Practical Aspects of Implementation of a Bioterrorism Preparedness Program in a Hospital setting

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“Plans are nothing; planning is everything.”

—General Dwight D. Eisenhower

Response to Hurricane Katrina brought to light the gross inadequacy of the local and federal disaster planning preparedness and the initial public health response [1,2]. This is despite the fact that significant resources have been expended in preparing for just that eventuality, possibly at the cost of other public health initiatives [3]. The disenchantment with current preparedness led the American Medical Association to study the feasibility of developing a federal public health disaster intervention team, which would be better equipped to respond to these disasters. Although this initiative may add to the response of a recognized disaster, it would add little to an individual institution’s ability to be better prepared to handle the initial presentation of a biologic disaster or a bioterrorist event.

Success of an institution’s preparedness for a bioterrorist event would be determined by its ability to limit exposure of other patients and health care workers before an event is confirmed and a definitive diagnosis is established. The inherent problem with most bioterrorism preparedness plans lies in the initial triggers that would kick the plan into action. Most clues that signal a bioterrorist event rely on unusual clustering of illness with regards to time, place, or person [4,5]. If one waits for an automated or manual surveillance process to raise a warning about a possible clustering, the scenario exists wherein a group of contagious patients already would have

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been admitted to the hospital and caused exposure to other patients and health care workers. Although this syndromic surveillance mechanism is useful for its public health implications, it does not provide adequate safeguards for a hospital against the initial untoward biologic exposures.

Most bioterrorism agents are not transmitted from person to person [5,6], and diligent use of standard precautions alone may suffice in limiting the exposure. For other agents, adherence to symptom-based recommendation for use of additional precautions would provide the extra layer of protection. Use of contact precautions while taking care of a patient with skin rash, draining wounds, or diarrheal illness would provide protection against exposure to cutaneous or gastrointestinal anthrax and bubonic plague. Initiation of droplet precautions for patients with flulike illness or symptoms of pneumonia would afford protection against exposure to pneumonic plague. Preparedness for diseases such as smallpox and viral hemorrhagic fevers, in addition to the usual precautions, would require an astute physician’s quick thinking based on clinical acumen and a high index of suspicion.

Although it is important to worry about preparedness for novel bioterrorist agents, potential devastation from the naturally occurring possibilities, including pandemic influenza, severe acute respiratory syndrome, and H5N1 avian influenza, is more likely [7]. These real threats, which could be “just a plane ride away,” make it imperative to ensure a hospital’s continued readiness and ability to identify these cases based on clinical and epidemiologic presentation. This readiness could be achieved by integrating the hospital’s day-to-day preparedness in dealing with the threat from naturally occurring biologic agents within the context of preparedness initiative for a less likely bioterrorist event. The success of an institution’s bioterrorism preparedness program would be determined by how effectively it handles the implementation of such a conjoined program to maximize the “dual benefit” [8]. For effective implementation of a biologic disaster or bioterrorism preparedness program, multiple practical aspects need to be addressed (Box 1) to achieve the goal of minimizing the morbidity and mortality associated with the event and to provide continued quality care to patients already receiving care in the hospital.

**Have a written bioterrorism preparedness plan**

A well-written plan is a crucial foundation of an institution’s bioterrorism preparedness program. Although several plans are available online [9,10], each institution should customize their plan to meet their unique needs and challenges. A good plan would be one that the users understand, are comfortable with, and can use to gain access to the information they need rapidly. The plan should be a living document of work in progress, with mechanisms for regular and periodic internal reviews to ensure that it stays current. It is vital to ensure continued availability and accessibility of the
plan to all who may need to use it; this may require simultaneous availability of the plan in different forms, including print, electronic media, intranet, and Internet, in the event that one form were to become unavailable during times of crisis.

