of hospital employees may fail to show up if there is a pandemic; in one survey, 42% of health care workers said they would not report to work during a flu pandemic.[2]

"The already existing shortage of health care workers will certainly be worse in a pandemic," says Toner. "How bad it will be is anybody's guess, but certainly it will be significant."

Preparing for a pandemic will be costly; the Center for Biosecurity estimates that to be ready for a severe pandemic, similar to the historic influenza pandemic of 1918, an average-sized hospital of 164 beds would need to spend $1 million, including $200,000 to develop a pandemic-specific plan, $160,000 for staff education and training, $400,000

to stockpile "minimal" personal protective equipment, and $240,000 to stockpile basic supplies.

Hospitals also will need to spend about $200,000 a year to maintain preparedness, the center estimates. Meanwhile, a pandemic would financially cripple hospitals, as they would lose money on delayed or canceled elective procedures while paying more for staff and supplies and treating more uninsured patients. The solution: more government spending for preparedness, tied to specific goals, and funds to reimburse hospitals for uncompensated care and extraordinary costs in a pandemic, the center said.

But don't rely on the federal government to save the day when a pandemic hits. Although there is a national stockpile of antiviral medications, N95 respirators, and vaccine, the supply is small compared to the immediate demand that would occur. Preparation must be local and regional, says Toner.

Yet for most hospitals, pandemic planning has been sketchy. "Hospitals are not taking this nearly as seriously as they should," says Toner. "Few hospitals have started stockpiling [PPE, antivirals, and other supplies] to the extent that they should. Almost every hospital has some sort of pandemic plan, but they've not been committing the resources necessary to get prepared."

Occupational health is one of the most critical areas of preparedness. "The No. 1 priority is protecting the health care workers. If we don't have health care workers, then everything else is moot," says Toner.

Yet Charney worries that hospitals are not planning to provide adequate respiratory protection. Charney and contributors to his book, Mark Nicas, John H. Lange, and Giuseppe Mastrangelo, contend that health care workers caring for patients with emerging infectious diseases need respirators that are more protective than the N95 — either the elastomeric half-mask respirator or powered air-purifying respirator (PAPR).

Both of those respirator types are reusable; the PAPR does not require fit-testing. Currently, the Centers for Disease Control and Prevention says that the use of an N95 during an influenza pandemic would be "prudent" and that an N95 or greater respiratory protection should be used during aerosolizing procedures, such as a bronchoscopy.

"We don't know how many viruses will be emitted and how far they'll travel and what the dose response will be [with an emerging infectious disease]," Charney asserts. "While the experts are arguing about [how influenza is transmitted], they're recommending lower-quality safety measures."

In their planning, hospitals must think through issues of supply for disposable products and disinfection of reusable ones. Toner recommends tiered levels of protection based on the health care worker's patient contact and degree of risk.

"Hospitals can't just stockpile one [item]," he says. "They need to really think this through and stockpile a number of different measures."

Cohorting patients can reduce the potential employee exposure and allow the hospital to concentrate its protective measures on those employees at greatest risk, he notes.

If your health care workers don't feel safe, they won't show up for work. That is a maxim that many occupational health experts emphasize in pandemic planning. HCWs also may stay home to care for ill family members or as the only caregiver for children whose schools have been closed as an infection control measure. Meanwhile, you'll need more health care workers than ever to care for a surge of patients. Where will you find them?

As part of pandemic planning, hospitals need to identify volunteers, including retired health care workers and those who have left clinical care, who can help during a crisis period, according to the Center for Biosecurity. Their credentials would need to be verified, and the registration of volunteers would need to be kept up to date.

"What are the essential things they need to be taught in order to do what we ask them to do?" says Toner. You also should consider "what functions in a hospital can be done by relatively untrained people."

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Hurricane H5N1? New pandemic 'storm' rankings

Community strategies depends on severity

The Department of Health and Human Services (HHS) and the Centers for Disease Control and Prevention (CDC), have released new guidance that calls for community response to pandemic flu to be triggered by a severity index much like the ranking system used for hurricanes.

