

Chapter 6

Metropolis, USA: Progress, Pitfalls in Front-line Readiness

Amy E. Smithson

Ask public safety officers, rescuers, health care providers, and city emergency managers what their challenges would be in the aftermath of a chemical terrorist attack and at a staccato pace they start ticking problems off on their fingers. Absence of awareness and standard operating procedures in 911 call centers. Disinterest among the police, who are insufficiently equipped and trained and therefore likely to rush into trouble. Difficulty in decontaminating large numbers of casualties rapidly. Lack of chemical antidotes, not to mention uncertainty about the protocols to administer them. Far too few hospitals ready to handle a major onrush of panicked, possibly contaminated casualties. Inadequate chemical casualty care training among medical professionals, not just in the emergency departments but throughout the hospitals. Deficiencies in communication systems likely to be overwhelmed and therefore contribute to a confused response. They run out of fingers before they reach the challenges of recovery in the days and months after such an attack. The list of worries deviates slightly from city to city, and although they have made headway in some areas, even cities that have benefitted from assistance under the federal government's unconventional terrorism preparedness programs can identify gaps in their planning and capabilities to deal with a large-scale chemical incident.

When these same individuals are asked to assess their level of readiness before and after receiving aid via one or more of the preparedness training and equipment programs, the answers also vary from city to city as well as among response disciplines. For example, in cities where the local government chipped in financial support for adequate manpower to enhance response plans and propagate the training, the ratings tended to be higher. Also, the training and equipment programs centered around firefighters and hazardous materials (hazmat) personnel, who generally gave higher ratings. Even within the firefighting ranks, however, some gave low assessments after the federal assistance. One fire chief said that "the training done to date has scared the first responders so much that they will stand back and watch people die."¹ As a whole, the appraisals of health care providers tended to be lower, since much less of the federal planning, training,

¹ Continued the chief, "They don't feel equipped either with the training or gear to tackle the situation." Interview with author: Chief, County Fire Department (9 September 1999). Also on this point: Hazmat Coordinator/Instructor (8 September 2000); Police Lieutenant (23 March 1999). Note also that one battalion fire chief lowered his city's chemical and biological preparedness rating three and two points, respectively, after the training, saying that he thought they were prepared before but now saw the magnitude of the problem differently. Interview with author: Battalion Fire Chief, Special Operations (25 May 2000).

and equipment assistance reached the medical sector. Of the preparedness of health care givers, a local official simply noted, “We’ve got problems no matter where we look.”²

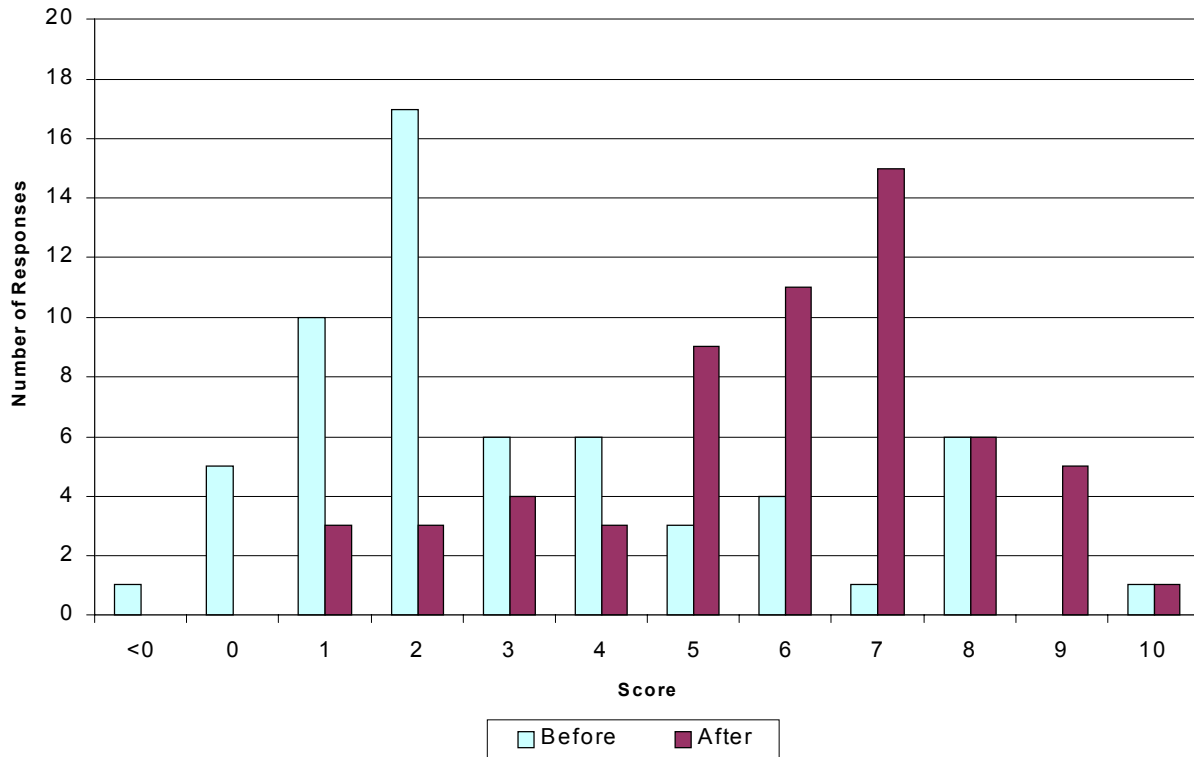
The responders’ assessments were subjective, since they were working without a definition of what constitutes “preparedness.” While some local officials felt qualified to appraise only their own organization’s status, others had a broader view of activities city-wide and therefore felt comfortable rating their city as a whole. Although the ratings in figure 6.1 are something of a potpourri, the intent of the survey was not to obtain a discipline-specific measure of preparedness. Rather, the purpose was to gain a sense of whether the federal programs were making a difference locally and how far along the path to readiness various local officials believed their cities to be. The proposed rating scale was from one to ten, with one being the least prepared and ten the most. For the “before” ratings, several local officials rewrote the scale. Five specified that their city ranked a zero and one a negative five prior to the federal aid programs. Overall, the local self-ratings certainly marked improvement, with the “before” ratings averaging 3.1 and the “after” score rising to 5.9. The mean improvement was 2.8. Eventually, almost all local officials ended up commenting on the unescapable, however. The level of preparedness in the months immediately following the federal programs might not be there in the years ahead unless training is institutionalized, equipment maintained, and seldom-used skills are drilled.³

Working from interviews with front-line personnel, the first half of this chapter describes what would unfold in a large US city stricken by a terrorist attack involving a chemical agent. The latter half provides a similar description for a likely response to a bioterrorist attack. This text can function at several levels. First, congressional, federal, and local officials can gain insight into where the front line is having difficulty with response capabilities, serving as a guidepost so that the appropriate adjustments to federal and local efforts can be made to address these gaps. Second, local emergency response officials may find a number of ideas that have been employed in other locations that would improve their plans and strategies. Finally, the following pages can provide lay readers and the media a reasonable understanding of the significant challenges facing on-scene rescuers and health care providers who would attempt to help their fellow citizens after this type of disaster.

² Interview with author: Paramedic/Emergency Planner, Public Health Department (4 February 1999). Also, “Heaven forbid something happens tomorrow, we’re definitely not ready.” Interview with author: Registered Nurse/Hospital Disaster Coordinator (4 February 1999). Similar remarks were made by a physician from a city that viewed preparedness as being much better than elsewhere. Interview with author: Physician, Hospital Department of Emergency Medicine (24 March 1999).

³ Conveying this point of view: “Sure, the feds gave us a bunch of equipment, but that does not mean we’re ready now or that we’ll be ready in the future.” Interview with author: Special Projects Program Manager, Department of Public Health (5 February 1999).

Figure 6.1: Local Officials Assess Their Preparedness for a Large-Scale Chemical Terrorist Event*



*Not all local officials interviewed for this report were asked to rate themselves and some who were asked declined to do so. The survey includes the appraisals of responders from twenty-two cities, although interviews were conducted with over thirty cities. Some responders were from cities that at the time of the interview had received only the Domestic Preparedness Program training, and others were from cities also enrolled in the Metropolitan Medical Response System program. Some cities had received equipment grants from the Justice Department, others had not.

Sources: Interviews with author: General Manager, Emergency Department (22 September 2000); EMS Chief, Emergency Services Department (21 September 2000); Director, County Emergency Management (21 September 2000); Physician/University Hospital Department of Emergency Medicine (20 September 2000). Physician, Director of Health, Public Health Department (20 September 2000); Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Director, Office of Emergency Preparedness (19 September 2000); Police Lieutenant, Tactical Support Office (18 September 2000); Hazmat Coordinator/Instructor (8 September 2000); Fire EMS statistician (30 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Police Lieutenant (8 July 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Deputy Director, Office of Emergency Management (26 May 2000); Battalion Fire Chief, Special Operations (25 May 2000); Director, Emergency Services Department (18 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); Police Sergeant (9 May 2000); MMRS Coordinator, Fire Department (9 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000); Detective/Bomb Squad (19 January 2000); Project Manager, Emergency Management Planning (27 July 1999); Director of Hospital EMS and Disaster Medicine (19 April 1999); Fire Commander (19 April 1999); Toxicologist, Poison Control Center (9 March 1999); Emergency Planner, Office of Emergency Management (8 March 1999); District Fire Chief, EMS Division (2 March 2000); Police Captain/Firing Range Director (5 February 1999); Emergency Response Planner, Office of Emergency Management (5 February 1999); Captain/Assistant Emergency Management Coordinator (5 January 2000); Battalion Fire Chief (17 November 1999); Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Battalion Fire Chief (15 November 1999); Associate Hospital Administrator/Registered Nurse (13 November 1999); EMS Superintendent-in-Chief (24 March 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999); Police Commander, Special Operations Division (23 March 1999); Assistant Director, Office of Emergency Management (23 March 1999); Deputy Fire Chief (23 March 1999); Police Captain, Special Operations Division (23 March 1999); Lieutenant/Hazmat Commander (10 March 1999); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999); Paramedic Operations Supervisor (9 March 1999); Fire Captain, HazMat Unit (9 February 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Battalion Fire Chief (9 February 1999); Fire Battalion Chief/Hazmat Specialist (8 February 1999); Police Lieutenant (8 February 1999); Battalion Fire Chief/EMS Supervisor (8 February 1999); Police Captain, Special Operations Division (8 February 1999); Special Projects Program Manager, Department of Public Health (5 February 1999); Fire Lieutenant (5 February 1999); Paramedic/Emergency Planner, Public Health Department (4 February 1999); Director, Office of Emergency Services (4 February 1999) Registered Nurse/Hospital Disaster Coordinator (4 February 1999).

BUILDING BLOCKS FOR RESPONDING TO TERRORIST INCIDENTS

No matter how well-equipped and trained the emergency rescuers in a community are, the effectiveness of the different responding agencies, separately and together, would be degraded if they do not have agreed upon disaster response plans. In a great many cities, a flexible, “all-hazards” plan already exists that, with situational adjustments, can apply to this kind of disaster.⁴ So, communities need not start from scratch, because they already have mechanisms in place (e.g., state emergency response plans, hospital mass casualty plans) that can serve as a planning platform. Many metropolitan areas created a terrorism subcommittee within an existing planning group to assess local risks and capabilities to handle the extraordinary circumstances that a chemical or biological terrorist event would create. The end product was an annex to existing multi-disaster plans and a prioritization of needed response improvements.⁵

One entity that might be assigned the task of unconventional terrorism response planning is the Local Emergency Planning Commission, which is responsible for formulating a community’s disaster response plan for hazmat incidents that must be drilled annually.⁶ In important respects, a chemical terrorist attack would be an amplified hazmat incident. Commission members are already well-versed in local hazmat response capabilities, not to mention the number, location, and nature of hazmat sites in the area. Substances that pose a danger to human health and the environment can be found in abundance in US cities.⁷ Since terrorists

⁴ Howard Levitin, “Preparing for Terrorism: What Every Manager Needs to Know,” *Public Management* 80, no. 12 (December 1998): 7–8.

⁵ One county accomplished this planning, tailored training, and exercising for first responders under a \$65,000 grant from state government. Their capability assessment covered ability to identify the agent involved, control access to the site, predict plume and downwind effects, maintain secure communications, protect first responders, alert response entities, gather intelligence, evacuate the public or shelter them in place, decontaminate victims, care for large numbers of casualties, and communicate necessary information to the public. Interviews with author: Director, County Emergency Management (21 September 2000); Deputy Director, Office of Emergency Management (2 March 2000). On the utility of building from existing plans, interviews with author: Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Battalion Fire Chief, Special Operations (25 May 2000); MMRS Coordinator, Fire Department (9 May 2000); Police Captain (10 August 1999); Physician, Hospital Division of Emergency Medicine (6 August 1999); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999).

⁶ Passed by Congress on 17 October 1986, the 1986 Superfund Amendment Reauthorization Act mandated that state governments appoint members to these commissions, including state and local government officials, representatives from police and fire departments, environmental, public health, transportation and civil defense agencies, hospitals, community groups, and the media. Each commission’s primary responsibility is the development and maintenance of an emergency response plan for potential chemical accidents that is specific to local conditions. Since the original legislation did not provide funds for the commissions, resources to sustain their activities are borne at the local level, which means that commissions are much more active in some areas than in others. See Public Law 99-499, Title 3. Under section 302 of Title 3, chemical companies and other industries that consume, handle, store, or process hazardous substances are required to submit data to these panels annually on the amount of hazmat chemical(s) on sites and where they are located. Also, Occupational Safety and Health Administration (OSHA) regulation 1910.120 requires employers to set up a health and safety plan dealing specifically with hazmat emergencies, including the training of personnel, establishment of fire brigades, and designation of escape routes.