Although the plan needs to be detailed in establishing authorities and responsibilities for each predefined role, it should not be exhaustive. The objective should be to achieve a right balance of the “strategic” and “operational” planning components, to prevent the plan from being too rigid, and to allow flexibility in decision making under the extraneous circumstance of things going wrong. Because it would be difficult, if not impossible, to predict each unique presentation, the program should allow for measures to address the dynamics caused by uncertainty, so as to “expect the unexpected.” Some degree of decentralized operations needs to be built in so that when communications fail, the lower tier leaders could make on-the-spot decisions geared toward achieving the plan’s overall goals. The plan should identify all the crucial tasks and roles that must be performed, assign responsibility for accomplishing each of these roles, and ensure that designated individuals have prepared standard operating procedures that detail how they carry out their critical tasks. This plan would promote activity-oriented execution at an individual level, while maintaining the result-oriented goal at a higher program level.

The plan should address the physical infrastructure needs of the bioterrorism response plan. The biocontainment area in the emergency department, or the “hot zone,” needs to be clearly defined, along with the

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**Box 1. Practical aspects of implementation of a bioterrorism preparedness program**

- Have a written bioterrorism preparedness plan
- Assess the feasibility and viability of the plan
- Disseminate the plan and ensure familiarity by all key stakeholders
- Use elements of daily practice as the backbone of the plan
- Incorporate internal mechanisms for intensified surveillance
- Ensure appropriate internal and external mechanisms of communication
- Test the plan periodically through drills
- Incorporate flexibility and build redundancy for key components of the plan
- Address logistics involving surge capacity
- Improve collaboration with community physicians, area hospitals, and local health departments
- Emphasize community preparedness
designated unit within the hospital or the “isolation unit” where the critically ill victims of the biologic disaster would need to be admitted, with the intent of minimizing the exposure to others in the remainder of the facility.

Assess the feasibility and viability of the plan

Although the plan may look good on paper, it is crucial to ensure that it has the potential to work as envisioned. An institution needs to do a critical risk appraisal of the plan, looking beyond to see what can go wrong. The institution needs to test viability of the implied assumptions within the plan as to their “reasonableness.” The institution needs to undertake realistic strengths, weaknesses, opportunities, and threats (SWOT) analysis to see if the plan withstands the challenge of different presentation scenarios. A multidisciplinary team should be organized to validate the functionality of the plan and should include key individuals from the emergency department, infection control, disaster management, and physical plant/engineering. This team should use the “tracer methodology”[11] to do a walk-around of the process of registration, triage, emergency department assessment, and admission to the hospital, exercising different scenarios of initial presentation. This process should be more than simply touring the facility; it should include taking the time to understand the physical layouts, patient flow, and security systems. It should be ensured that the waiting areas have proper signage directing patients to use appropriate cough etiquette and have the physical capability to separate patients with respiratory symptoms.

The registration personnel must be included as the first line of defense and educated appropriately to be able to safeguard their own health and to guide patients in following these recommendations. Triage personnel must be trained to recognize a clustering of syndromic presentation, be guided by a predefined threshold, and have the ability to initiate a biothreat containment alert. As part of a tiered planning approach with escalating action thresholds, this alert should be executable at a level below the facility’s disaster alert code to facilitate its rapid implementation, without expending significant resources toward handling the multiple false alarms that possibly may be generated by its lower threshold. The biothreat containment alert should prompt initiation of a separate triage location to avoid contamination of other parts of the emergency department and, similar to a cardiac arrest code, should lead to designated personnel reporting to an assigned location and a “disaster cart” with additional backup medical equipment and supplies being delivered to the “hot zone.” A departmental checklist of necessary immediate actions to be taken should be an integral part of this alert. Large-scale events that overwhelm the emergency department biocontainment capacity would require initiation of the full-fledged disaster management protocol, with logistics led in accordance with the Hospital Emergency Incident Command System [12].
The physical plant/engineering staff should ensure that when a biothreat containment alert is called, appropriate plans are in place for a “lockdown” of the potentially contaminated areas, with ability to change the ventilation patterns of these areas to make it a negative pressure zone. The containment area should be physically designated in such a way that it provides an isolated entrance for suspect patients through the decontamination shower, to be used only in the event chemical contamination cannot be ruled out. Structural modifications must be in place to close off the containment area quickly and completely from other parts of the emergency department, with controlled access provided to crucial staff. It also should be ensured that if needed, the designated isolation unit, along with the hallway and elevator leading to it, can be included in “lockdown” zone, to allow the rest of the hospital to remain independently functional.

