Aftermath of a Hypothetical Smallpox Disaster

Jason Bardi
Johns Hopkins University, Baltimore, Maryland, USA

The second day of the symposium featured a discussion of a scenario in which a medium-sized American city is attacked with smallpox. Four panels represented various time milestones after the attack, from a few weeks to several months. Panelists discussed what they and their colleagues might be doing at each of these milestones. The goal of the responses was to communicate the complexity of the issues and to explore the diverse problems that might arise beyond the care and treatment of patients.

The scenario itself was a step-by-step account of a smallpox epidemic in the fictional city of Northeast. Tara O'Toole, the scenario's lead author, read the narrative account before each panel.

The panelists responded to the events as if the epidemic were real and they were actually trying to identify, contain, communicate, and otherwise deal with it. Panel members included experts on hospital, city, state, federal, and media responses. Representing the hospitals were John Bartlett and Trish Perl, Johns Hopkins Hospital; Julie Gerberding, Hospital Infections Program, Centers for Disease Control and Prevention; and Gregory Moran, Emergency Medicine, University of California at Los Angeles. Jerome Hauer represented New York City's response. Representing the state were Michael Ascher, California Department of Health Services Laboratory; Arne Carlson, former governor of Minnesota; Terry O'Brien, a Minnesota State Assistant Attorney General; and Michael Osterholm, Minnesota Department of Public Health. The federal representatives on the panels were Robert Blitzer, former counterterrorism chief with the Federal Bureau of Investigation; Robert DeMartino, Substance Abuse and Mental Health Services Administration; Robert Knouss, Office of Emergency Preparedness, Department of Health and Human Services; and Scott Lillibridge, Centers for Disease Control and Prevention. Joanne Rodgers, Johns Hopkins Medical Institutions Public Affairs, spoke to the response of the media. George Strait, the medical news director for ABC News, acted as moderator for each of the panels scheduled on day two. D.A. Henderson also helped to moderate.

Address for correspondence: Jason Bardi, Johns Hopkins University, Center for Civilian Biodefense Studies, 111 Market Place, Ste. 850, Baltimore, MD 21202, USA; fax 410-223-1665; jsb14@jhunix.hcf.jhu.edu.

Identifying the Agent

At the start of the epidemic, 2 weeks after the bioterrorist attack, confusion reigns. There is uncertainty as to what the infection is and reluctance to diagnose smallpox even when it is suspected. It is unclear who is in charge of investigating and containing the epidemic. Outside, reporters are knocking on the hospital doors. The question of what took so long to identify the agent opens the panel. Smallpox, a nonspecific flulike illness, is hard to diagnose, replies an emergency medicine physician. The disease is not suspected because it was eradicated in the late 1970s. Any laboratory work on the first cases would initially be testing for a battery of other causes, such as other viral infections (e.g., monkeypox) or reactions to recent vaccinations. A window of 2 weeks before positive identification of smallpox may even be optimistic. The diagnosis would probably take much longer because of physicians' lack of familiarity with the disease.

When all the tests for other infections turn up negative and smallpox is strongly suspected, suggests a state laboratory chief, a conclusive result from the laboratories at the Centers for Disease Control and Prevention (CDC) or the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) would still be needed. These are the only two places in the United States equipped to identify smallpox virus in tissue samples. This part of the diagnosis is fairly straightforward but it would take at least 1 day before the definitive results could be obtained.

Responding at the Hospital Level

Hospitals would probably isolate the early cases presumptively, even if smallpox was not suspected, since the symptoms would appear infectious. This is the opinion of a hospital infections expert. In the city, argues a state health department professional, several hospitals would each see one or two of the first few cases. The city health department would quickly become aware of the similarity of the cases in the various hospitals, recognize a potential outbreak (probably measles) and mobilize early to contain it.

Once smallpox is identified, the following organizations within city government would be notified: the police department, the local emergency management office, the city health commissioner's office, and, ultimately, the mayor's office. This process may be difficult since it requires integrating the health department into emergency management plans, an event with little precedent, notes a city emergency official.