⁷ One emergency official said that his city had over four hundred facilities working with extremely hazardous substances and over two thousand regular hazmat facilities. Another said that there were roughly six thousand laboratories in his city using hazardous materials, as well as several high-level containment laboratories working with dangerous pathogens. Yet a

could well view hazmat sites as an attractive target for theft or sabotage, some communities worked through these planning commissions and public safety authorities to strengthen the security at hazmat facilities.⁸ Another city identified some two thousand locations of all types that could benefit from a security consultation and activated an expert team for that purpose.⁹

Another important step that metropolitan areas can take to facilitate a prompt and organized response is to prepare contingency plans for major sites. To create such a plan, an emergency response team first surveys the location, whether it be a sporting arena, office building, civic auditorium, landmark, amusement or public park, zoo, shopping mall, or transportation center. They identify optimum area(s) at the site for rescuers to enter swiftly, to set up a command post, to gather, decontaminate, and triage casualties, and to stage emergency equipment. The best routes to and from the closest trauma center and other hospitals are marked. At large indoor facilities, this team also scouts the ventilation system and obtains the telephone numbers for the site engineer or others who would be able to advise them on its operation. Then, the emergency responders meet with the managers of the site to discuss the plans and ascertain what logistic support the facility might make available during an emergency. Some site managers agree to drill the plan. Some cities drew up contingency plans for their major sites long ago, with natural disasters, fires, or conventional bombings in mind.¹⁰

The domestic preparedness effort prompted other cities to identify their high-risk facilities and map out contingency plans. Aside from major public gathering places, some cities have taken extra precautions

third recalled over three hundred such facilities within city boundaries, including over 125 extremely hazardous substance sites. Interviews with author: Deputy Director, Office of Emergency Management (26 May 2000); Fire Chief (15 May 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000).

⁸ Interviews with author: MMRS Coordinator, Fire Department (9 May 2000); EMS System Analyst/Paramedic, State Department of Health and Social Services (25 January 2000); Lieutenant/Hazmat Commander (10 March 1999). OSHA regulation 1910.120, which governs emergency response plans at hazmat facilities, stipulates that a facility's plans address "site security and control," but this matter receives neither emphasis nor exposition within the text of the regulation. Matters such as the height of security fences, creation of patrols, and other measures to prevent or restrict access are left to the judgment of the facility operator.

⁹ The local Federal Bureau of Investigation (FBI) office in this city has organized a small team of fire, bomb, and special weapons and tactics specialists. In addition to the factors considered for an emergency response contingency plan, this team looks at a site's security patrol patterns and incident response plans. Afterwards, the team makes verbal recommendations to site security and managerial personnel on how to harden the facility against intruders. Within a five-month period, this team completed almost ninety consultations. Interview with author: FBI Special Agent (3 February 2000).

¹⁰ City officials are confident that these plans would serve well in an unconventional terrorist attack. Interviews with author: Director, County Emergency Management (21 September 2000); Battalion Fire Chief/Special Operations Officer (25 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); MMRS Coordinator, Fire Department (9 May 2000); District Fire Chief, EMS Division (2 March 2000); Deputy Fire Coordinator, Emergency Preparedness and Disaster Services (3 February 2000); Battalion Fire Chief, (19 January 2000); Lieutenant/Hazmat Operations, Fire Department, (27 July 1999); Fire Chief (6 April 1999); Deputy Fire Chief (23 March 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999).

with other high-risk sites (e.g., government buildings, Planned Parenthood clinics).¹¹ These sites disproportionately receive threats of all types. As noted in chapter 2, the incidents involving chemical and biological substances were mostly non-credible threats, but some have resulted in minor injuries from materials like butyric acid.¹²

LOCAL BLUEPRINTS FOR RESPONDING TO A CHEMICAL TERRORIST ATTACK

Getting A Smart Start

When a noxious substance is in the air, it often creates victims and panic. Emergency responders increasingly understand that after a chemical terrorist attack they would encounter chaos and could themselves be overcome by toxic fumes. Since 911 calls often bring police to the scene moments before firefighters, police have been nicknamed the “blue canaries.” This label is a macabre reference to the fact that soldiers and miners used to carry the caged yellow birds to detect the presence of poison gases. The number of first responders injured would depend largely upon any warning they might get en route and their training and awareness of the consequences of chemical agent exposure.¹³

Time and again, the importance of how 911 call receivers and dispatchers handle their duties has been demonstrated. Emergency call receivers ascertain the scope of an emergency and whether its cause is readily understood (e.g., gunshot, explosion), and, accordingly, forewarn rescuers when extra caution should be used. The alertness of 911 call receivers and dispatchers to the signals of a toxic event would therefore

¹¹ Cities applying for a Justice Department equipment grant are required to conduct an analysis of all of their high-risk sites. In addition to preparing contingency plans for these sites, one city sent the terrorism awareness tapes to all of the sites on its list. Interviews with author: Battalion Fire Chief, Special Operations (25 May 2000); Fire Commander (19 April 1999).

¹² On the preponderance of hoaxes, see the end of chapter 2. Also, Paul de Armond, “Right Wing Terrorism and Weapons of Mass Destruction: Motives, Strategies and Movements,” in *Hype or Reality? The “New Terrorism” and Mass Casualty Attacks*, ed. Brad Roberts (Alexandria, Va.: Chemical and Biological Arms Control Institute, 2000); T. Trent Gegax and Mark Hosenball, “The New Bomb Threat,” *Newsweek*, 22 March 1999, 36; Jason Pate, Center for Nonproliferation Studies, Monterey Institute for International Studies, “Anthrax Hoaxes in the United States,” forthcoming 2001.

¹³ Police are not the only first responders likely to rush in and be injured in such circumstances. One city conducted a no-notice, mass casualty drill fifteen years ago mocking the release of an organophosphate chemical. Exercise officials ruled the first fire engine and EMS companies to arrive “dead” of exposure to the hazardous material. Interview with author: Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999). Theoretically, firefighters are better equipped and trained to cope with this situation since they have self-contained breathing apparatus. However, firefighters also took considerable “casualties” in a drill mocking the release of sarin in New York City’s subway system in June 1995. The author has reviewed the videotape of this exercise, conducted at the station located at East 14th Street and 1st Avenue. Interviews with author: former EMS Supervisor/Paramedic (12 July 2000); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999). In the 20 March 1995 sarin attack in Tokyo, roughly 10 percent of the first responders were injured, although none seriously. For more detail, see chapter 3.

be a crucial factor in limiting injuries among the first rescuers.¹⁴ One veteran firefighter described the 911 dispatcher as “the most important person there is in an unconventional terrorist event” because that person’s quick thinking could save the lives of victims and responders alike.¹⁵ Nonetheless, the domestic preparedness training touched lightly on the role of the 911 centers.¹⁶ Figure 6.2 diagrams one city’s 911 protocol.

Should a caller report numerous choking, seizing victims, a properly trained 911 dispatcher would advise the police, fire, and Emergency Medical Service (EMS) units directed to the site of a possible toxic hazard. Next, the dispatcher would follow standard operating procedures, proceeding down a call list to roll out other units that may be required, particularly the hazmat team.¹⁷ In other words, 911 operators could get a response off to a smart start. For the time being, however, in many cities rescuers could arrive at an incident scene with minimal warning and information because 911 staffs have not consistently received tailored training or standard operating procedures.¹⁸

¹⁴ The rule of thumb is that one or two people down may be suffering heart attacks or seizures, but *any* time there are multiple casualties on the ground for unclear reasons, an unknown gas present may be present. Interviews with author: Deputy Director, Office of Emergency Management (27 July 1999); Police Commander and Police Captain, Special Operations Division (23 March 1999); Battalion Fire Chief (8 February 1999). One state has drafted a pocket guide that is aboard all of its first response units and enumerates the steps to be taken in such circumstances. Interview with author: Captain, State Highway Patrol (22 April 1999).

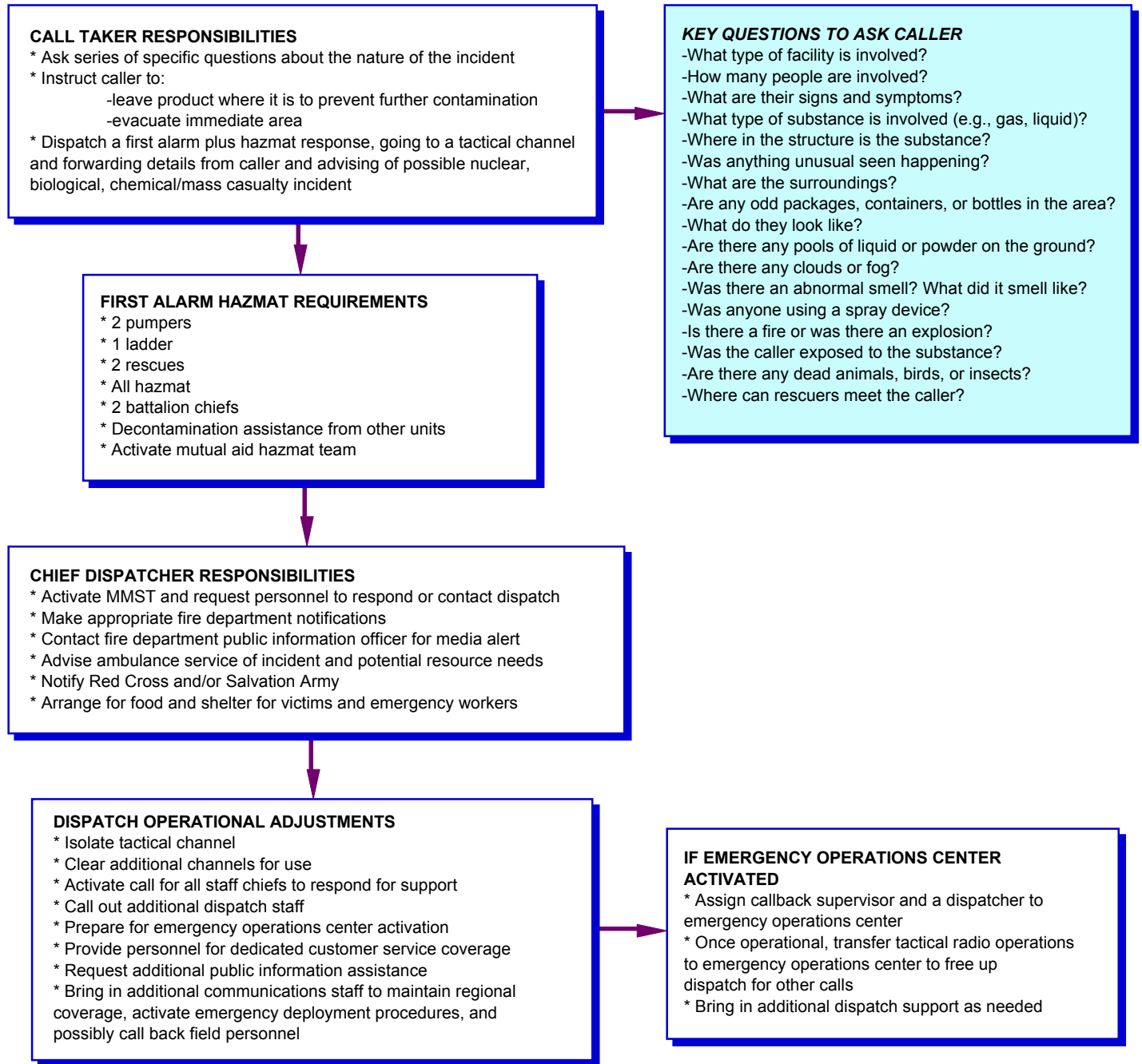
¹⁵ Interview with author: Fire Captain/Assistant Emergency Management Coordinator (5 January 2000). Seconding the importance of well-trained dispatchers: Director, Emergency Management Division, County Department of Public Safety (19 September 2000).

¹⁶ The manual’s broad instructions are that the operators and dispatchers need to recognize verbal descriptions of an attack and unusual trends, know what questions to ask, alert the appropriate responders, and provide them with safety guidance. “Responder Actions,” in *Domestic Preparedness Training: Responder Awareness Course, Instructor Guide*, Booz Allen & Hamilton Inc., Science Applications International Corporation, EAI Inc., and Disaster Planning International, Inc. (1998), 30.

¹⁷ Given the prevalence of toxic hoaxes over the past couple of years, 911 staff should also have standard operational procedures for toxic threats. One city dispatches a police car and supervisor to the scene, notifying the fire department and FBI of the situation. If the initial responders locate a device, the bomb squad is called, the on-scene command is turned over to the hazmat chief, and the fire chief is informed of the situation. Interviews with author: Police Commander and Police Captain, Special Operations Division (23 March 1999). When an untrained dispatcher at one 911 center took a call about the receipt of a letter supposedly containing anthrax, both the dispatcher and the supervisor gave the call a routine priority. The responding police officer, also untrained and unfamiliar with anthrax, became a “victim.” Afterwards, emergency officials concluded that everyone in the response chain needed awareness training, standardized notifications, appropriate response assets identified beforehand, and clearly delineated agency responsibilities. Interview with author: Fire Chief (6 April 1999). When an anthrax hoax letter ended up in Phoenix, the rescuers’ response terrified the victims, cost the company involved \$43,000 in lost productivity, and ran the city \$40,000 for police, fire, and laboratory testing. Kerry Fehr-Snyder, “It Was a Day I Will Never Forget,” *Arizona Republic*, 15 February 2000. The problem of “overresponding” is also discussed in chapter 2, footnote 181.

