

BIOTERRORISM WATCH

Preparing for and responding to biological, chemical and nuclear disasters

INSIDE

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Logistics for a nightmare: CDC prepares for mass vaccinations in event of smallpox attack

Hospitals, schools could become clinics for administering vaccine

Thinking the unthinkable down to chilling detail (e.g., stock Post-it notes and a flashlight), the Centers for Disease Control and Prevention (CDC) has issued hands-on, how-to plans for setting up emergency smallpox vaccination clinics in the event of a bioterrorism attack.

"It takes into consideration a lot of the logistics associated with doing this," says **Joseph Henderson**, MPA, associate director for terrorism preparedness and response at the CDC. "We are issuing guidance to state and local health agencies to help them understand what they need as far as tools to develop their strategies to respond to smallpox, should an event happen tomorrow."

And what event would activate the plan? One case of smallpox. The variola virus has been eradicated in the wild, but is held in stocks by the United States and Russia and could be in the hands of terrorists or rogue states.

"Basically, given that smallpox has been eradicated from the world, a single case of smallpox, assuming that the evidence is that it's intentionally caused, would constitute an attack," says **David Fleming**, MD, deputy director for science and public health at the CDC.

"In the event where we have a highly suspected case or a confirmed case, we would act, at that point, as if the nation were under attack and would immediately implement this response plan."

The Smallpox Vaccination Clinic Guide comes as a revision and update of the CDC's overall Smallpox Response Plan, which first was released in November 2001 and updated last January. The plan, which will continue to be updated and revised, is designed for implementation following a smallpox attack. Thus, it is not to be confused with the still unresolved, as of this writing, strategy of identifying how many health care workers, first responders, and others will be immunized

against smallpox “pre-attack.” While federal bioterrorism officials are making that decision, there is no doubt that health care workers would be offered vaccine if there was a smallpox attack, Henderson says. “There is no question that we will look to immunize our immunizers and first responders,” he says. “This becomes a universal infection control issue. If people start showing up at hospitals, you want to protect the frontline work force.”

The new CDC guidance is essentially a clinic blueprint, including consent forms, supply checklists and a “model clinic” schematic. **(See consent form, p. 19.)**

“States will be using this information to develop plans that will enable them to deliver

these services as absolutely quickly as they possibly can,” Fleming says. “The time frame [for clinic setup] we’ve given in the guidelines is 10 days. That can be scaled up or down, depending on the specifics of the circumstances that an individual state is presented with.”

While actual implementation of the plan is left to state and local health departments, the thinking is that vaccination clinics could be set up in schools, hospitals, and recreational facilities in the event of terrorist attack involving smallpox, Henderson says.

“Knowing the number of people that you are going to attract to the clinics, you want to use a facility that can accommodate people and get them out of the weather,” he tells *Bioterrorism Watch*. “You want to run them through with some degree of privacy where you are immunizing them and talking to them personally so that they can clearly weigh the risk and benefits of receiving the vaccine. Then [have an area] to monitor them post-vaccination for a short period of time to make sure they don’t suffer any serious adverse events.”

Regarding the informed consent process, Henderson says it will be left to the individual patient’s assessment of his or her own health — rather than trying to test for HIV or other contraindicated conditions.

“If there is some suspicion — based on us going through the pre-screening material with them — that maybe they need further work up, then we would refer them to their primary care provider before we would vaccinate them,” he says. “That’s where they could receive lab tests, etc.”

In issuing the guidance, CDC officials say they are not abandoning the controversial “ring vaccination” strategy of immunizing around first cases and contacts. Rather mass vaccination could be used as a complementary strategy to the ring outbreak containment approach.

“The decision to do mass vaccination will be dependent upon an assessment of the magnitude of the attack, the potential duration of the attack, and the mode of the attack,” explains **Walter Orenstein**, MD, director of the CDC’s national immunization program. “We would do some form of contact tracing or ring vaccination and vaccination of contacts regardless.”

The plan calls for voluntary vaccination — given the potential serious side effects — but bioterrorism experts have little doubt people would cue up by the thousands if smallpox were let loose upon the land. It is well remembered as

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Editorial Questions

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Source: Centers for Disease Control and Prevention, Atlanta.

a disfiguring disease with a mortality rate of roughly one-third of those infected.