Should avian influenza A (H5N1) mutate into a pandemic strain, community strategies that delay or reduce the impact of a pandemic — also called nonpharmaceutical interventions — will be critical to reduce the spread of disease until a vaccine that is well matched to the virus is available.

"Pandemic influenza is not necessarily imminent, but we believe it is inevitable," **Julie Gerberding**, MD, MPH, said a recent press conference. ". . . And this isn't just about H5N1 avian flu. This is about any novel influenza virus to which people have not been exposed and to which we might all be susceptible. Planning requires that a whole network is engaged. It means individuals and families. It means communities and it means the whole system of business, education, health care and government really work together so that we have a strong linkage throughout the entire network. We are only as strong as our weakest link."

The new guidelines focus primarily on community-level measures that could be used during an influenza pandemic in an effort to reduce the spread of infection. In order to help authorities determine the most appropriate actions to take, the guidelines incorporate a new pandemic influenza planning tool for use by states, communities, businesses, schools and others. The tool, a Pandemic Severity Index (PSI), takes into account the fact that the amount of harm caused by pandemics can vary greatly, with that variability having an impact on recommended public health, school, and business actions. **(See table, below.)**

The PSI, which is modeled after the approach used to characterize hurricanes, has five different categories of pandemics, with a Category 1 representing moderate severity and a Category 5 representing the most severe. The severity of pandemic

Table: Pandemic Severity Index by Epidemiologic Characteristics

Characteristics	Pandemic Severity Index				
	Category 1	Category 2	Category 3	Category 4	Category 5
Case Fatality Ratio (percentage)	<0.1	0.1 - <0.5	0.5 - <1.0	1.0 - <2.0	≥ 2.0
Excess Death Rate (per 100,000)	<30	30 - <150	150 - <300	300 - <600	≥600
Illness Rate (percentage of the population)	20 - 40	20 - 40	20 - 40	20 - 40	20 - 40
Potential Number of Deaths (based on 2006 U.S. population)	<90,000	90,000-<450,000	450,000-<900,000	900,000-<1.8 million	≥1.8 million
20th Century U.S. Experience	Seasonal Influenza (Illness rate 5-20%)	1957, 1968 Pandemic	None	None	1918 Pandemic

Source: Department of Health and Human Services, Washington, DC; and Centers for Disease Control and Prevention, Atlanta.

primarily is determined by its mortality rate. A Category 1 pandemic is as harmful as a severe seasonal influenza season, while a pandemic with the same intensity of the 1918 flu pandemic, or worse, would be classified as Category 5.

"Now we all know that if a pandemic virus emerged, the first thing we would try to do is completely extinguish it or quench it," Gerberding said. "But that might not be realistic given the speed with which virus can move around the world. So, the next best thing we can do is to try and slow down the spread and buy some time. The best way to protect people is of course a vaccine. But we are not likely to have an effective vaccine in the first six months of a pandemic. So we have to put our heads together and figure out what can we do in the first six months before the pandemic virus vaccine is available."

To develop a plan, public health officials analyzed the last three pandemics, which occurred in 1918, 1957, and 1968. The later two pandemics were classified as only Category 2 in the new system, primarily because they did not result in a high case fatality rates, explained **Martin Cetron**, MD, director of CDC's division of global migration and quarantine.

"We've had few pandemics — fortunately — to draw experience on, but each of them threw us curve balls, whether it was high attack rates and low case fatality ratios or very rapid spread and high case fatality ratios like 1918," he said.

The tool used to construct the severity index uses the major parameters, such as illness rates and case fatality ratios to forecast or categorize a pandemic threat as it begins to emerge. "We have also modeled looking at what we know about seasonal flu transmissions," Gerberding said. "And we have been able to draw some important conclusions. One is that the earlier you initiate an intervention, the more likely it is to make a big impact."