Coordinating Response Efforts

Who is in charge, agree panelists, is one of the most important questions yearly in the epidemic, because any large-scale relief effort would require good management. Complicating the answer, however, are various levels of government, each with its own responsibilities and perspective on response, as reflected in panelists' remarks.

Acts of domestic terrorism are under the jurisdiction of the federal government, so several federal agencies become involved, starting with FBI. FBI is involved from the very beginning since any cases of smallpox would indicate a deliberate terrorist attack. A criminal investigation begins immediately. CDC is involved as soon as samples are sent for laboratory diagnosis.

The state government becomes involved at the outset, since major threats to public health are dealt with on the state level. The state health department starts its own investigation, and to reassure the public, the governor may act as a spokesperson for the management of the epidemic.

The city is involved from the outset, explains the city emergency management official, understanding that "bioterrorism is a local issue," which escalates very rapidly to state and federal levels. The local police and emergency management teams, as well as the city health commissioner, the city health department, and the mayor, are involved.

The problems of the city become state problems immediately, counters the former governor, because the news media treat any potential infectious disease outbreak as a regional problem. This forces the governor's hand. The governor has to move in because there is a need for one person to be in charge.

The most difficult situation is how to deal with the hospital patients. One danger in the early days is losing control of the crisis through panic. Once rumors about smallpox start to spread, many workers within the hospital walk off the job. Understaffing also leads to increased stress and confusion for patients and providers alike.

Even before federal and state command structures are in place, suggests a hospital infections control expert, hospital epidemiologists would already be addressing infection control issues. She notes that hospital infection control specialists would be on the phone to colleagues in other city hospitals alerting one another. Hospital epidemiologists, adds a state health official, would have a contact list of state, local, and federal public-health authorities who also would be notified.

Another problem in coordination becomes clear to panelists: the difficulty in sharing classified risk information among agencies and various levels of government. Any early warning, which could have contributed to a more effective response, was missing in the scenario. Even though the FBI had some early intelligence of the attack, the alerting of health care workers was nonexistent. The problem lies in the fact, assesses a state health department official, that health departments have never been seen as intelligence communities, nor has there ever been a precedent for passing such information to them.

On the federal level, CDC addresses the public health issues of the epidemic, and FBI addresses the law enforcement issues. These aims are not necessarily exclusive of one another, and the possibility of linking efforts is raised. Everyone interviewed as a part of the epidemiologic investigation may have to be interviewed as part of the criminal investigation as well. Perhaps the most effective way to accomplish this is to conduct both interviews simultaneously.

Some aspects of the two federal agencies may overlap, perhaps even conflict, in agendas. Specimens that are sent to CDC for positive identification of the smallpox virus may be needed by FBI as evidence for any eventual prosecution. In many ways, it may appear as if FBI is running the investigation. However, dealing with the sick, obtaining vaccine, and mobilizing the epidemiologic investigation at the local, state, and federal levels are outside the scope of FBI. CDC takes the lead on these public health issues, and together with FBI, coordinates the management of federal resources.

However, who is coordinating activities at the hospitals is still unclear, and the question of authority on that level is unresolved. Can outsiders come into a hospital and wield power, and if so, who are they? Federal responders may have ambiguous authority within a hospital and may add to the chaos. An FBI offical notes that his agency's role in the hospitals will simply be to inform the doctors and administrators of what the hospital needs to do to assist in the criminal investigation—keeping evidence and coordinating interviews with patients. However, this may still leave gaps of authority within the hospital.

In the scenario under consideration, the state identifies one hospital as the smallpox hospital, and this also presents a problem of coordination. The hospital itself has to work out the details of local quarantine and the distribution of medicine to the patients, and there is a need to protect the health-care workers and other hospital staff. Vaccine should be immediately available to these workers, and its distribution will have to be coordinated with CDC.

Outside the hospitals, an epidemiologic investigation will be taking place that will need to be coordinated with CDC. A CDC official points out the need for surveillance in the early days of the epidemic. To assist in collecting data necessary to identify the release source and people at risk, he recommends that CDC provide additional staff for much of the epidemiologic work, including mid- and senior-level investigators. Bringing in these outside experts should not represent a problem for local officials, he suggests, since CDC already has strong ties with state epidemiologists.