¹⁸ As noted in chapter 5, just under half of the respondents answered negative when asked if their 911 personnel had been trained. Moreover, such training does not ensure that 911 operators will handle this type of incident well. In one city, just a week after 911 dispatchers and their supervisors received awareness training, a caller reported over a dozen casualties and an unknown gas in a shipping mall, but the 911 dispatcher did not call the hazmat unit or warn responding paramedics of the possible presence of a toxic substance. Interview with author: Paramedic Operations Supervisor (9 March 1999).

Figure 6.2: Example 911 Protocol for a Mass Casualty Incident Involving Hazardous Materials



Source: City Fire Department, Dispatch and Deployment Procedures Protocol (June 1999).

Beginning to Wrest Order From Chaos

As the closest rescue units arrive on the scene, responders might observe important signs of a toxic threat, such as dead birds and other small animals, not just choking people. To avoid becoming victims themselves, the initial rescuers may decide that their best course of action would be to withdraw and call for units properly equipped to operate in a toxic environment. Circumstances would dictate whether front-line units could and should attempt rescue operations.

Once the general nature of the emergency is recognized, the senior fire or hazmat officer on the scene would probably assume command responsibility until all victims who can be rescued are saved. The incident commander would bear the burden of making a series of critical decisions in rapid-fire succession.¹⁹ This individual's first priority would be to figure out how to keep things from getting worse, so he must quickly size up the situation, taking into consideration the type of venue and estimating how many people were harmed.²⁰ As a matter of priority, he would request the city's hazmat squad, of which there are some six hundred across the country.²¹ If a city had a Metropolitan Medical Response System (MMRS) team, this unit and any inventory of personal protective gear and specialized detection, decontamination, and rescue equipment would also be called to the scene, along with bomb and special weapons and tactics (SWAT) teams.²² In the interim, the incident commander would begin examining the bare-bones options of how to rescue victims. Initial rescue decisions would be driven by the number of moving, viable victims and how quickly additional personnel and special equipment could get there, among other factors. Within minutes, responding agencies would establish command posts. Ideally, a unified incident command post collocating personnel from all responding agencies would form, a safe distance upwind and, if possible, uphill from the "hot zone," where the toxic hazard might persist.²³ As assorted rescuers arrive, the incident commander

¹⁹ An incident commander can use one of several decision management systems in this regard, including DECIDE, the 8-Step Process[®], GEDAPER[®], and HAZMAT Strategic Goals. These managerial tools are summarized in Chris Hawley, *Hazardous Materials Response & Operations* (Albany, NY: Delmar, Thomson Learning, 2000), 124.

²⁰ Interviews with author: Hazmat Coordinator/Instructor (8 September 2000); MMRS Coordinator, Fire Department (9 May 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Police Commander and Police Captain, Special Operations Division (23 March 1999).

²¹ General Accounting Office, *Combating Terrorism: Use of National Guard Response Teams Is Unclear* GAO/NSIAD-99-110 (Washington, DC: US General Accounting Office, May 1999), 2.

²² Interviews with author: Battalion Fire Chief, Special Operations (25 May 2000); District Fire Chief, EMS Division (2 March 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Deputy Director, Office of Emergency Management (27 July 1999); Police Commander and Police Captain, Special Operations Division (23 March 1999).

²³ Interviews with author: Hazmat Coordinator/Instructor (8 September 2000); MMRS Coordinator, Fire Department (9 May 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Police Commander and Police Captain, Special Operations Division (23 March 1999). The bombing of the Murrah Building in Oklahoma City occurred at 9:02am. The shift commander of the fire department began setting up a command post between 9:05 and 9:08am, a block away from the incident site. Also at 9:08am, emergency

would ask them to accomplish several tasks simultaneously or in quick succession, as the following paragraphs describe. After such an attack, these tasks would be very difficult even for well-equipped and drilled responders.

Hazard Assessment

To identify and assess the concentration of the toxic substance, the incident commander would insert a small reconnaissance team. Circumstances would determine whether firefighters outfitted in maximum protective gear—level A—or in self-contained breathing apparatus (SCBA) and taped-down bunker gear should take on this task.²⁴ The team would activate detectors and take a quick look around, observing the victims' symptoms and behavior, before withdrawing to brief the incident commander so that an appropriate response plan could be devised.²⁵

Ideally, this team would be equipped with a combination of detectors to provide a general characterization of the hazardous threat within moments.²⁶ As noted in chapter 5, some emergency responders were not confident that they purchased the best detection equipment. Some cities would employ

medical services was establishing a command post on the same street, a block away from the fire command post. Police ordered their mobile command post to the scene at 9:19am, with the vehicle arriving at the fire command post at 9:31am. *Alfred P. Murrah Federal Building Bombing April 19, 1995: Final Report*, The City of Oklahoma City (Stillwater, Okla: Fire Protection Publications, Oklahoma State University, 1996), 365–6.

²⁴ Defense Department-sponsored tests show that turnout gear and SCBA will provide sufficient protection to enter the hot zone for a time ranging from two to thirty minutes. If an unknown nerve agent or suspected mustard gas is present, taped down turnout gear with SCBA will protect the wearer for two to three minutes. For this type of insertion, firefighters would use duct tape to secure their bunker gear at several different places to reduce the possibility of skin exposure to agent. *Guidelines for Mass Casualty Decontamination During a Terrorist Chemical Agent Incident* (Aberdeen, Md.: US Army Soldier and Biological Chemical Command, January 2000), 7–10.

²⁵A reconnaissance team is not likely to confront any suspected terrorists that remain at the site or to rescue victims since it could consist of as few as two individuals. Interviews with author: Hazmat Coordinator/Instructor (8 September 2000); Battalion Fire Chief, Special Operations (25 May 2000); MMRS Coordinator, Fire Department (9 May 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000); Police Detective/Bomb Squad member (19 January 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Battalion Fire Chief (15 November 1999); Police Commander and Police Captain, Special Operations Division (23 March 1999).

²⁶ Several types of chemical agent sensors could be employed, including the APD-2000 handheld monitor from Environmental Technologies; the SAW mini-CAD from Microsensor Systems, Inc; the IQ-1000 multi-gas detector from International Sensor Technology; and detector tubes from Draeger. These detectors are multi-purpose. For example, the SAW mini-CAD also detects a few industrial chemicals, and the APD-2000 detects pepper spray and mace. Other detectors purchased through the federal grant programs included the M256 chemical detection kit from Truetech, Inc. and M-8/M-9 chemical detection papers from Tradeways, Ltd.

a robot for this reconnaissance task.²⁷ The goal at this point would be to identify the chemical family involved so that the level of personal protective gear for rescue operations could be set and guidelines established for the initial medical treatment of casualties. Exact identification of the agent characteristics, which is important for criminal prosecution, could be obtained later through laboratory analysis.²⁸

After launching the hot zone assessment, the incident commander would seek other information to inform his decisions. If available, the incident commander would activate mobile weather analysis and computerized plume modeling capabilities to aid in setting the perimeters of the hot zone, the warm zone where decontamination and initial triage would occur, and the cold zone where personnel could presumably operate without protective gear.²⁹ Based on such information, the incident commander would establish triage and decontamination areas as well as the transportation corridor(s) for emergency response units. Throughout rescue operations, he would evaluate progress and adjust plans as necessary.³⁰

Establishing Perimeter Control of the Disaster Scene

Initially, the incident commander would set the exclusion zone conservatively and thus quite widely. The purpose of a perimeter is to establish firm, complete control of who enters and exits the disaster area. A first cut at this task could be quickly accomplished with crime scene tape. Refinement of the perimeter

²⁷ A robot can be a time-saving option because people must don protective gear. One city equipped their robot with a SAW mini-CAD that feeds data back to the command truck. Other cities have opted for the APD-2000 and a video camera. These robots could also be used to drag victims out of a hot zone. Interviews with author: Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Special Projects Program Manager, Department of Public Health (5 February 1999).

²⁸ Interviews with author: Hazmat Coordinator/Instructor (8 September 2000); Firefighter/Hazmat Instructor/Paramedic (28 June 2000); FBI Special Agent (19 June 2000); FBI Special Agent (16 May 2000); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Fire Captain, Hazmat Unit (9 February 1999).

²⁹ In addition to plume projections, some computerized modeling systems can also forecast how many people may have been injured or killed and how many are likely to be affected by the plume, depending upon the estimated population in the affected area at different times of the day. Some cities have weather stations atop their hazmat vehicles or at various points around the metropolitan area. Up-to-the-minute weather data can also be obtained from a variety of other sources, ranging from the local airport to the National Weather Service. Interviews with author: Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000); EMS System Analyst/Paramedic, State Department of Health and Social Services (25 January 2000); Police Detective/Bomb Squad member (19 January 2000); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999).

³⁰ Interviews with author: Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Hazmat Coordinator/Instructor (8 September 2000); MMRS Coordinator, Fire Department (9 May 2000); Battalion Fire Chief (19 November 1999); Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Police Commander and Police Captain, Special Operations Division (23 March 1999).

zones would depend on the type of chemical involved, and better perimeter control could be achieved gradually with additional personnel and physical barriers.³¹

Promptly establishing a perimeter is important to hold the number of victims to a minimum and enable rescuers to do their jobs without undue interference. News crews monitor the emergency communications frequencies and could quickly get to the scene, sometimes even before key response squads.³² Continuous, live television broadcasts of the Murrah Building in Oklahoma City began twelve minutes after the 19 April 1995 bombing.³³ Some reporters would view such a disaster as a career-making story and might be willing to do practically anything to obtain spectacular images or insider interviews for live reports. The media's behavior could jeopardize their own health and also impede rescue operations in the early moments critical to victims' survival. Citizens who believe that family members or friends could be victims would also have to be kept at a safe distance, and responders would need to corral those trying to flee the scene because exposure to toxic chemicals can cause serious health effects.³⁴

Whether in small accidents or full-fledged disasters, police routinely establish and hold the perimeter zone. Police are accustomed to acting independently, using basic skills to assess each situation, creating an operational plan as they go, and calling in more personnel as needed.³⁵ When a toxic substance is the cause of the disaster, however, police have, with good reason, expressed doubts about their ability to fulfill perimeter duties. A badge and a gun offer no protection under these circumstances, and most patrol officers nationwide have little equipment or training to protect them from exposure to hazardous substances. Depending upon their department's assets and policies, beat cops may lack even riot control masks, which provide insufficient protection against super toxic chemicals. Therefore, some patrol officers worried about the exposure risk should the wind shift while they were on perimeter detail. They were wary that police

³¹ Seattle firefighters demonstrate the crime scene tape perimeter in the instructional video "Weapons of Mass Destruction and The First Responder." (Washington, DC: Department of Justice, Office of Justice Programs, 2000). During a disaster, initial chaos and the impulse to rescue victims can delay setting of the perimeter. At 9:28am on 15 April 1995, just over twenty-five minutes after the bombing of the Murrah Building, Oklahoma City police began to establish crime scene perimeters. Outer perimeter control was secured at 11:20am. *Final Report of the Alfred P. Murrah Federal Building Bombing*, 366–7. Some chemical agents (e.g., mustard, soman, VX, tabun) can persist in the contaminated area for days under temperate conditions, while others (e.g., phosgene, hydrogen cyanide) will dissipate within a few minutes. Frederick Sidell, Ernest Takafuji, David Franz, eds., *Medical Aspects of Chemical and Biological Warfare: Warfare, Weaponry and the Casualty* (Washington, DC: US Army, Office of the Surgeon General, 1997), 139–42, 198–200. Also, interviews with author: Fire Chief (15 May 2000); Battalion Fire Chief (15 November 1999); Deputy Director, Office of Emergency Management (27 July 1999).

³² For instance, one city's SWAT and bomb units responded to a 911 call reporting a possible school shooting incident to find eight television news cameras already at the school. Interview with author: Police Detective/Bomb Squad member (19 January 2000).

³³ *Final Report of the Alfred P. Murrah Federal Building Bombing*, 366.

³⁴ Interviews with author: Police Lieutenant, Tactical Support Office (18 September 2000); District Fire Chief, EMS Division (2 March 2000); Battalion Fire Chief (15 November 1999).