“The estimates of deaths [from vaccination] come from 1960s data, and at that point, it was roughly one death per million vaccinations,” Orenstein says.

“I would think in [the current] population where we have more people with immune problems and more people with certain skin rashes that put them at greater risk of some of the severe complications, it would probably be a little bit higher than that. This is in marked contrast to smallpox itself, which in the past has been associated with a 300,000 per million death rate. So we think in the setting of a smallpox outbreak, the vast majority of people would react quite favorably to getting this vaccine,” he says.

While a new vaccine is under development, the CDC currently has enough of the old vaccine to immunize about 155 million people, Henderson says. Ongoing dilution studies indicate that the available vaccine could be expanded and still be effective if necessary. “That would expand [the supply] by the end of this year to cover the entire population,” he says.

At least part of the cost of establishing the clinics would come from federally allocated bioterrorism preparedness funds. The cost of running a smallpox vaccination clinic would be in the neighborhood of \$5 to \$10 a patient, but costs will not be a driving factor in the event of an attack, Fleming says. “We’re talking about a decision that for the most part is one that we want to make based on how many lives we can save.”

(Editor’s note: To see the complete CDC smallpox clinic document, go to www.bt.cdc.gov/agent/smallpox/response-plan/index.asp.) ■

Reassurance: No workers harmed by nuke patients

Q&A with a leading radiation exposure expert

Given the much discussed “dirty bomb” scenario of using a conventional explosive to disperse radioactive material, it is reassuring to know that no U.S. health care worker has ever been harmfully exposed by a patient following a radiation incident.

That and a few other salient points were recently stressed to *Bioterrorism Watch* during an interview

with **Robert C. Ricks**, PhD, director of the Radiation Emergency Assistance Center/ Training Site (REACT/S) in Oak Ridge, TN. The center’s web site (<http://www.orau.gov/reacts/emergency.htm>) has a wealth of information on triaging and treating potentially contaminated patients in the wake of a nuclear incident. **(See summary recommendations, p. 21.)**

Q. *What is the threat to health care workers treating victims of a nuclear attack? Is it primarily surface skin contamination as opposed to any inhalation threat?*

A. In the United States, no health care worker responding to a contamination accident has ever received a medically significant exposure. No health care provider has experienced significant contamination if they utilize those measures commonly used in hospitals for infection control. This is normally referred to as universal (standard) precautions. The primary concern is contamination of the skin, while inhalation threats are minimal if health care providers follow simple guidelines to prevent resuspension of contaminants into the air.

Q. *Should any medications be taken as prophylaxis for workers exposed to contaminated patients?*

A. No.

Q. *Regarding the hospital emergency department response to victims, what are a few of the most important measures to determine the radiological status of patients?*

A. Unlike most hazardous materials a general-purpose radiation survey instrument (GM Count Rate Meter with pancake probe) can be used to detect the presence of alpha, beta, and gamma radiations. Any hospital with a nuclear medicine department would have such instruments and individuals trained in their use. Otherwise, these instruments can be obtained from state and local radiation health officials or your local hazardous materials unit of the fire department. Therefore, one should be able to triage the exposed vs. contaminated patient. If a dirty bomb is suspected, all victims should be presumed contaminated until proven otherwise.

Q. *The isolation protective measures described on the REACT/S web site use protective equipment that is generally available at most hospitals, but what about the recommendation that “a radiation dosimeter should be assigned to each team member and attached to the outside of the surgical gown at the neck where it can be easily removed and read?” Should hospitals have these available now?*

- A.** A dosimeter is used to determine the cumulative exposure over time while working in a contaminated environment. If dosimeters are available, health care professionals can check their exposure levels at periodic intervals. In the absence of personal dosimeters, health care providers may have to rely on the results of radiological monitoring in their immediate work area. The hospital radiation safety officer is the best resource person in this regard.
- Q.** *Are patients exposed to a dispersed cloud in a dirty bomb scenario likely to have internal contamination and/or develop potentially lethal acute radiation syndrome?*
- A.** Individuals in locations where radioactive materials are dispersed into the environment are likely to be contaminated both externally and internally. It is very doubtful that these individuals will develop acute radiation syndrome.
- Q.** *Is there a type of nuclear material that is more likely than others to be used in a dirty bomb scenario?*
- A.** While a variety of potential radiation materials exist for making dirty bombs, these four are more likely due to their widespread use on a worldwide basis: cesium 137, cobalt 60, iridium 192, americium 241.