Key points of the plan include:

• Based on the projected severity of the pandemic, government and health officials may recommend different actions communities can take in order to try to limit the spread of disease. These actions, which are designed primarily to reduce contact between people, may include:

• Asking ill persons to remain at home or not go to work until they are no longer contagious (seven to 10 days). Ill persons will be treated with antiviral medication if drugs are available and effective against the pandemic strain.

• Asking household members of ill persons to stay at home for seven days.

• Dismissing students from schools and closing child care programs for up to three months for the most severe pandemics, and reducing contact among kids and teens in the community

• Recommending social distancing of adults in the community and at work, which may include closing large public gatherings, changing workplace environments, and shifting work schedules without disrupting essential services.

(Editor's note: The latest CDC guidance on pandemic flu is available at: www.pandemicflu.gov.) ■

CE/CME *questions*

5. Because the various scenarios are markedly different, experts warned that the massive national effort to meet the threat of pandemic influenza has not better prepared the nation against bioterrorism threats.
A. True
B. False

6. Though some national supplies will be available, federal planners have essentially left it to individual states to stockpile:
A. antivirals such as Tamiflu.
B. vaccine.
C. portable hospitals.
D. All of the above

7. The Center for Biosecurity estimated that to be ready for a severe pandemic similar to the historic influenza pandemic of 1918, an average-sized hospital of 164 beds would need to spend:
A. $100,000.
B. $500,000.
C. $1 million.
D. $2 million.

8. Community strategies that delay or reduce the impact of a pandemic include:
A. asking ill people to remain at home.
B. dismissing students from schools.
C. closing large public gatherings.
D. All of the above

Answer Key: 5. B; 6. A; 7. C; 8. D.

CE/CME instructions

Physicians and nurses participate in this CE/CME program by reading the issue, using the provided references for further research, and studying the questions. To take the CE/CME test on-line, go to http://subscribers.cmeweb.com/. Each issue will test separately. If you have questions, please call customer service at (800) 688-2421. ■

New 'first hours' messages developed to alert public

Template messages for bioterror agents

In the first hours after a bioterrorism incident communication with the public will be critical to head off panic and rumor as the public health and medical system respond to the incident. To prepare for this critical need, a "first hours" web site has been designed by the Department of Health and Human Services (HHS) and the Centers for Disease Control and Prevention that includes messages and other resources for federal, state, local, and tribal public health officials to use during a response to an emergency. (Web site: www.bt.cdc.gov/firsthours/intro.asp.)

Template messages have been created for chemical and radiological events, suicide bombings and all of the category A biological agents, including anthrax. Here, for example, is an excerpt from the message designed for anthrax, the agent used in the 2001 mail attacks that still remain unsolved.

• Public health officials believe that the spores that cause anthrax disease may have been deliberately released in the *xxx area*.

• At this time, we do not know the extent or source of the anthrax release. Local, state, and federal officials, including HHS, FBI, and Homeland Security, are working together. Updated announcements will be made as soon as these officials know more.

• Anthrax disease is not known to spread from person to person so people do not have to avoid contact with one another.

• Based on what we know now, only those people who were in *xxx area* on *xxx date* are at risk for getting sick.

• There are treatments for anthrax. Treatment should start as soon as possible after exposure to anthrax.

• HHS is working to get treatments to the people who need them.

• We have challenges ahead, and we are working to find out more about this outbreak. By staying informed and following instructions from health officials, you can protect yourself, your family, and the community against this public health threat. ■

CE/CME objectives

After reading each issue of *Bioterrorism Watch*, the infection control professional will be able to do the following:

• identify the particular clinical, legal or educational issue related to bioterrorism;

• describe how the issue affects health care providers, hospitals, or the health care industry in general;

• cite solutions to the problems associated with bioterrorism, based on guidelines from the federal Centers for Disease Control and Prevention or other authorities, and/or based on independent recommendations from clinicians and bioterrorism experts. ■