**Disseminate the plan and ensure familiarity by all key stakeholders**

After the plan is in place, the institution needs to disseminate to all who might be involved in its implementation, realizing that the main focus of planning is to reduce uncertainty. All key stakeholders need to be trained to acquire mastery and competency of the roles and tasks they are expected to perform and a clear understanding of how they fit into the overall preparedness plan at large. This training helps ground-level employees to make crucial decisions on the run, in the event of communication failure with program leaders and any required last minute plan modification.

The institution needs to ensure that each staff member is familiar with his or her individual and collective responsibility during the disaster response and recognizes the lines of authority while performing those duties. The appropriate medical staff from the emergency department, family practice, internal medicine, infectious disease, and hospitalists’ program should be included in the pre-event planning so that they are aware that they may be called on to help and to provide them the opportunity to train in the diagnosis and treatment of bioterrorism agents that have been prioritized in the Centers for Disease Control and Prevention (CDC) categories class A and B [13]. Senior leadership need to be apprised of their expanded roles, responsibilities, and expectations related to bioterrorism and disaster management so that they have the ability to make quick decisions with confidence.

**Use elements of daily practice as the backbone of the plan**

The plan should incorporate elements of day-to-day practice and emphasize attention to strict infection control measures in routine patient care to control the spread of disease and to limit the loss of life among health care workers, as had occurred with the severe acute respiratory syndrome outbreak
in Toronto [14]. Routine infection control practices including hand hygiene should be emphasized for every patient encounter. Standard infection control measures should include practice of respiratory hygiene and cough etiquette in dealing with patients with respiratory symptoms and contact precautions for managing patients with unexplained rashes or draining skin wounds. Adherence to these measures would help to limit exposures for most of the CDC category A bioterrorist agents that have a high potential for being contagious, including pneumonic plague and viral hemorrhagic fevers.

Although the causative agents of bioterrorism may vary, the potential devastating effects may not. This fact should provide a basis to develop a plan to deal with effects common to several agents, rather than developing separate plans for each bioterrorist agent. The plan can be focused on syndromic presentations, with minor adjustments for the probable rapidity and severity as needed. Specific recommendations for managing individual biologic agents with bioterrorism potential should be addressed in an appendix to the main plan.

**Incorporate internal mechanisms for intensified surveillance**

The bioterrorism preparedness plan should address triage procedures for identifying febrile patients with respiratory symptoms or skin lesions for immediate separation from the common waiting area and rapid medical evaluation. History of foreign travel within 21 days of presentation should be asked of all febrile patients with respiratory symptoms, unexplained skin rash, or other unusual constellation of symptoms. Patients with a positive travel history to areas endemic for diseases of concern or experiencing unusual outbreaks should be isolated from other patients and staff immediately to prevent cross-contamination. Focus on syndromic recognition in the emergency department should lead to initiation of airborne isolation and other appropriate precautions that conform to CDC infection control guidelines [15].

Protocol should be established for immediate notification of emergency department physicians and infection control specialists to determine the need to initiate the biothreat containment alert in the event of multiple patients presenting with similar symptoms. If the hospital uses an electronic medical record, fields incorporating the travel history should be added so that a positive response would generate an automated report of notification to the infection control. This would serve as a backup surveillance mechanism in the event a clustering is not detected on clinical grounds alone.

**Ensure appropriate internal and external mechanisms of communication**

The institution should be committed to an open, timely, and truthful dialogue with the employees and strive to ensure that the internal
communication precedes any form of external communication. This communication would help to build trust, boost employee morale, and prevent a flurry of rumors and false information. Feedback received as a result of addressing employees' questions and concerns may prove vital in anticipating and responding to public and media queries.