³⁵ Interview with author: Police Detective/Bomb Squad member (19 January 2000).

supervisors confronting this novel situation could bobble instructions to line officers. Also, some officers predicted that off-duty police beeped to report as reinforcements might ignore the page if they knew poison gas had been released.³⁶

Some perimeter strategies have been devised to take regular patrol officers out of harm's way. Instead of police, some cities plan to assign hazmat and fire crews to establish scene control initially.³⁷ Other cities have found a viable way for police to assume their normal perimeter control duties in these circumstances without incurring the expense of training and equipping patrol officers for level A operations. This approach is described in box 6.1. If special police units were deployed on the warm zone perimeter, regular officers could be stationed at the cold zone perimeter positions—those upwind and crosswind of the hot zone—where they would be unlikely to encounter concentrations of toxic material

Box 6.1: Assigning Special Police Units the Perimeter Control Mission

Instead of relying on regular uniformed officers, SWAT and special operations police can be posted on the perimeter in the event of a terrorist attack using chemical agents. These special units are accustomed to taxing missions, so some cities have trained and equipped them with level B protective gear to hold the warm zone perimeter.¹ In a variant of this approach, another police department has prepared a trio of officers and a sergeant in each of its districts to report to the scene immediately, appropriately equipped and trained to operate in the warm zone. This concept spreads the requisite resources throughout the city to enable a quick, if modest, response. Special operations police, also level B trained, will augment the early deployment teams to flesh out perimeter control capabilities.²

NOTES

1. Interviews with author: Deputy Director, Office of Emergency Management (26 May 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000); Police Captain/Firing Range Director (5 February 1999). In an adaptation of this approach, one city is recruiting 130 volunteers from its patrol officers to serve as a standing unit for perimeter duty in level B protective gear. Interviews with author: Police Detective/Bomb Squad member (19 January 2000). Another city is also thinking about outfitting and training its transportation police to level B so that they can assist with the perimeter. Interview with author: Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000).
2. Interviews with author: Police Commander and Police Captain, Special Operations Division (23 March 1999).

³⁶ This attitude and aptitude may change in cities that train their police force well and procure protective gear for officers. Not all departments distribute riot control masks for patrol units. Even in departments that do, officers interviewed said that several years often pass in which beat cops do not use these masks. Interviews with author: Battalion Fire Chief, Special Operations (25 May 2000); Director, Emergency Services Department (18 May 2000); EMS System Analyst/Paramedic, State Department of Health and Social Services (25 January 2000); Police Detective/Bomb Squad member (19 January 2000); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Police Lieutenant and Police Captain, Special Operations Division (8 February 1999); Police Captain/Firing Range Director (5 February 1999).

³⁷ Interviews with author: Fire Chief (15 May 2000); Battalion Fire Chief (15 November 1999); Deputy Director, Office of Emergency Management (27 July 1999).

sufficient to cause injury.³⁸

Some police departments have begun to issue patrol officers a reasonable amount of respiratory protection so that they would be able to go about various cold zone duties with confidence. For example, the incident commander might ask police to escort special equipment trailers to the area and to bust open transportation corridors so that rescue vehicles could get to and from the disaster scene.³⁹ Regular patrol officers are a challenge to equip because they are notoriously tough on their gear, and police departments are reluctant to train line personnel to use complicated respirators when so many other certifications must be met.⁴⁰ Therefore, whatever gear a department chooses needs to be robust, low maintenance, very easy to use, and suited to the task to be performed. If patrol officers are to be stationed considerable distances away from the hot zone, then the officers could be outfitted with a high-performance riot control agent mask that has canisters to filter extremely toxic industrial and even warfare chemicals (e.g., the MSA Millennium Chemical-Biological and Advantage 1000 masks). This gear choice is multipurpose, but cities were also weighing other options.⁴¹ To provide additional manpower, one city had arranged for area “mini-cops,” namely the transit police and those who guard empty buildings, to hold the perimeter once the disaster scene

³⁸ Interviews with author: Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999); Police Lieutenant (23 March 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Police Lieutenant and Police Captain, Special Operations Division (8 February 1999); Police Captain/Firing Range Director (5 February 1999).

³⁹ Note that getting equipment trailers to the scene in a timely fashion is such a concern in one city that their equipment trailer has been palletized and sling-wrapped. Special arrangements have been made for it to be brought in by helicopter. Interview with author: Paramedic (12 May 2000). On this police role, comments were also made by: Medical Toxicologist/Poison Control Center Director (13 June 2000); District Fire Chief, EMS Division, (2 March 2000); Police Detective/Bomb Squad member (19 January 2000); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999).

⁴⁰ Interviewees observed that police habitually toss seldom-used items in the trunks of their patrol cars where they bounce around, ignored, until the moment they are needed. Interviews with author: Detective/Bomb Squad (19 January 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Police Lieutenant (8 February 1999); Police Captain, Special Operations Division (8 February 1999). See also the discussion of the new certification point in chapter 5.

⁴¹ The Millennium Chemical-Biological Mask is designed for extended periods of wear, equipped with a speaking diaphragm and drinking tube. In addition to being effective against biological agents, the mask has been tested both by the manufacturer and independent laboratories, is certified by the National Institute on Occupational Safety and Health for protection against chloroacetophenone, chlorobenzylidene, P-100 particulate efficiency level and particulates, and meets the chemical weapon agent protection requirements of the Chemical Agent Safety and Health Policy Action Committee. The canister contains a high-efficiency particulate air filter and a carbon bed to absorb gases and liquid vapors. The military version of the mask is the MCU-2/P. The manufacturer’s list price for a single mask kit is \$297, and the cost to those meeting federal Government Services Administration qualifications is \$167.50. The Advantage[®] is a less expensive version of the Millennium mask. “Advantage[®] 1000 CBA-RCA and Millennium Gas Masks,” MSA Data Sheet 05-00-03 (Pittsburgh, Pa.: MSA, August 1999). Whereas self-contained breathing apparatus is imperative for those working inside or in close proximity to the warm zone, some cities are considering escape-only masks or positive pressure hoods, options that do not require fit tests or annual certification. This type of gear may be appropriate in situations when the respiratory threat is minimal. Air purifying respirators, which do require a fit test, are another equipment choice. Some police departments are also putting a couple of Tyvek suits in the trunks of patrol cars. Interviews with author: Police Lieutenant, Tactical Support Office (18 September 2000); Hazmat Coordinator/Instructor (8 September 2000); Hazmat Trainer/Firefighter/Paramedic (2 August 2000); Paramedic (12 May 2000); Sergeant, Fire Department (9 May 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000).

had been mostly cleared.⁴² Physical barriers, such as sawhorses or chained-link fencing, could also reinforce the perimeter.⁴³

One of the dilemmas that police anticipate after a chemical terrorist attack is sheer, utter panic, with some attempting to bolt the scene and others to aid the wounded. Police officers expressed uncertainty about the appropriate level of force to be used to hold the perimeter. Although anyone in regular clothes who entered the contaminated zone could be harmed, police presumed that they would not be authorized to use physical force. Rather, police guessed they would be told to use verbal orders and psychological persuasion to try to maintain order. Perhaps, they would be asked to help fire crews hose people down both to decontaminate them and to discourage them from leaving the area.⁴⁴ In some jurisdictions, law enforcement officers have standing authority to use non-lethal force to maintain order during riots or other difficult circumstances.⁴⁵ Elsewhere, police departments had yet to clarify use of force policies for exigent situations involving large numbers of terrified, confused, and desperate people.

Other Law Enforcement Missions

In addition to perimeter control, police would be asked to attend to the security of the rescuers. SWAT teams would be on the lookout for snipers and other signs that terrorists might still be at the scene. Given the need for SWAT teams to have tactical and tactile agility to operate in a potentially hostile environment, cities were making different decisions about what level of personal protective clothing these

⁴² Deploying mini-cops, who have a certain amount of academy training and are licensed by their local law enforcement authority, can free up police officers to answer regular 911 calls. Interviews with author: Police Commander and Police Captain, Special Operations Division (23 March 1999).

⁴³ Just over three hours after the Oklahoma City bombing on 19 April 1995, chained-link fencing was brought to the scene for more effective perimeter control. By 4:30 on the afternoon of the bombing, personnel from the Oklahoma City Police, County Sheriff's Office, and Departments of Military Personnel and Public Safety had met to establish around-the-clock staffing rotations for an eighteen-square-block area around the Murrah building. *After Action Report: Alfred P. Murrah Federal Building Bombing* (Oklahoma City, Okla.: Oklahoma Department of Civil Emergency Management, n.d.), 15.

⁴⁴ For instance, those trying to depart might be told where they should gather to be decontaminated, receive medical assistance, and be reunited with their companions. Giving people the information they want can have a calming effect, convincing people that they will get the help they desire by remaining at the scene. Also, should police and fire crews promptly begin to hose down the victims, the water pressure should be low and caution exercised if the temperature is cold. Interviews with author: Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Police Lieutenant, Tactical Support Office (18 September 2000); Hazmat Coordinator/Instructor (8 September 2000); District Fire Chief, EMS Division (2 March 2000); Police Detective/Bomb Squad member (19 January 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999); Police Captain/Firing Range Director (5 February 1999).

⁴⁵ During one city's chemical functional exercise, local police officers shocked some by firing non-lethal weapons at those trying to breach their perimeter. Interview with author: Fire Captain/Assistant Emergency Management Coordinator (5 January 2000).

teams would wear in a contaminated setting.⁴⁶ The incident commander would also probably order the bomb squad to search for other toxic or explosive boobytraps.⁴⁷ Terrorists have been known to plant additional bombs to injure the initial responders and cause further havoc.⁴⁸ Such tactics can have a demoralizing effect on the rescuers and reduce the public's confidence in the government's ability to handle such situations if additional people are injured. Until SWAT and bomb squads declare the scene free of such hazards, the incident commander would try to minimize the number of rescuers involved.

Dealing with the second device issue under the pressure of a disaster rescue is easier said than done. During one city's full chemical drill, the responders got so caught up in the rescue that they forgot to look for the dummy secondary device.⁴⁹ In the second hour of the rescue at the Murrah Building in Oklahoma City, at least two bomb scares forced rescuers to retreat, the incident command post to be relocated, and rescue operations to be suspended until the "all clear" was given.⁵⁰ To enable faster, more effective searches, bomb squads and hazmat teams in several cities have begun cross-training, and some have begun routinely deploying together on calls to improve operational efficiency.⁵¹

Next, police would also be mindful that while lifesaving efforts take precedence over criminal investigation, preservation of evidence is of key importance. Particularly once decontamination of victims begins, key pieces of evidence could be compromised or lost entirely. Depending upon local capabilities, the incident commander might instruct the bomb squad or another unit trained in toxic evidence collection

⁴⁶ One city is putting its SWAT team in level A after tests that showed that they could still hit targets in a slightly larger area than they would in their regular gear. Interview with author: Paramedic (12 May 2000). In 1997, another police department put its SWAT team in level As and found that they were unable to fire their guns with sufficient precision. Therefore, they concluded that their SWAT team would use level Bs and SCBA. Interview with author: Lieutenant/Hazmat Commander (10 March 1999). Also on level Bs for SWAT teams: Police Lieutenant, Tactical Support Office (18 September 2000); Hazmat Instructor/Firefighter/Paramedic (2 August 2000); Deputy Director, Office of Emergency Management (26 May 2000); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999).

⁴⁷ Interviews with author: Police Lieutenant, Tactical Support Office (18 September 2000); Hazmat Coordinator/Instructor (8 September 2000); Deputy Director, Office of Emergency Management (26 May 2000); Battalion Fire Chief, Special Operations (25 May 2000); Paramedic (12 May 2000); District Fire Chief, EMS Division (2 March 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000); Battalion Fire Chief (15 November 1999); Physician/EMS Medical Director (13 November 1999).

⁴⁸ Alan Sverdlik, "Blasts Rock Atlanta Abortion Clinic; At Least 7 People Slightly Injured in Explosions 45 Minutes Apart," *Washington Post*, 17 January 1997.

⁴⁹ Interview with author: General Manager, Emergency Department (22 September 2000); Physician, Hospital Emergency Department (11 May 1999).

⁵⁰ While bomb squads combed the site, rescue efforts were suspended from 10:28am to 11:22am. *After Action Report: Alfred P. Murrah Federal Building Bombing*, 2, 14; *Final Report of the Alfred P. Murrah Federal Building Bombing*, 367–8.

⁵¹ Interviews with author: Police Lieutenant, Tactical Support Office (18 September 2000); Paramedic (12 May 2000); Battalion Fire Chief (15 November 1999); Chief of Response Division, State Department of Civil Emergency Management (13 April 1999); Police Lieutenant (23 March 1999); Police Commander and Police Captain, Special Operations Division (23 March 1999); Paramedic/Emergency Planner, Public Health Department (4 February 1999).

to protect or gather evidence using equipment especially designed for toxic crime scenes.⁵² The skills of toxic evidence collection are unfamiliar to many metropolitan police departments. Successful prosecution of the perpetrators would depend upon proper collection and analysis of samples and other evidence, as well as strict observance of chain-of-custody rules for that material. Police would also want to get contact information for victims and witnesses to facilitate interviews. As soon as is practicable, the incident commander would notify the nearest Federal Bureau of Investigation (FBI) office of the circumstances. The FBI would dispatch evidence collection personnel who can operate in a hot zone.⁵³ At the conclusion of rescue operations, site command would transition to law enforcement authorities.

A final chore that would draw upon police resources relates to whether the situation merited the sheltering-in-place or rapid evacuation of some citizens. If a significant toxic cloud were present, police would be directed to ask people in the immediate downwind area to remain indoors until the hazard had passed or dissipated.⁵⁴ Further downwind from the disaster scene, citizens might be evacuated. Most cities and all states have evacuation plans, but their gaping defects have surfaced when these plans were activated. For example, when Hurricane Floyd struck the southern coastal states in mid-September 1999, governors in Florida, Georgia, and South Carolina ordered the evacuation of coastal regions. Routes inland turned into parking lots, and for some the traffic jams lasted up to seventeen hours.⁵⁵ Experience has shown that just

⁵² Isolating and collecting contaminated evidence requires special procedures and equipment that not all local police departments have. SWAT and explosive ordnance disposal (EOD) teams are being trained in some cities to undertake this task. Interview with author: Director, County Emergency Management (21 September 2000); Police Lieutenant, Tactical Support Office (18 September 2000); FBI official (1 August 2000); Battalion Fire Chief/Special Operations Officer (25 May 2000); FBI Special Agent (16 May 2000). Barrier Products, LLC began fabricating special contaminated evidence kits after the collective suicides of Heaven's Gate cult members in March 1997. The kits, called Portable BioSeal Facility Systems, include a roll of polyaluminum foil-Tyvek laminate wrapping material, that when welded shut with a heated unit forms a sealed containment package around contaminated items, fully isolating any associated hazardous gases or liquids. For further information, see the Barrier Products website at: <http://www.bioseal.com>.