Informing the Public

How to control the message going to the public weighs heavily upon the minds of all panelists. Reporters on the hospital scene will quickly become aware of any rumors and will demand answers of any worker or official who is handy. Official channels will not be the only source of information during the epidemic, argues the public affairs specialist.

First responders, such as the police or fire officials, might show up with full biohazard protection; such an image immediately raises questions. The media will digest information from day one, whether or not there is an official statement from the city, state, or federal level.

Controlling the message that goes out over the airwaves could be extremely difficult, especially since there may not even be any consensus on what the message should be in the first place. Several panelists point out the need to ensure that information presented to the media is consistent and credible. The city emergency manager suggests that the mayor will work with federal and state officials to get consistent and credible information out to the public. One viable alternative to speculation and misinformation, proposes an FBI official, is to have a centralized joint information center, such as the one his agency set up in Oklahoma City after the bombing, with several experts answering all the questions that arise.

Regardless of how information is disseminated, the message must be carefully considered. If the flulike symptoms of smallpox are identified on the evening news, a flood of noninfected persons with stuffy noses or headaches could swell emergency rooms across the state. Other reports, such as upcoming quarantine efforts, may also spread panic and should be handled carefully. The types of stories the media choose to write present a challenge. The press will not only cover the crisis but the managers of the crisis. Plans for responding to questions about crisis management must be in place. Whether or not the message that goes out to the public includes mention of terrorism should be weighed.

The hospital infections expert pursues a different angle to the issue of information exchange. The difficulties in interviewing the public have not been solved, she points out. Who will do the interviews? How they will be coordinated with criminal investigations? Who will receive vaccine? And how will health-care workers be protected? Will the system be overwhelmed by false cases—people who think they have smallpox? Moreover, a basic problem in the early days of the epidemic is the need for an infrastructure to handle the large volume of calls flooding the hospitals.

Handling Logistics

What will be the plan of action? Hundreds of people will have to be mobilized to interview the public, and hundreds more will be needed to administer vaccine. The distribution of antibiotics and vaccines represents a logistical problem that must be overcome.

As the epidemic grows and spreads to several states, friction between the levels of government grows. Governors are demanding vaccine supplies, fueling a larger debate of how vaccination should be handled. Tens of thousands of people are vaccinated, but many more still need vaccine. Media reports begin to be critical of the government's handling of the crisis.

What still needs to be done? With a growing number of deaths, the rise in the number of patients in quarantine, the loss of critical health-care workers and city emergency workers, within the city things are beginning to get out of focus, notes a city official. Asking how leadership will function inside the hospital, the hospital epidemiologist identifies a need for official responses that are well thought out, strong, and based on hard science.

The vaccine campaign poses significant issues. The limited supply of vaccine must be divided up and distributed according to greatest risk—persons who may have been infected or who care for those infected, argues an official in federal emergency management. Political leaders and essential city workers are other priority groups. A consensus must be reached as to how to proceed with the vaccinations. CDC is best suited to coordinate vaccine efforts, but the public health community must work towards an emergency. The governor, warns the city emergency manager, may step in and call the shots. There is a need for a public health emergency plan. Did the outbreak start from a single source or from multiple sources? This determination would help with vaccine management and allocation, but there is no answer. Moreover, testing facilities at CDC and USAMRIID are overwhelmed at this point in the epidemic.

Hospitals must deal with quarantine. Restrictions are imposed in the first days or weeks of an epidemic. Workers' fear of being sequestered causes them to leave hospitals understaffed. Many people are likely to stay at their posts if they feel they have reliable information and support, argues a mental health provider. Some, however, may leave the front lines to go home to their own families.

Legal Ramifications

According to a 1905 Massachusetts case, cites a state's assistant attorney general, compulsory vaccinations are not a violation of due process and are therefore legal. So the local, state, and federal levels of government have no obstacle to vaccinating those designated at risk.

A more difficult legal question is that of quarantining smallpox patients. Many of the public health codes used to allocate powers to government officials are old and may not be valid or useful. Also, court precedents from HIV cases may have heavily weighted matters in favor of due process. Minnesota, for example, requires a separate court hearing for each case of quarantine. Thus, quarantine may be possible in a hospital but not in the community.