Improving the communication flow is probably the biggest challenge in the determination of the programs’ eventual success. Just providing the plan would not be enough; there needs to be training, follow-up, and support to encourage use of the appropriate communication channels at horizontal and vertical levels. Strengthening the communication skills and capacity of the staff in the emergency department, especially the registration and the triage personnel, would yield the most benefit in ensuring effective communication of the initial threat at an internal level for timely analysis of the risk potential. One should not expect that sharing and communication between emergency department personnel and the other members of the response team would happen automatically; this communication needs facilitation and encouragement. Communication during a “biothreat containment alert” should use the channels established in the hospitals’ disaster response plan to ensure consistency.

The disaster manual should maintain an up-to-date roster of emergency contact information for all key hospital staff (eg, home telephone, fax, beeper, and cell phone) and should have a system in place for notifying, informing, and mobilizing staff, including physicians, nurses, pharmacists, allied health professionals, and other key support staff, in the case of an emergency. The manual also should incorporate current information and a 24-hour response hotline for external contacts, including the local health department, Federal Bureau of Investigation, and CDC.

**Test the plan periodically through drills**

A variety of methods or tools have been used to train the hospital staff and evaluate the effectiveness of the disaster preparedness plans, including disaster drills, computer simulations, and tabletop exercises [16]. Full-scale disaster drills are time-consuming and expensive, however; one large-scale drill conducted by the US Department of Justice in May 2000 cost $3 million [17]. Despite this, it is still important to participate in city-wide drills and table-top exercises because an important part of the joint emergency planning is to understand how available community resources should be used to respond together to any bioterrorist event. Hospitals must overcome the attitude that they can handle events by themselves and remember that the institutional and public health plans must dovetail to reap maximum benefit of all available resources.

The institution should begin by testing their plan with progressive drills to assess the operations’ continuity on a regular basis and to ensure that
everyone in the response team knows how to react. Running the "fire drills" tests how well the plan has been laid out and how effectively it has been communicated to the employees. The institution should let employees know they are going to test their familiarity with disaster procedures at random times, then simulate some of the scenarios set out in the plan rather than playing out the entire drill each time, recognizing that normal functioning of the hospital cannot be stopped during the exercise. The idea is to assess individual components of the preparedness plan during different shifts and to prioritize testing of the weakest link. Drills should not be intended as a test in the strictest sense, but rather as an opportunity to identify weakness; build teamwork; improve coordination; and enhance acquired skills, knowledge, and competencies. After completion of the drill, the institution should ensure a proper debriefing session facilitated by trained observers [18], to maximize the learning opportunity, provide for constructive critique, and discuss changes that need to be implemented as a result of the exercise.

**Incorporate flexibility and build redundancy for key components of the plan**

It is important that bioterrorism preparedness include contingency planning, recognizing the adage that "if something can go wrong, it will." The observation by German strategist Helmut von Moltke that "No plan survives contact with the enemy" mandates this flexibility to afford protection against a tendency to try to stick to a predefined game plan, despite situation dictating otherwise. A detailed checklist for each role, enumerating assigned responsibilities and tasks, should be incorporated as an attachment to the plan to allow for substitute personnel to fill in the role at the last minute. Preparedness for this level of flexibility could be achieved by cross-training individuals for other roles and responsibilities they could be expected to fill in at times of need.

The plan operations and contingency response should incorporate redundancy of key personnel, equipment, and processes to add stability and allow flexibility in handling the unexpected. Such redundancy may be ensured by a forcing function that would prevent an erroneous action from being performed or facilitate performance of a desired action and provide for a safeguard against fatigue failures.