⁵³ As chapter 4 describes, the FBI's Hazardous Materials Research Unit is trained and equipped specifically for this task. Some FBI field offices are also acquiring the capability to perform evidence collection in a contaminated area. FBI personnel in one city trained local firefighters to collect evidence in a contaminated zone. Interview with author: Battalion Fire Chief, Special Operations (25 May 2000).

⁵⁴ Sheltering-in-place involves shutting off air handling systems, closing all windows and doors, and tuning to local emergency or news outlets for official notifications of when it is safe to go outside. Hawley, *Hazardous Materials Response & Operations*, 130–2. Coordinator/Instructor (8 September 2000).

⁵⁵ Hurricane Floyd was by no means the only time that citizens have cursed the evacuation more heartily than the original misfortune. The evacuation orders put some two million Floridians, 500,000 Georgians, and 800,000 South Carolinians on the road at roughly the same time. Authorities eventually recognized that they could relieve some of the congestion by turning two-way highways into one-way highways headed inland. Bruce Henderson, Scott Dodd, and David Perlmutter, "Millions on Run From Fierce Floyd," *Charlotte Observer*, 15 September 1999; Schuyler Kropf, "Evacuation Traffic Jam Sparks Anger in S. Carolina," *Reuters*, 15 September 1999; Alan Judd, "Highways Clogged, Hotel Rooms Scarce," *Atlanta Journal-Constitution*, 15 September 1999; Lynne Langley, Arlie Porter, and Robert Behre, "Lowcountry Lies in Path of Hurricane," *Charleston Post and Courier*, 15 September 1999.

having a plan on paper is a far cry from having an effective evacuation plan.⁵⁶ By all indications, police would have difficulty organizing and implementing a large-area evacuation on short notice.

Rescue Operations

The crux of a disaster scene is rescue operations. The incident commander's natural choice for hot zone rescuers would be a city's hazmat squad, but, as needed, some cities reported plans to insert SWAT and EMS personnel to help extricate victims.⁵⁷ Should the hazard assessment mandate level A suits, rescuers noted that putting on this gear consumes time. A widely held misperception about a regulatory requirement for a pre-insertion medical check-up exacerbated rescuers' worries about this time lag. This misunderstanding was so pervasive that even very experienced firefighters made impassioned pleas that it be waived if lives were at stake.⁵⁸ To set the record straight, Occupational Safety and Health Administration (OSHA) regulations do *not* stipulate pre-entry health monitoring (e.g., blood pressure), but they do specify medical check-ups at other times and good safety practice would always incorporate an exam as personnel exit the hot zone.⁵⁹ For those still concerned about running afoul of OSHA regulations, box 6.2 describes a pragmatic time-saver to speed rescues in level A gear.

Given the urgency of administering antidotes to victims exposed to poison gas, several experienced rescuers strongly advocated the use of snatch-and-grab tactics to extricate victims with the utmost haste.⁶⁰

⁵⁶ Interview with author: Police Lieutenant, Tactical Support Office (18 September 2000); Police Lieutenant (23 March 1999).

⁵⁷ Some cities are sending hazmat squads only into the hot zone. Interviews with author: Director, Emergency Services Department (18 May 2000); Fire Chief (15 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000). Other cities will also send in EMS personnel to help with the rescue. Interviews with author: Police Lieutenant, Tactical Support Office (18 September 2000); Police Detective/Bomb Squad member (19 January 2000); Physician/EMS Medical Director (13 November 1999). On deploying SWAT team members for hot zone rescue: Paramedic (12 May 2000); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999).

⁵⁸ With regard to foregoing the level A medical exam, they argued, no one expects police on patrol to stop and put on eye protection and ear plugs before they fire their gun, even though they are required to do so at the firing range. Interviews with author: Chief, County Fire Department (9 September 1999); Battalion Fire Chief (9 February 1999); Fire Captain, Hazmat Unit (9 February 1999).

⁵⁹ OSHA Regulation 1910.134 specifies that hazmat personnel receive an annual physical, or, at the discretion of the physician, a biannual checkup. In addition, regulations also require that EMS personnel be standing by for medical assistance during a hot zone entry. Checkups are required in the event of a chemical exposure injury or an exposure to a chemical above the permissible exposure limit. Hawley, *Hazardous Materials Response & Operations*, 10.

⁶⁰ Interviews with author: Battalion Fire Chief (9 February 1999); Fire Captain, Hazmat Unit (9 February 1999). One county has put four high-level protection suits on each fire truck so that front-line personnel can perform snatch-and-grab. Interview with author: Chief, County Fire Department (9 September 1999).

Box 6.2: Cutting Down on Dress-out Time for Level A Gear

One city's fire department has instituted a policy that can measurably reduce the level A dress-out time, requiring hazmat personnel to undergo baseline medical checks at the beginning of every shift. Bypassing blood pressure and other vital sign checks at the scene can cut the suit up time in half. This city's hazmat squad also conducts daily checks of its specialized detectors, which helps personnel with equipment familiarization. The hazmat squad is also responsible for routinely checking the gear on the city's MMRS equipment trailer.¹

NOTES

1. Harkening again to the widespread misinterpretation of the regulations on this matter, the veteran firefighter who described this policy expressed concern that foregoing the field medical exam could lead to an OSHA violation, but that penalty was deemed acceptable if lives could be saved. Interview with author: Battalion Fire Chief (15 November 1999). Chris Hawley, *Hazardous Materials Response & Operations* (Albany, NY: Delmar, Thomson Learning, 2000), 11.

As one battalion chief put it, "If there is a lot to be gained, we'll risk a lot."⁶¹ Should the reconnaissance data reveal a less severe hazard, the incident commander could insert firefighters in SCBA and taped-down bunker gear into the hot zone to rescue known live victims.⁶² The risk to snatch-and-grab rescuers could be further reduced by aiming water hoses with fog nozzles to clear away the ambient hazard. Dousing the rescuers and victims as they exit the hot zone would also jumpstart decontamination of the victims.⁶³ If the attack occurred indoors, the vapor hazard could be significantly decreased for victims and rescuers alike by positioning fans in doorways.⁶⁴

Decontamination Operations

Decontamination of people exposed to hazardous substances is a multi-step process.⁶⁵ The layman's impression is that decontamination significantly affects the survival of victims, but in truth its main purpose is to protect the health and safety of on-scene rescuers and hospital personnel who are not typically in

⁶¹ Interview with author: Battalion Fire Chief, Special Operations (25 May 2000).

⁶² If nerve agent vapor is present, rescuers in standard turnout gear with SCBA can enter a contaminated building or the downwind area of a hot zone for thirty minutes. See also, footnote 24. *Guidelines for Incident Commander's Use of Firefighter Protective Ensemble (FFPE) with Self-Contained Breathing Apparatus (SCBA) for Rescue Operations During a Terrorist Chemical Agent Incident* (Aberdeen, Md.: US Army Soldier and Biological Chemical Command, August 1999), 10–17.

⁶³ Interviews with author: Deputy Director, Office of Emergency Management (26 May 2000); Fire Captain, Hazmat Unit (9 February 1999).

⁶⁴ For example, the concentration of an agent indoors can be reduced by fifty to seventy percent within ten minutes. Specific instructions on the positioning and size of fans, as well as when to use positive or negative pressure fans, are provided in *The Use of Positive Pressure Ventilation (PPV) Fans to Reduce the Hazards of Entering Chemically Contaminated Buildings: Summary Report* (Aberdeen, Md.: US Army Soldier and Biological Chemical Command, October 1999).

⁶⁵ The four types of decontamination are emergency, gross, formal, and fine. For a tutorial on the distinctions and how-to's, see Hawley, *Hazardous Materials Response & Operations*, 146–57.

protective gear.⁶⁶ Cities began adopting tactics to get the job done with all possible speed using front-line fire equipment, and their commonsense approach passed Defense Department-sponsored tests in 1999. Overturning conventional wisdom about the need for bleach or soap decontamination solutions, studies show that it would probably be most expedient and effective to use water alone. Taking time to dilute a bleach solution properly or to add soap could delay the onset of decontamination and cause additional medical problems.⁶⁷ The overriding factor in decontamination is to begin as soon as possible.

Weather conditions permitting, firefighters would probably start gross decontamination of the victims using fog nozzles as soon as hoses were hooked to hydrants. Ladder trucks could raise boom nozzles to create large area, high-volume, low-pressure outdoor showers or engines could be arranged side-by-side to set up decontamination corridors. Firefighters would adjust configurations of front-line equipment according to the number of victims. Well-drilled crews could set up an impromptu decontamination corridor in fifteen minutes or less. Although the requirements vary depending on the agent used, the initial goal would be to get victims to shower thoroughly for at least two to three minutes.⁶⁸ Ideally, victims would be separated into different holding areas, prioritizing those with more serious exposure symptoms for decontamination first.⁶⁹ Firefighters—often dual-trained as emergency medical technicians (EMTs)—could

⁶⁶ According to a physician who has treated hundreds of chemical agent casualties, not a single one of whom was decontaminated, the most dangerous exposure risk—vapor—evaporates as the victim moves to the medical treatment area. “By the time the casualty hits a medical response station, you are not going to do the casualty one bit of good by decontaminating the casualty’s skin. After thirty minutes, that agent is in the skin; mustard is in the skin. The nerve agent has either killed the casualty, or else there has not been enough on the skin to do any harm.” Dr. Fred Sidell, “Chemical Agents: Overview,” in *Proceedings of the Seminar of Responding to the Consequences of Chemical and Biological Terrorism*, Office of Emergency Preparedness (Washington, DC: US Department of Health and Human Services, Public Health Service, 11-14 July 1995), page 1-73. See also, page 1-71.

⁶⁷ Use of bleach solutions is also not advisable for victims with abdominal, thoracic, or neural wounds. Care must also be taken to avoid areas near the victims’ eyes and mucous membranes. Employment of soapy solutions if a blister agent has been released could also increase the damage such agents can cause. *Guidelines for Mass Casualty Decontamination*, 5–6. To mix a decontamination solution quickly, one city has decided have its firemen dump a product called Pool Shock—stackable, unbreakable packages of chlorine—into its pumper trucks en route to the incident scene. This simple approach, in the words of those who described it, obviates the need for measurement and therefore is “fireman proof.” Another fast approach that avoids measurement is to buy bleach in quarts rather than in bulk. Interviews with author: Police Lieutenant (23 March 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Battalion Fire Chief (8 February 1999).

⁶⁸ Interviews with author: Fire EMS Statistician (30 August 2000); Deputy Director, Office of Emergency Management (26 May 2000); Battalion Fire Chief, Special Operations (25 May 2000); Director, Emergency Services Department (18 May 2000); Fire Chief (15 May 2000); Paramedic (12 May 2000); MMRS Coordinator, Fire Department (9 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); District Fire Chief, EMS Division (2 March 2000); Battalion Fire Chief, (19 January 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000). Instructions for positioning trucks and ladders for decontamination can be found in *Guidelines for Mass Casualty Decontamination*, 7–13; Hawley, *Hazardous Materials Response & Operations*, 148–55.

⁶⁹ At first, victims can be separated into ambulatory and non-ambulatory categories. Those who have liquid agent on their skin or clothing, were closest to the source of the agent, reported exposure to vapor or aerosol, or have serious clinical symptoms would receive first priority for decontamination. Next, ambulatory cases could be further separated into those moderately showing the characteristic signs of exposure, who would be the second in priority for decontamination. Also in this category would be individuals who suffered other conventional injuries. Finally, those who were farthest away from the source of the agent and have no outward exposure symptoms could wait until last for decontamination. This final group should be

perform initial triage by observing the victims and trying to distinguish between individuals who were more frightened by the situation than in genuine need of decontamination.

Optimally, rescuers would begin the decontamination process by instructing victims to disrobe. Even those in physical distress might object to taking off their clothes in public, so rescuers would have to explain clearly that taking off one's outer clothing can remove roughly 80 percent of the contamination hazard.⁷⁰ Separate showers for men and women would help preserve victims' privacy. Failure to erect barriers that shield victims from prying eyes can result in harsh criticism from the media, the public, and even those rescued.⁷¹

Plans often call for impromptu front-line fire truck and engine set-ups to be augmented with a second, formal stage of more careful showering and scrubbing of residual contaminants from the victims, using bleach or soap solutions, as appropriate. Some cities have trailers filled with commercially available field decontamination systems and so-called tent cities.⁷² Other cities may bring in a dedicated decontamination truck or bus, which is a more expensive option that some first responders view with cynicism.⁷³ To cut set-up time down to about eight minutes, one rescue team pre-packed its tents, using

periodically checked for the onset of clinical symptoms that might indicate they should receive a higher decontamination priority. *Guidelines for Mass Casualty Decontamination*, 14–5.

⁷⁰ Undressing also reduces the chances that showering could transfer the agent from the clothing to the skin. Clothing should be taken off from head to toe. If use of a biological agent is suspected, victims should be doused before they remove their clothing. *Guidelines for Mass Casualty Decontamination*, 6.