REACT/S RECOMMENDATIONS

Protective clothing: The purpose of protective clothing is to keep bare skin and personal clothing free of contaminants. Members of the radiological emergency response teams should dress in surgical clothing (scrub suit, gown, mask, cap, eye protection, and gloves). Waterproof shoe covers also should be used. All open seams and cuffs should be taped using masking or adhesive tape. Fold-over tabs at the end of each taped area will aid removal. Two pairs of surgical gloves should be worn. The first pair of gloves should be under the arm cuff and secured by tape.

The second pair of gloves should be easily removable and replaced if they become contaminated. A radiation dosimeter should be assigned to each team member and attached to the outside of the surgical gown at the neck where it can be easily removed and read.

If available, a film badge or other type of dosimeter can be worn under the surgical gown. A waterproof apron also can be worn by any member of the team using liquids for decontamination purposes. This protective clothing is effective in stopping alpha and some beta particles but not gamma rays. Lead aprons, such as those

used in the X-ray department, are not recommended since they give a false sense of security — they will not stop most gamma rays.

Treatment area: If possible, select a treatment room near an outside entrance. Clear the area of visitors and patients. Remove or cover equipment that will not be needed during emergency care of the radiation accident victim. Several large plastic-lined waste containers will be needed. The treatment table should be covered with several layers of waterproof, disposable sheeting. Plastic bags in all sizes will be needed and should be readily available. Survey instruments should be checked and ready for use before the patient arrives. Background radiation levels should be documented. The treatment team should be prepared to meet the patient at the ambulance where the patient can be transferred to the prepared treatment gurney. Rolls of brown wrapping paper or butcher paper 3-4 feet wide can be unrolled to make a path from the ambulance entrance to the decontamination room.

Triage: During triage, consideration is given to both medical and radiological problems. Serious medical problems always have priority over radiological concerns, and immediate attention is directed to life-threatening problems. Radiation injury rarely causes unconsciousness or immediate visible signs of injury and is not immediately life-threatening; therefore, other causes of injury or illness must be considered. Noncontaminated patients are admitted to the usual treatment area. Contaminated patients are admitted to a specially prepared area. When in doubt, a critically injured patient should be taken immediately into the prepared area. If the victim's condition allows, an initial, brief radiological survey can be performed to determine if the victim is contaminated. Any radiation survey meter reading above background radiation levels indicates the possibility of contamination. A more thorough survey will be performed once life-threatening problems are addressed.

The victim's contaminated clothing should be removed before arrival at the hospital (at accident scene), if this can be accomplished without causing harm or delay. Otherwise, clothing should be removed as promptly as possible (without compromising life or limb), using care to avoid spread of any contaminants embedded in or on the clothing. Clothing and any accompanying sheets, blankets, etc. should be placed in a plastic bag. Caregivers should change gloves after handling clothing or other potentially contaminated items. ■

Hospital engineers should 'air' on the side of caution

NIOSH urges preventing public access to intakes

Hospital engineers and safety officials should take measures to prevent public access to outdoor air intakes to make health care facilities a less attractive target for bioterrorism, public health officials recommend. "You could see why someone might want to target a hospital — just to reduce your capability to respond to whatever other event may be created if there was a two-stage attack," says **Kenneth R. Mead**, MS, PE, a research mechanical engineer at the National Institute for Occupational Safety and Health (NIOSH) in Cincinnati. "If the goal of the terrorist was to strike fear and disrupt the community, that certainly would be [one facility] they could go after."