Another basic legal question is whether the lines of legal support are clear to all officials, such as hospital guards and police officers. How far can police go to detain quarantined patients? The limits of emergency powers should be clearly delineated in any predisaster planning.

The epidemic is threatening to expand beyond the city into the rest of the country and even beyond. The World Health Organization (WHO) will probably become involved, and travel notifications have to be introduced.

Vaccine Supply

Even without adequate supplies of vaccine, much can be done with the existing stocks. Prevaccinating some health-care workers is a proactive approach. Having a sizable pool of prevaccinated professionals who can mobilize and act as emergency responders takes much of the pressure off local hospitals. One way to reduce secondary transmission (outside of vaccinating the contacts of the infected person), instructs the hospital epidemiologist, is good infection control—wearing filter masks and washing hands well. Another way of controlling the epidemic is through quarantine. While these measures are not a substitute for adequate vaccine supply, they can slow the epidemic.

One problem with the vaccine supply is that many more people want to be vaccinated than limited stores permit. There are not even enough stores of vaccine to prevent the spread of the epidemic. The existing 6 to 7 million doses of smallpox vaccine will not last forever, and the 36 months it takes for additional large-scale preparations is prohibitive, argues a vaccine campaign expert. Health officials will likely not have the time or resources to target precisely those people who have an actual need for vaccine. The need for vaccine will overwhelm the supply.

The cost of vaccine development may inhibit stockpiling, proposes a CDC official. Since an attack with smallpox is of low probability, large-scale production may be difficult to justify. A partnership between private industry and the government would help, however. Also, the cost of getting caught without an adequate supply could be disastrous.

Possible emergency measures to stretch the vaccine supply, proposes a smallpox expert, include arm-to-arm vaccination as pustules form on the arms of vaccinated people; vaccinia could be grown in massive amounts in tissue culture; and 30 million doses of vaccine could be contracted from South Africa.

The Final Stage

The smallpox epidemic has become a major public health emergency affecting several cities in many states and at least four other countries. The event is identified as a terrorist attack, because no other source of smallpox outside a deliberate release exists. For those who have already contracted smallpox, antiviral drugs, such as cydolfivir, may be useful but these medicines may be just as scarce as the vaccines.

Secondary transmission got out of hand, vaccine use did not contain the epidemic, and standard planning did not work. Thus a state health official sums up the deficiencies of response. Hospital resources have been overwhelmed, with people flooding emergency rooms in the belief they have smallpox. These cases are added to hospitalized cases before and during the epidemic; yet there are not even enough beds for all the sick. The hospital staff have become physically and emotionally exhausted from the long hours and from seeing about a third of infected patients die.

Failure of containment has turned the outbreak from local to national and international. However, the epidemic would have been much worse, had it gone unchecked, notes a state health official. Containment was significant. The 15,000 smallpox cases could have easily been more than 100,000.

No perpetrators have yet been identified, despite combining the criminal and the epidemiologic investigations. Such methodical work, however, is important because, unless the intelligence community comes up with information or a tip, there is no other way to identify the source of the epidemic, explains an FBI offical.

Many of the problems in the epidemic could have been avoided or controlled if extensive plans had existed, panelists agree. The panelist speaking from a governor's perspective identifies leadership as the most pressing void. Should the city have been placed under immediate quarantine? Should martial law have been implemented? Is the designation of a single smallpox hospital a reasonable thing for any city to do? These are difficult questions to face in the wake of a disaster. Such issues must be addressed long before trouble strikes.

Who Will Pay for the Smallpox Epidemic?

The significant cost of curtailing the epidemic is debated. How will a smallpox hospital be financed, inquires a physician. The money might come from the federal government as emergency management funding, suggests a city emergency manager. The infrastructure and linkages within the public health community could be improved, the capacity for laboratory testing of samples could be increased, surveillance methods could be enhanced, and a health information strategy could be developed.

While the smallpox scenario is certainly frightening, experience with earlier epidemics (smallpox among them), knowledge of the issues, and expertise to deal with them show that in a crisis people from all disciplines pull together.

Mr. Bardi is a freelance writer in Baltimore who holds degrees in biophysics and science writing from Johns Hopkins University.