⁷¹ On 24 April 1997, the nationwide print and electronic media splashed images of the Washington, DC fire department's efforts to decontaminate individuals that they thought had been exposed to anthrax. As it turned out, the container placed in front of the B'nai B'rith headquarters in the capital city was part of a hoax. The only things exposed were the victims, thirty whom were stripped to their undergarments for decontamination within full view of media cameras. A further 109 people from this building were quarantined, and two blocks of the city were cordoned off from traffic. The city's emergency response community, which had previously been described as a model of preparedness, was harshly criticized afterwards. For a dissection of this response, see Jessica Stern, *Fire Department Response to Biological Threat at B'nai B'rith Headquarters*, US Fire Administration Technical Report Series, report 114 (Washington, DC: Federal Emergency Management Agency, 1997). See also, Michael Powell and Allan Lengel, "Chemical Alert Traps Workers in Buildings," *Washington Post*, 25 April 1997; Sari Horwitz, "FBI Sends Alert to Jewish Groups," *Washington Post*, 26 April 1997; "Defense Department Establishes DC Anti-terrorism Unit," *Armed Forces Newswire*, 13 January 1997.

⁷² The contents of these trailers vary from city to city, depending upon prevailing weather conditions, resources, and the city's decontamination plan. They may contain tents, hoses, decontamination solutions, scrub brushes, personal protective gear, backpack tanks and decontamination sprayers, plastic storage bags, pools to catch contaminated water, heaters and propane tanks to heat the water, towels, and temporary or disposable clothing for the victims. Interviews with author: Paramedic (12 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); MMRS Coordinator, Fire Department (9 May 2000); District Fire Chief, EMS Division (2 March 2000); Deputy Director, Office of Emergency Management (27 July 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999).

⁷³ One city spent \$80,000 to install shower heads and other features (e.g., hydraulic lift for wheelchair patients) on a delivery truck. This truck can decontaminate over twenty people at a time, with tents stored aboard to expand its capacity. Funds for this vehicle came from a state law requiring private facilities to pay for hazmat services. The truck is to be deployed to all hazmat incidents. Interview with author: Fire Chief (15 May 2000). Other locations have also invested in mass decontamination trucks. Interview with author: Chief, County Fire Department (9 September 1999). More than one individual expressed the view

velcro to secure pools and hoses at the appropriate places inside the tents, which inflate with the push of an air button.⁷⁴ Some cities were also hoping to save time by stationing their decontamination trailer(s) with their hazmat team(s); others situated these trailers at strategic area locations.⁷⁵ As they exit the decontamination process, victims would be given Tyvek suits, spare clothing, or even garbage bags to wear.⁷⁶ Depending on the size of a tent city and rescuers' training, dozens of people could be herded through decontamination lines simultaneously.⁷⁷

Decontamination operations, which are labor intensive and exhaustive, would soon deplete a city's supply of trained responders. Hours would be required to decontaminate hundreds of people. To provide a ready supply of reinforcements, fire departments have designated engine companies to serve as hazmat and decontamination squads, equipping and training them to level A and level B operations, respectively.⁷⁸ Some cities were also spreading training and equipment to neighboring municipal areas, so that their mutual aid partners could help. In one metropolitan area, each jurisdiction was asked to offer one fire house to serve as a decontamination squad on all shifts. Between \$1,300 and \$1,500 worth of equipment can outfit a fire

that these fancy decontamination rigs will soon be seen as dinosaurs because the front-line fire engine set-up is much more expedient and tent cities much less expensive. Moreover, these trucks may be unable to make it to the scene in time to be of much use. Interviews with author: Hazmat Instructor/Firefighter/Paramedic (2 August 2000); Paramedic (12 May 2000); Physician, Hospital Department of Emergency Medicine (24 March 1999).

⁷⁴ All that remains is to hook the water hoses to outside lines. Interview with author: Hazmat Specialist/Instructor (9 February 1999).

⁷⁵ Interviews with the author: Deputy Director, Office of Emergency Management (27 July 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999).

⁷⁶ Interview with author: Battalion Fire Chief (8 February 1999). Industrial trash bags come two thousand per roll and could provide slight modesty and thermal protection for victims. Interview with author: Police Lieutenant (23 March 1999). Another rescuer thought that asking the victims to wear garbage bags—a cheap and easy option—would rob them of their dignity and also show that city emergency personnel were less than well prepared to handle the situation. Interview with author: Fire Captain, EMS Division (27 July 1999).

⁷⁷ Victims can be moved quickly through decontamination lines if the attending personnel are well trained. For example, the 100-person National Medical Response Team in Winston-Salem, North Carolina, practices regularly and can decontaminate twenty non-ambulatory and two hundred ambulatory people per hour. Interview with author: Physician/National Medical Response Team member (11 May 1999). In one city's decontamination drill, however, it took three hours to process twenty people with an indoor shower. Interview with author: Deputy Fire Chief (23 March 1999). Other cities concerned about how long it would take them to set up decontamination lines gave some thought to busing victims to car washes and water amusement parks, but discarded the idea. Interviews with author: Emergency Management Specialist, Office of Emergency Management (9 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000).

⁷⁸ Interviews with author: Hazmat Coordinator/Instructor (8 September 2000); Fire EMS Statistician (30 August 2000); Deputy Director, Office of Emergency Management (26 May 2000); Battalion Fire Chief/Special Operations Officer (25 May 2000); Director, Emergency Services Department (18 May 2000); EMS Specialist/Paramedic (12 May 2000); MMRS Coordinator, Fire Department (9 May 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Battalion Fire Chief (17 November 1999); Battalion Fire Chief (15 November 1999); Fire Captain, EMS Division (27 July 1999); Lieutenant/Hazmat Commander (10 March 1999); Fire Lieutenant and Fire Captain (5 February 1999).

house to function in a backup decontamination capacity.⁷⁹ The incident commander would probably request such assets via the emergency operations center described in box 6.3. Another pool of local backups possibly available to an incident commander would be the hazmat teams from private industry sites.⁸⁰ Unless the attack was of truly astronomical proportions, local rescuers do not anticipate calling upon rescuers from outside the region because they could not arrive within sufficient time and some of the federal teams would, quite frankly, be more trouble than they were worth. Local concerns about being bombarded by outside aid teams are discussed in box 6.4.

Triage and Initial Medical Treatment

The goal of triage and on-scene medical care is to stabilize patients before transport so that definitive treatment can be given in a more controlled hospital setting. During triage, EMS crews, aided in these circumstances by hazmat crews and firefighters, would quickly evaluate the condition of patients and prioritize those with the most severe injuries as the first to receive attention. Color-coded tags would indicate a person's condition and treatment priority.⁸¹

⁷⁹ Inexpensive versions of much of the requisite equipment can readily be found at hardware stores. Interviews with author: Director, County Emergency Management (21 September 2000); Hazmat Instructor/Firefighter/Paramedic (2 August 2000); Battalion Fire Chief, Special Operations (25 May 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000); Deputy Director, Office of Emergency Management (27 July 1999); Fire Chief (13 April 1999); Assistant Director, Office of Emergency Management (23 March 1999); Police Lieutenant (23 March 1999); Deputy Fire Chief (23 March 1999); Emergency Planner (8 March 1999); Fire Lieutenant and Fire Captain (5 February 1999).

⁸⁰ Interviews with author: Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Battalion Fire Chief, Special Operations (25 May 2000); EMS Licensing Agent, State Department of Public Safety (27 January 2000); EMS System Analyst/Paramedic, State Department of Health and Social Services (25 January 2000); Deputy Fire Chief (23 March 1999).

⁸¹ EMS crews employ a number of triage systems, such as Simple Triage and Rapid Treatment/Transport, to prioritize patients. One city plans to affix a numbered, waterproof Tyvek wrist band to victims in order to indicate level of problem. The same number would identify bags that contain victims' clothing and personal items. Interview with author: Fire Chief (14 June 1999).

Box 6.3: Emergency Operations Center Coordination of Local, Regional Assets

Once it is understood that an event of significant proportions has taken place, designated officials from all of the responding agencies would be paged to a city's emergency operations center to help coordinate the disaster response. This center—the civilian equivalent of a war room—would be open around the clock until normalcy was restored. Aside from public safety and health agencies, the public works department, which can supply a great deal of logistical assistance to the incident commander, and public utility companies (e.g., electric, gas, telephone) would be represented. Volunteer organizations, such as the Red Cross, often have permanent seats at the table. Emergency operations centers normally have extensive communications capabilities to enable them to interact simultaneously with a great number of organizations throughout a high-demand period. Ideally, regional, state, and federal organizations would send representatives to this center if they became involved in the response.¹ State emergency officials may open their own command center as well.

As soon as the emergency operations center opened, the incident commander at the scene of a chemical terrorist attack would begin to funnel requests for resources through the center, delegating the notifications, logistics, and coordination of incoming response units. For instance, should the incident commander ask for extra help to contain the runoff from the decontamination lines and buses to transport patients to the hospitals, the public works and environmental safety departments would deliver crews, and the city might pull regular transit buses or activate contracts with private transport companies. Anticipating a response of some duration, city managers might ask one of the volunteer organizations to provide water and food for the rescuers on scene, as well as for the hospital staffs. The emergency operations center would also organize humanitarian assistance for victims (e.g., food, clothing, shelter). The emergency operations center would help coordinate any evacuation that might be needed, or in the case of a biological attack, quarantine activities. In these types of disasters, special attention would have to be given to mental health care services not only for the victims but for the community at large.² Another major function of the emergency operations center is to provide information to the public and the media about the disaster and the city's response to it.

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To supervise triage and initial medical care, MMRS teams include physicians and sometimes medical toxicologists.⁸² Rapid administration of antidotes would be key to patient survival,⁸³ but precision and advanced medical expertise is required. Experience has repeatedly shown that serious consequences can result when the wrong type or quantity of antidote is used. For example, the incorrect amount of dicobalt vegetate given to individuals thought to have been poisoned by cyanide caused them to exhibit cobalt

⁸² Some cities are paging other toxicologists to the receiving hospitals, as well as to the city emergency operations center. Interviews with author: Fire EMS Statistician (30 August 2000); Physician/Director of Hospital Disaster EMS (27 July 1999); Toxicologist, Poison Control Center (9 March 1999).

⁸³ Sidell, Takafuji, and Franz, eds, *Medical Aspects of Chemical and Biological Warfare*, 329–31; Richard J. Brennan, Joseph F. Waeckerle, Trueman W. Sharp, and Scott R. Lillibridge, “Chemical Warfare Agents: Emergency Medical and Emergency Public Health Issues,” *Annals of Emergency Medicine* 34, no. 2 (August 1999): 201.

Box 6.3: Emergency Operations Center (continued)

City response agencies would first bring all of their own assets to bear, but as soon as officials recognized that the disaster would outstrip their capacities, mutual aid agreements with neighboring municipalities would be activated. The terms of fire mutual aid agreements differ from area to area, sometimes involving hazmat as well as fire crews. In some locations, police and EMS also have mutual aid agreements, in other cases not. Some cities also have standing aid arrangements with the hazmat crews employed by private chemical companies.³ A couple of cities also reported cooperative arrangements with local military bases that would enable them to tap into supplies, equipment, and manpower.⁴ These regional assets were always described as essential components of success in responding to a major disaster, in part because of the quick deployment time their proximity allowed and in part because of prior responses that engendered high confidence that experienced, collegial support would be provided.

NOTES

1. During a chemical terrorism drill in November 1997, one city challenged its major public utility company to maintain service throughout the emergency, which led company officials to recognize the need to train and equip a team to operate in warm zone conditions. Interview with author: Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999). Also on emergency operations center functions: Director, Emergency Services Department (18 May 2000); Division Chief, State Department of Emergency Management (3 May 2000); District Fire Chief, EMS Division (2 March 2000); Project Manager, Emergency Management Planning (27 July 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Director, Office of Emergency Services (4 February 1999).

2. If a large number of fatalities were involved, the emergency operations center would help coordinate mortuary services and grief counseling. Interviews with author: Director, Emergency Services Department (18 May 2000); District Fire Chief, EMS Division (2 March 2000); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999). For background on emergency management practices as they apply to terrorism, see William L. Waugh, Jr., *Terrorism and Emergency Management: Policy and Administration* (New York: Marcel Dekker, Inc., 1990).

3. Interviews with author: Fire EMS Statistician (30 August 2000); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999); Chief of Response Division, State Department of Civil Emergency Management (13 April 1999); Lieutenant/Hazmat Commander (10 March 1999); Special Projects Program Manager, Department of Public Health (5 February 1999).