A branch of the Centers for Disease Control and Prevention (CDC), NIOSH is the principal agency behind a recent investigation and report on securing public buildings to prevent bioterrorism attacks. In November 2001, following the discovery that letters containing *Bacillus anthracis* had been mailed to targeted locations in the United States, the Secretary of the U.S. Department of Health and Human Services requested site assessments of an array of public- and private-sector buildings by a team of engineers and scientists from NIOSH and CDC. In November 2001, the team assessed six buildings, including a large hospital and medical research facility, a museum, a transportation building, two large office buildings, and an office/laboratory building. In January 2002, additional building assessments were conducted at CDC campuses in Atlanta and, in April 2002, at a large, urban transportation facility. A total of 59 buildings were evaluated during this five-month period.¹

One of the prime vulnerabilities of hospitals and other institutional buildings is access to the air intake, giving bioterrorists a possible mode to introduce an agent into the building ventilation system. The report states that "publicly accessible outdoor air intakes located at or below ground level are at most risk." That is due to their accessibility, ease of identification, and because most chemical or biological agents released near a building may remain close to ground level. "Securing the outdoor air intakes is a critical line of defense," the report states.

Relocating accessible air intakes to a publicly

inaccessible location is preferable. Ideally, the intake should be located on a secure roof or high sidewall, NIOSH recommends. The lowest edge of the outdoor air intakes should be placed at the highest feasible level above the ground or above any nearby accessible level (i.e., adjacent retaining walls, loading docks, handrail). These measures also are beneficial in limiting the inadvertent introduction of other types of contaminants, such as landscaping chemicals, into the building.

"In terms of new construction, people are starting to think about this [air intake access] as a new issue, whereas in the past, they wouldn't have thought it was a problem," Mead says. "Interestingly, people involved in the indoor air quality arena have been trying to get the air intakes up off the ground anyway, especially those that are below ground and tend to be done in window wells. There are a lot reasons — terrorism aside — why you would not want a ground level intake."

If relocation of outdoor air intakes is not feasible, intake extensions can be constructed without creating adverse effects on heating-ventilation-air conditioning (HVAC) performance. Depending upon budget, time, or the perceived threat, the intake extensions may be temporary or constructed in a permanent, architecturally compatible design, NIOSH recommends. "The goal is to minimize public accessibility," the report states. "In general, this means the higher the extensions, the better — as long as other design constraints [excessive pressure loss, dynamic and static loads on structure] are appropriately considered." In addition to the air intake recommendations, NIOSH warned against doing any of the following:

1. **Do not permanently seal outdoor air intakes.** Buildings require a steady supply of outdoor air appropriate to their occupancy and function. This supply should be maintained during normal building operations. Closing off the outdoor air supply vents will adversely affect the building occupants and likely result in a decrease in indoor environmental quality and an increase in indoor environmental quality complaints.
2. **Do not modify the HVAC system without first understanding the effects on the building systems or the occupants.** This caution directly relates to the recommendation that building owners and managers should understand the operation of their building systems. If there is uncertainty about the effects of a proposed modification, a qualified professional should be consulted.
3. **Do not interfere with fire protection and life**

safety systems. These systems provide protection in the event of fire or other types of events. They should not be altered without guidance from a professional specifically qualified in fire protection and life safety systems.

(Editor's note: The complete NIOSH report is at <http://www.cdc.gov/niosh/bldvent/2002-139.html>.)

References

1. Centers for Disease Control and Prevention. Notice to readers: Protecting building environments from airborne chemical, biological, or radiologic attacks. *MMWR* 2002; 51:789.
2. National Institute for Occupational Safety and Health. *Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks*. Cincinnati: U.S. Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health, 2002; DHHS publication no. NIOSH2002-139. ■

Info Tech: Will you have IT if you really need it?

Enhance detection, management, communication

Having adequate information technologies and decision support systems (IT/DSS) in place can significantly enhance a hospital's ability to respond effectively to a bioterrorism event, according to the Rockville, MD-based Agency for Healthcare Research and Quality (AHRQ). The bad news? Only a small minority of hospitals has such systems in place.

The importance of adequate information resources was underscored in a new *Evidence Report — Bioterrorism Preparedness and Response: Use of Information Technologies and Decisions Support Systems*. The study is part of AHRQ's Evidence-Based Practice Program, through which it is developing scientific information for other agencies and organizations on which to base clinical guidelines, performance measures, and other quality improvement tools.

"The main reason IT and DSS, as well as other areas of bioterrorism response, are being studied by AHRQ is because we want people to be better prepared," notes **Eduardo Ortiz**, MD, MPH, senior service fellow at AHRQ.