**Address logistics involving surge capacity**

A large-scale bioterrorist event likely would overwhelm the existing facility capacity rapidly, given that the current health care infrastructure frequently is overwhelmed by the demand for services during normal influenza seasons. This situation underscores the need for addressing issues related to surge capacity, to enable hospitals to expand beyond their normal operations to meet a sudden increase in demand that can be sustained for
an extended period. To be adequately prepared, the plan should assume no outside help during the first 72 hours and count on existing staff only. This assumption would imply staff working longer hours and extra shifts and needing arrangements for overnight stay in the hospital. Medical equipment and other hospital supplies, including personal protective gear and pharmaceutical caches, would need to be stocked adequately to cater to the increased demand during this period. Ability to update hospital inventory in a real-time manner would need to be incorporated to allow sufficient notice to address continued additional demands though the strategic national stockpile. The CDC’s FluSurge software program [19] could be used to estimate some of the potential increased hospital requirements during a pandemic influenza outbreak and to provide a basis for extrapolating usage in response to other biologic disasters or bioterrorist events.

Protocols should be in place for discharging patients with non–life-threatening conditions, closing the facility to elective surgeries, and prioritizing exposed patients who require hospitalization. Strategies to increase bed capacity should be addressed, including the use of nonconventional beds in the outpatient areas. The role of enhanced hospital security in enforcing and controlling facility access should be emphasized to help deal with emergency department overcrowding during times of panic and enforcing of quarantine measures, if implemented.

The plan should address functionality of the health care team in the event of having fewer patient care staff show up to work and losing crucial administrative personnel. Policies should include criteria for use of emergency and volunteer staffing during such a crisis and address their liability and credentialing issues. Human resources should look into the feasibility of having incentives and provisions for encouraging existing health care workers to continue working in the event of a major biologic disaster and the legality of the staff’s right to refuse assignment involving patients infected with agents of bioterrorism. Mechanisms should be in place for early identification of illness and psychosocial issues among employees to allow rapid access to evaluation and treatment and to allay anxiety of the workforce, including concerns for their families’ well-being.

**Improve collaboration with community physicians, area hospitals, and local health departments**

A biologic disaster or bioterrorist event poses unique challenges because it may go unrecognized for days [20], with the possibility of victims presenting to different hospitals or physician practices. This possibility underscores the importance of building alliance with community physicians, who could be the initial gatekeepers funneling patients with unusual illness into the health care system. Educating community physicians about the importance of providing advance notice to the hospital emergency department staff
would help with institution of appropriate precautions in a timely manner. Similarly, collaboration and information sharing with other area hospitals, preferably using the existing network of infection control practitioners, could provide the heads-up of a possibility of a suspected exposure to a biologic disaster or bioterrorist agent within the community.

Integration of the institution’s goals into the local health department’s preparedness initiative could yield significant benefits, especially if there is a two-way flow of information. The health department would obtain information from area hospitals as part of the laboratory or syndromic surveillance system. In return, the hospitals would benefit from the health department’s commitment to share information of any ongoing investigation into a suspected case of biologic disaster or bioterrorist agent, in a timely but confidential manner to avoid undue media hype.

**Emphasize community preparedness**

The effectiveness of disaster preparedness and response depends on the involvement of the local communities. An integral part of the program should be to work with the established communities (eg, business, ethnic, neighborhood, nongovernmental) to educate the public on emergency and disaster procedures and preparedness initiatives. The hospital should partner with the local media in the planning phase so that they can serve the vital role of disseminating key messages to the public and help portray a realistic image to the national media. This platform would enable communication to the public in a consistent and timely way and go a long way in preparing for the “fear factor” and prevent the system from getting overwhelmed by the “worried well.”

**Summary**

In an ideal world, bioterrorism preparedness efforts would leave nothing to chance and include planning for everything. So the question remains, can the medical community practically plan for everything? Although it is true that “forecasting is always difficult, particularly when it’s the future we are dealing with,” if one has a good plan for dealing with the probable, one might stand a better chance of responding adequately to the improbable. In this context, Eisenhower’s dictum could be interpreted to mean that in planning for a bioterrorist threat, original plans would need to be changed to address the dynamics caused by uncertainty, but proper planning with periodic testing would go a long way in minimizing the chaos associated with this change. If after all this preparation the outlook still looks dismal, some consolation can be derived from the quote of a German officer, “the reason the American army does so well in war is because war is chaos and the American army practices chaos on a daily basis.”
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