4. Interviews with author: Battalion Fire Chief/Special Operations Officer (25 May 2000); Director, Emergency Services Department (18 May 2000).

poisoning. Also, when too much atropine is administered to patients suffering from nerve agent or organophosphate exposure, they have to be put on respirators.⁸⁴ While EMS crews have standardized procedures for many types of injuries, such as immobilizing those with possible spinal cord damage, a consensus is still forming as to the best practices for the field care of people exposed to super toxic chemicals. The lack of pre-hospital treatment protocols has caused no end of frustration and confusion locally. A case in point was the significant controversy over civilian use of the Mark 1 kits, which were

⁸⁴ Timothy C. Marrs, "National Consequence Management Concepts and Plans for Chemical and Biological Incident Response," in *Proceedings of the Seminar of Responding to the Consequences of Chemical and Biological Terrorism*, page 3–14. An atropine overdose patient may need to be on a respirator for several days. From 18 to 28 February 1991, Iraq bombed Israel with thirty-nine Scud missiles, and many thought they were armed with chemical agents. In the vicinity of Tel Aviv, 230 overdoses of atropine occurred during this timeframe. *Guidelines for Mass Casualty Decontamination*, 37, note 10.

designed by the military for battlefield use to counteract severe nerve agent poisoning. Absent guidelines, cities were adopting different policies.⁸⁵

Emergency response personnel expressed differing philosophies about when to initiate medical treatment of victims, depending in no small part upon whether their EMS squads were trained and equipped to operate in the warm zone. According to one approach, EMS personnel in regular work clothing would attend to victims after they were fully decontaminated.⁸⁶ A second approach would be more aggressive, with EMS personnel in protective garb, partnering with hazmat specialists in the contaminated area. Some cities would even call upon their EMS staffs to help with rescue operations; others would assign their paramedics and EMTs to conduct preliminary triage, begin medical treatment before decontamination if warranted, and assist and evaluate the medical status of victims throughout the decontamination process. Figure 6.3 portrays this forward triage approach as it pertains to nerve agent casualties. Patients would then move to the formal triage area for additional medical treatment, as appropriate, and priority staging to ambulances.⁸⁷ The advantage to forward triage is that medical intervention occurs as soon as possible, all the more important

⁸⁵ Mark 1s contain a pair of auto-injectors with atropine and pralidoxime chloride, or 2-PAM. The doses in these injectors are pre-measured for physically fit soldiers, but children, the elderly, and pregnant women could be felled in a terrorist attack. Some cities are therefore reserving Mark 1s solely for their affected first responders, who are more likely to match the military weight and fitness profile. Some cities bought vials of atropine so that doses can be adjusted for civilians. Interviews with author: Police Sergeant (2 April 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999). Others, however, developed pre-hospital protocols for the Mark 1s. In some jurisdictions, only paramedics are authorized to use these kits; in others, EMTs are authorized as well. As to worries about whether the kits are appropriate for civilians, one responder observed that if victims are exhibiting symptoms, the fine tuning of treatment could be done by physicians, if the EMS crews could keep them alive. Interviews with author: EMS Chief, Emergency Services Department (21 September 2000); Deputy Director, Office of Emergency Management (26 May 2000); Battalion Fire Chief, Special Operations (25 May 2000); Director, Emergency Services Department (18 May 2000); Paramedic (12 May 2000); MMRS Coordinator, Fire Department (9 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Physician/Associate Medical Director, Fire EMS Division (27 July 1999). On having developed pre-hospital protocols for several chemical agents: Fire EMS Statistician (30 August 2000).

⁸⁶ In some instances, this approach is being used out of choice, as EMS supervisors see no reason to have their personnel operate in a contaminated environment. In other cities, stationing EMS crews only in the cold zone is a necessity, because cities have not yet been able to outfit and train their EMS personnel to operate in protective gear. Interviews with author: Director, County Emergency Management (21 September 2000); Hazmat Coordinator/Instructor (8 September 2000); Director, Emergency Services Department (18 May 2000); Fire Chief (15 May 2000); Paramedic (12 May 2000); MMRS Coordinator, Fire Department (9 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); District Fire Chief, EMS Division (2 March 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Battalion Fire Chief (19 January 2000); Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Paramedic Operations Supervisor, Paramedic Division (9 March 1999).

⁸⁷ Several cities plan to employ forward triage. Interviews with author: EMS Chief, Emergency Services Department (21 September 2000); Deputy Director, Office of Emergency Management (26 May 2000); Battalion Fire Chief, Special Operations (25 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Physician/EMS Medical Director (13 November 1999); Fire Captain, EMS Division (27 July 1999); Fire Chief (14 June 1999). A Defense Department report cautions that non-ambulatory patients showing significant signs of exposure should be the only ones to receive medical treatment prior to decontamination. In cases of nerve agent exposure, Mark 1 kits can be administered in the hot zone, after which victims should be quickly removed from the contaminated area. *Guidelines for Mass Casualty Decontamination*, 21.

Box 6.4: Local Worries About Help From Outside the Region

In contrast to the confidence that city officials expressed about regional rescue assets stepping in to help them after an unconventional terrorist attack, virtually every local official interviewed had major reservations about the ability of federal and even state assets to arrive in sufficient time to impact the outcome of a chemical terrorist attack response. They were also seriously concerned whether the federal government could quickly deliver enough medical manpower to help after a biological attack. Whereas rescuers can recover victims days after earthquakes and tornadoes, the lifesaving window of opportunity for a chemical attack is much, much briefer. The locals repeatedly pointed out the difference between the deployment times promised for these teams and reality. Several interviewees, veterans of Urban Search and Rescue task forces and Disaster Medical Assistance Teams, knew full well the delays in deploying these teams. None of the specialized federal or state teams, they said, would have lifesaving applicability after a chemical terrorist attack unless they were pre-deployed. To say the least, interviewees were vexed about the funds “wasted” on creating new federal and state teams and money frittered away on enhancing other federal teams for rescue missions they cannot achieve. Conversely, they worried that insufficient funding and use of the civilian medical response system meant that the medical cavalry might not come through when they were needed most.¹

Far and away the most criticized of the newcomers were the National Guard’s Weapons of Mass Destruction Civil Support Teams, at first known as the RAID (Rapid Assessment and Initial Detection) teams. The National Guard can be called out by a state governor, but can also be federalized. The locals viewed the resources being poured into the RAID teams as nothing short of scandalous, characterizing this effort as a job employment program. Locals that saw RAID squads in action rated them as bulldozing amateurs. To illustrate the point, a RAID team pushed aside local rescuers in the Portsmouth segment of the mid-May 2000 Topoff drill, where a terrorist attack with the chemical agent mustard was simulated. Yet, this particular team lacked the technical expertise to understand the minimal hazard posed by mustard on a chilly, forty-nine degree day.² Incident commanders want to be able to rely on the help that arrives, not worry about deficiencies in training and experience that could hinder or jeopardize their own personnel. RAID teams would not accrue invaluable mission experience until a unconventional attack occurs, and trials by fire are a recipe for failure. Similar concerns were voiced about other federal squads that rarely see real action, but in particular, local responders heaped ridicule on the RAID teams: “They’re *helping* me?” scoffed one fire chief.³ To a person, however, the local officials welcomed the Guard in its traditional support role. The locals anticipate asking the National Guard to help only with cots, water supplies, law enforcement support, and other logistical matters.⁴

City emergency managers and responders expressed a great deal of apprehension that just as they were beginning to get a handle on the disaster, they would be bombarded with incoming federal teams. Although local officials had heard federal authorities state that no help would be sent unless requested, each dismissed such claims because they had seen the federal teams shove vigorously to participate in mere exercises, much less in a real event. The locals noted that the officers and bureaucrats who created these teams would deploy to justify their existence. Once on the ground, local authorities expected the pushing to continue. With a mixture of chagrin and amusement, they related tales of federal squads scrapping with each other for tasks, brandishing every conceivable kind of gizmo. Federal protestations to the contrary, locals have also experienced outside teams telling them what to do in their own city, despite their utter lack of knowledge of local capabilities and circumstances. Local rescuers therefore predicted that the state and federal teams would jam them up so completely that they could hardly function, creating another disaster of sorts.⁵ Only half facetiously, one city emergency manager stated that once the disaster scene was cleared, his first order of business would be to station police at the city boundaries, guns pointed outward, to keep all of these “helpers” from overrunning the city hours later.⁶

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Box 6.4: Local Worries (continued)

The locals were not alone in this forecast: One senior federal bureaucrat described how the sky would be “black with the incoming aircraft filled with helpers.”⁷ The locals worried that once the federal teams arrived they would have to expend more time and energy managing the federal assets than the crisis at hand. Instead of weaving into the local emergency operations center, multiple federal command posts would be established. To keep tabs on what these so-called helpers were doing, local officials would have to send representatives to the federal command posts, an additional drain on already depleted city emergency response personnel.⁸ While they were extremely skeptical that federal teams would be disciplined enough not to barge in after a chemical disaster, local officials hoped that outside teams would at least stage at the nearest military base. With the exception of FBI personnel, who would be pursuing the criminal investigation, the only non-local expertise the city officials could truly foresee needing in the short term was in area decontamination, if their regular contractors refused to take the assignment. In other words, locals fully expect to ask that these state and federal squads to return home without any ever seeing the disaster scene. If a biological attack took place, however, they simply hope against hope that a federal medical aid system never tested in such a crucible would be able to get significant medical assets there in time.⁹

NOTES

1. Interviews with author: General Manager, Emergency Department (22 September 2000); Hazmat Coordinator/Instructor (8 September 2000); Fire EMS Statistician (30 August 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Deputy Director, Office of Emergency Management (26 May 2000); Battalion Fire Chief/Special Operations Officer (25 May 2000); Director, Emergency Services Department (18 May 2000); Division Chief, State Department of Emergency Management (3 May 2000); Detective/Bomb Squad (19 January 2000); Battalion Fire Chief (19 January 2000); Chief, County Fire Department (9 September 1999); Project Manager, Emergency Management Planning (27 July 1999); Director of Hospital EMS and Disaster Medicine (19 April 1999); Fire Commander (19 April 1999); EMS Superintendent-in-Chief (24 March 1999); Police Lieutenant (23 March 1999); Assistant Director, Office of Emergency Management (23 March 1999); Paramedic Operations Supervisor (9 March 1999); Lieutenant/Hazmat Commander (10 March 1999); Fire Captain, Hazmat Unit (9 February 1999); Battalion Fire Chief (9 February 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Fire Lieutenant (5 February 1999); Police Captain/Firing Range Director (5 February 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999); Paramedic/Emergency Planner, Public Health Department (4 February 1999); Director, Office of Emergency Services (4 February 1999). Often, the delay is not in the team reporting to the airport, but in getting them and their equipment aboard commercial flights.
2. Interviews with author: Hazmat Coordinator/Instructor (8 September 2000); former EMS Supervisor/Paramedic (12 July 2000). Another National Guard team was so unfamiliar with its equipment that in another drill several hours passed before they were ready to enter the contaminated zone. Then, the Guard team tried to give the city responders directions about possible plume repercussions, but they lacked the knowledge of how the chemical plume would effect the area depending upon the population at different times of day. Interview with author: Detective/Bomb Squad member (19 January 2000); Battalion Fire Chief (19 January 2000).
3. Emphasis reflects the incredulous tone of the comment. Interview with author: Chief, County Fire Department (9 September 1999). Similar reactions to the RAID teams were given by: Hazmat Coordinator/Instructor (8 September 2000); former EMS Supervisor/Paramedic (12 July 2000); Firefighter/Hazmat Instructor/Paramedic (28 June 2000); Battalion Chief (19 January 2000); Fire Commander (19 April 1999); Hazmat Materials Specialist (19 April 1999); Director of Hospital EMS and Disaster Medicine (19 April 1999); Lieutenant/Hazmat Commander (10 March 1999); Lieutenant/Hazmat Commander (10 March 1999); Emergency Planner, Office of Emergency Management (8 March 1999). Similar tales and views were expressed by: Fire EMS Statistician (30 August 2000); EMS Supervisor (20 May 1999); Deputy Director, Office of Emergency Management (26 May 2000); Division Chief, State Disaster Medical Services Division (15 February 2000); Detective/Bomb Squad member (19 January 2000); Battalion Fire Chief (15 November 1999); Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Project Manager, Emergency Management Planning (27 July 1999); Police Lieutenant (23 March 1999); Fire Captain, Hazmat Unit (9 February 1999); Battalion Fire Chief (9 February 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Director, Office of Emergency Services (4 February 1999). For yet another negative review of the RAID teams, see General Accounting Office, *Use of National Guard Response Teams Is Unclear*.
4. Ibid.

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Box 6.4: Local Worries (continued)

5. “Everybody and their brother wants to go to the scene to justify their response capability or some little whiz-bang toy that they have developed and want to use.” Interview with author: Director of Hospital EMS/Disaster Medicine (19 April 1999). Two officials described federal teams arriving in their city with price tags still on their gear, then coming close to a fist-fight over which team would get to analyze a sample that common sense told the locals was innocuous. Interviews with author: Lieutenant/Hazmat Commander (10 March 1999); Emergency Planner, Office of Emergency Management (8 March 1999). Other tales of this nature were recalled by: General Manager, Emergency Department (22 September 2000); Hazmat Coordinator/Instructor (8 September 2000); Fire EMS Statistician (30 August 2000); former EMS Supervisor/Paramedic (12 July 2000); Deputy Director, Office of Emergency Management (26 May 2000); EMS Supervisor (20 May 1999); Division Chief, State Disaster Medical Services Division (15 February 2000); Detective/Bomb Squad member (19 January 2000); Battalion Fire Chief (15 November 1999); Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Project Manager, Emergency Management Planning (27 July 1999); Police Lieutenant (23 March 1999); Fire Captain, Hazmat Unit (9 February 1999); Battalion Fire Chief (9 February 1999); Director, Office of Emergency Services (4 February 1999). On how squabbles between local, federal, and state officials can cost lives, Osterholm and Schwartz, *Living Terrors*, 179.