A number of studies have shown that the use of IT in health care can reduce medication errors and improve patient safety, communication, patient self-management, and knowledge and

adherence to recommended guidelines, Ortiz observes. "IT can definitely be used to improve quality of care," he says. "There is so much information out there and a lot of research funded by AHRQ and others that shows that it does, so the natural evolution would be that if IT is useful in improving quality, it makes sense that it could be used in terms of bioterrorism."

During the study process, the University of California at San Francisco-Stanford Evidence-Based Practice Center staff, along with an AHRQ task force, which included clinical experts, IT

CE/CME questions

This issue concludes the semester. A Scantron sheet is included as well as a survey form. Please return in the envelope provided.

9. According to Joseph Henderson, MPA, of the CDC, which describes the informed consent process for smallpox vaccination clinics?
 - A. It will be left to the individual patient's assessment of his or her own health.
 - B. Those who have risk factors must take a rapid HIV test.
 - C. Some patients may be referred to their primary care providers before immunization.
 - D. A and C
10. CDC officials say they are not abandoning the controversial "ring vaccination" strategy of immunizing around first cases and contacts. Rather mass vaccination would be used:
 - A. as complementary strategy to ring approach
 - B. only if the ring failed to contain the outbreak
 - C. only on previously immunized patients
 - D. A and C
11. No U.S. health care worker responding to a radioactive contamination accident has ever received a medically significant exposure.
 - A. true
 - B. false
12. Hospital engineers and safety officials should take air intake measures to make health care facilities a less attractive target for bioterrorism, public health officials recommend. Which of the following measures were recommended?
 - A. lowering rooftop air intakes so they are in plain site at ground level
 - B. installing equipment to detect unusual pathogens in the ventilator system
 - C. limiting public access to outdoor air intakes located at or below ground level
 - D. all of the above

experts, and experts in epidemiology, asked and answered these key questions:

- What are the information needs of clinicians and public health officials in the event of a bioterrorism attack?
- Based on information needs identified for these decision makers, what are the criteria by which IT/DSS should be evaluated with respect to usefulness during a bioterrorism event?
- When assessed by these criteria, in what ways could existing IT/DSS be useful during a bioterrorism event? In what ways is it limited?
- In areas where existing IT/DSS does not meet the information needs of clinicians or public health officials, what functional and technical considerations are important in the design of future IT/DSS to support response to bioterrorism events?

The study found 217 IT/DSS that had the potential to help in bioterror response, although the majority was not designed specifically for bioterror, Ortiz says. "They are potentially useful, but we're not sure yet. . . . We should take an evidence-based approach to assess these and other systems."

Meanwhile, a number of organizations work to develop a national health information infrastructure, which should prove invaluable. "Many federal agencies are working on it now, led by the National Committee for Vital and Health Statistics," he says. Other agencies include AHRQ, the Centers for Disease Control and Prevention, the National Library of Medicine, and the Centers for Medicare & Medicaid services, along with private-sector organizations such as the American Medical Informatics Association, the E health Initiative, and The Markle Foundation.

Unfortunately, Ortiz notes, the health care profession is behind the eight ball when it comes to IT development. "We know that, in general, the majority of hospitals in this country do not have comprehensive IT decision support systems for clinical care. The estimates range between 5% and 30%, so I would say that probably somewhere in the vicinity of 10% of all hospitals have comprehensive systems, and that the number that have adequate systems for bioterrorism would be less than that — and these are inpatient systems.

When you go to the outpatient area, there are even fewer of them, even though the majority of health care is delivered in an outpatient setting," Ortiz says. The good news is that if your current system is inadequate, there are opportunities to benchmark a number of hospitals/health care systems with good systems, he says.

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[Editor's note: The full report is available free from AHRQ Publications Clearinghouse. Telephone: (800) 358-9295. Additional information on the linkage between IT/DSS and health care quality may be found in the following article:

• Hunt DL, Haynes RB, Hanna SE, Smith K. Effects of computer-based clinical decision support systems on physician performance and patient outcomes. JAMA 1998; 280:1,339-1,345.] ■

CE objectives

After reading each issue, 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. ■