6. Interview with author: Director, Office of Emergency Services (2 April 1999).

7. Interview with author: Senior official, Health and Human Services (HHS) Department (6 May 2000).

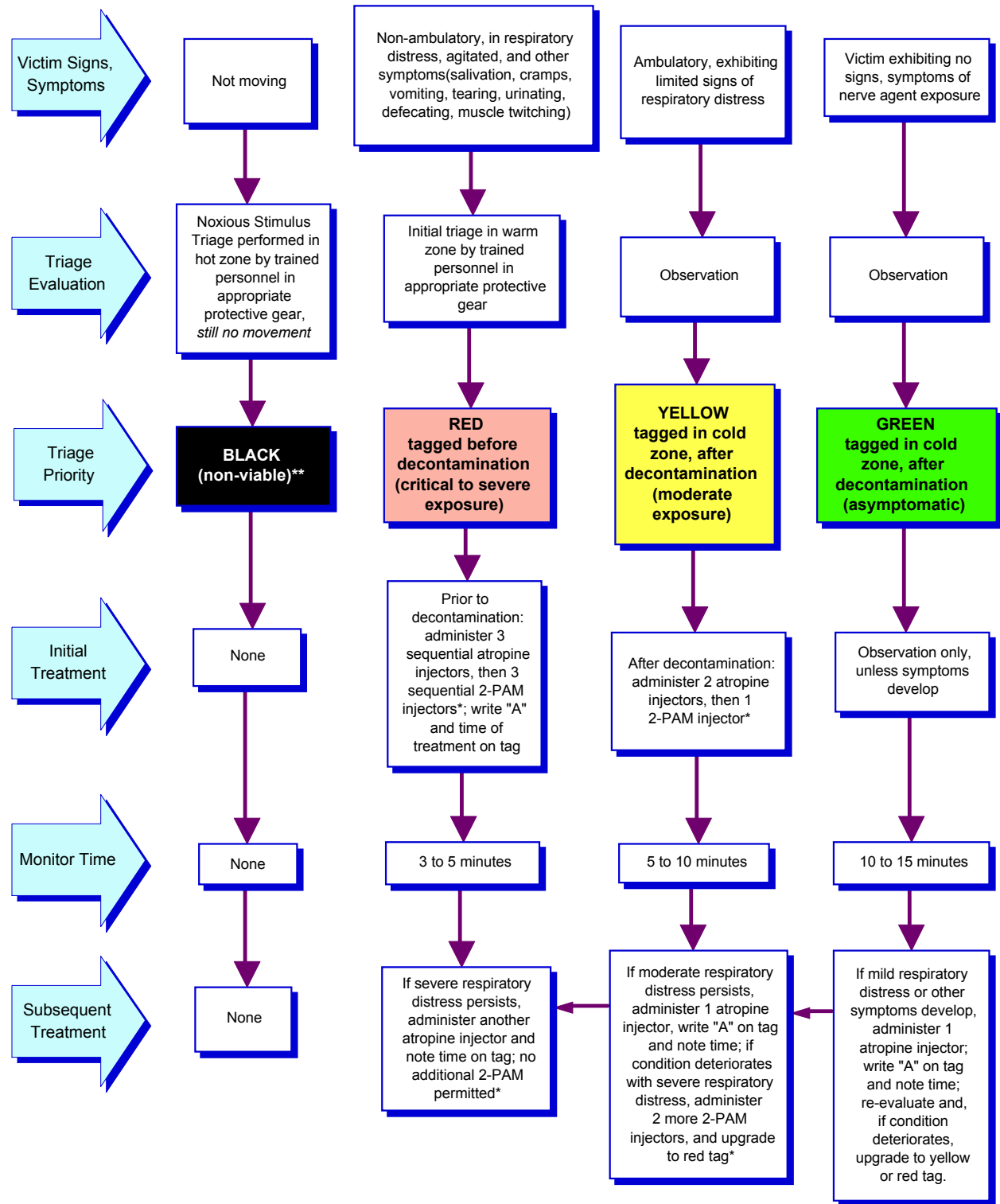
8. “The federal government doesn’t understand the concept of a unified command.” Director, Office of Emergency Services (2 April 1999). Acknowledging the problem of multiple federal command posts, Senior official, HHS Department (6 May 2000). Also on the headache of interacting with the various federal commands, Chief of Response Division, State Department of Civil Emergency Management (13 April 1999); Police Lieutenant (23 March 1999).

9. Federal assets were staged in this manner after the Oklahoma City bombing and in natural disasters, such as Hurricanes Opal and George. Many teams were sent home without being pulled into service. Interview with author: Director of Hospital EMS and Disaster Medicine (19 April 1999). Cities often have companies on contract to clean up sites after a hazmat incident, but more than one city reported being unable to locate a contractor willing to take on this type of a job. Expecting to ask for decontamination assistance: Director, Emergency Management Division, County Department of Public Safety (19 September 2000); District Fire Chief, EMS Division (2 March 2000); Battalion Fire Chief (17 November 1999); Emergency Manager, Office of Emergency Management (17 May 1999); Fire Commander (19 April 1999); Chief, County Fire Department (9 September 1999). On worries about the timeliness and quantity of federal medical aid: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Director of Hospital EMS and Disaster Medicine (19 April 1999); Police Lieutenant (23 March 1999); EMS Superintendent-in-Chief (24 March 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999); former State Epidemiologist (18 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Fire EMS Statistician (30 August 2000); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Senior CDC Official (29 August 2000); Registered Nurse/Hospital Disaster Coordinator (4 February 1999).

because chemical agents can kill within minutes and decontamination can be a slow process. According to one source, decontamination could delay medical intervention by twelve to twenty-five minutes.⁸⁸ However, this forward triage approach requires EMS crews to don protective clothing, unfamiliar territory for many. A study with twenty paramedics, summarized in table 6.1, shows that EMS personnel can still perform procedures that demand dexterity in this gear, albeit not as quickly.

⁸⁸ S. Dyer et al., “Efficiency of Civilian Paramedics at Performing Medical Interventions While in Chemical Protective Gear,” Presentation Abstract, *Clinical Toxicology* 36, no. 5 (1998): 477.

Figure 6.3: Medical Management for Nerve Agent Casualties, Employing Mark 1 Kits*



*The Mark 1 atropine autoinjector contains a 2 milligram dose, the 2-PAM (pralidoxime chloride) injector contains a 600 milligram dose. While the maximum dose for 2-Pam is 1.8 total grams, or three injectors, there is no maximum dose for atropine.

**Since severe nerve agent exposure makes victims stop breathing, one medical toxicologist cautioned against quick black tagging of non-breathing victims. Instead, a Mark 1 kit should be administered to attempt to revive such victims. If there is not response to resuscitation efforts, then a black tag is appropriate. Interview with author: Toxicologist/Poison Control Center Director (13 June 2000).

Source: Hazmat Medical Management Protocol, Medical Director, EMS Division, Fire Department (n.d.).

Table 6.1: Efficiency of Paramedics Performing Medical Interventions in Standard Uniform Versus Level B Chemical Protective Gear

Procedure	Standard Uniform	Chemical Protective Equipment**
Endotracheal intubation***	23.3 seconds +/- 4.91 seconds	26.58 seconds +/- 6.75 seconds
Intramuscular injection	42.3 seconds +/- 10.79 seconds	50.23 seconds +/- 12.13 seconds

* Study performed with two physicians using a crossover design to evaluate twenty civilian paramedics performing two procedures on mannequins. A paired test was employed to compare performance in standard uniform and chemical protective gear. Results for intubation were $p = 0.02$; for intramuscular injection, $p = 0.004$.

** Self-contained breathing apparatus, butyl suits, and nitrile gloves.

*** Two recognized esophageal intubations occurred in chemical protective gear, one in standard uniform.

Source: S. Dyer, K. Brinsfield, A. Woolf, D. White, R. Haley, "Efficiency of Civilian Paramedics at Performing Medical Interventions While in Chemical Protective Gear," Presentation Abstract, *Clinical Toxicology* 36, no. 5 (1998): 477.

Cities using the forward triage approach were putting Mark 1s and other treatments on their ambulances, hazmat trucks, as well as on some fire engines and at hospitals.⁸⁹ This strategy is not without its downside, however, because these chemical antidotes have both limited applications and shelf lives. To illustrate the point, one city placed cyanide kits on all of its ambulances as a precaution during the 1982 Tylenol poisoning scare, but these kits were never used, expired, and were never replaced.⁹⁰ Some cities were purchasing the powdered form of the nerve agent antidote atropine. The powdered variant has no expiration date, which takes the fiscal sting out of stocking a single-purpose drug, but some advise against relying on powdered atropine when time is of the essence, particularly for the pre-hospital treatment of patients.⁹¹ Perhaps not surprisingly, given the lack of consensus on several matters, numerous cities had not

⁸⁹ One approach is to put 20 percent of the antidotes on the front-line units, 20 percent in reserve on the MMRS trailer, and spread 40 percent among different receiving hospitals. Interview with author: Physician/EMS Medical Director (13 November 1999). Also noting placement of antidotes on front-line units in interviews with the author: Deputy Director, Office of Emergency Management (26 May 2000); Battalion Fire Chief, Special Operations (25 May 2000); Paramedic (12 May 2000); Fire Captain, EMS Division (27 July 1999); EMS Superintendent-in-Chief (24 March 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Special Projects Program Manager, Department of Public Health (5 February 1999). Some of these medications are controlled substances, so one city opted against putting medical antidotes in the kits that its MMRS members carry in their cars because of concerns that these drugs might be stolen. Interview with author: Emergency Management Specialist, Office of Emergency Management (9 May 2000).

⁹⁰ Interview with author: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000). Similarly, another EMS supervisor noted that his city's ambulances used to carry some respiratory and protective gear, but these items were very seldom used and had been misplaced over the years. Interview with author: District Fire Chief, EMS Division (2 March 2000). See chapter 5 for discussion of the aggravation surrounding the required purchase of large numbers of Mark 1 kits by cities participating in the MMRS program.

⁹¹ In some locations, paramedics are accustomed to reconstituting drugs, but extra precautions must be taken when reconstituting atropine. Exposure to the powdered form of atropine can be lethal. Interviews with author: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999); Emergency Planner (8 March 1999).

established pre-hospital chemical agent exposure treatment protocols.⁹² A 25-member expert panel sponsored by the Health and Human Services Department was developing consensus pre-hospital and hospital medical protocols, but by mid-2000 only a draft protocol for chlorine exposure victims was available.⁹³ The completion of such protocols would no doubt be of great utility to EMS personnel attending to critical patients in the most difficult of circumstances.

A chemical incident with numerous casualties would preoccupy a city's EMS resources for quite some time. In the event of such an attack, one city arranged for the EMS crew from neighboring areas to cover regular 911 calls.⁹⁴ EMS personnel in large cities attend to hundreds, even thousands, of 911 calls daily. Emergency planners in other locations had not made supplemental arrangements to provide EMS service for the routine baby deliveries, car accidents, and heart attacks that would continue in the city during post-attack rescue operations.

Crisis Management at the Hospitals

When it comes to the ability of the nation's hospitals to handle large numbers of casualties exposed to hazardous materials, the shortcomings are glaring if one talks to hospital staffers or examines the regulations and the professional literature. First, accidents with hazardous materials occur frequently, to the tune of 60,500 incidents nationwide every year, over 2,550 of which result in injury or death.⁹⁵ Notwithstanding EMS policies that mandate decontamination prior to ambulance transport, over 80 percent of these casualties arrive at hospitals still contaminated.⁹⁶ While a significant residual concentration of

⁹² Interviews with author: District Fire Chief, EMS Division (2 March 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Battalion Fire Chief (19 January 2000).

⁹³ This panel, staffed out of the Rocky Mountain Poison and Drug Center, met for the first time in March 1999 and conducts an extensive literature review in advance of each draft protocol. Abbreviated pre-hospital and hospital protocols will be developed for several major warfare agents or agent categories, including nerve agents, mustard gas, phosgene, and cyanogen agents. Interview with author: Toxicologist, Poison Control Center (15 June 2000).

⁹⁴ Interview with author: Paramedic Operations Supervisor (9 March 1999).

⁹⁵ These figures represent an average over a ten-year time period and take into account on-site accidents at facilities and with the transit of chemical substances. *The 600K Report: Commercial Chemical Incidents in the United States 1987-1996*, Special Congressional Summary (Washington, DC: US Chemical Health and Safety Investigation Board, 24 February 1999), 10. This report, incorporating statistics collected by five separate agencies, also contains a list of the chemicals most frequently involved.

⁹⁶ Interviews with author: Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician/Director of Hospital Disaster EMS (27 July 1999); Director of Hospital EMS and Disaster Medicine (19 April 1999); Physician, Hospital Division of Emergency Medicine (24 March 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999). The author was told eye-opening tales about hospital contamination. In one, two patients arrived via helicopter at a hospital, contaminating not only their transport, but the hospital elevators, corridors, and emergency department. In another, an EMS crew delivered a critical patient to the emergency department. So much hazardous liquid had dripped from the patient during transport that the ambulance, left running just outside during the delivery, exploded. Interview with author: Fire Chief (14 June 1999). On decontaminate-before-transport policies: Former EMS Supervisor/Paramedic (12 July 2000); Emergency

chemicals may not remain on them at that juncture, the contamination threat must still be isolated and the patients decontaminated and treated.⁹⁷ Second, despite these statistics, the nation's hospitals are not required to have a standing capacity to decontaminate a few, much less large numbers of patients. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and OSHA govern hospital preparations in that regard, with the former stipulating that hospitals maintain a decontamination capability without further specification. Hospitals have typically interpreted this standard to mean they must be able to decontaminate one person.⁹⁸ Finally, apparently neither JCAHO nor OSHA ensures that hospitals meet even this minimal standard. None of the hospital personnel interviewed could recall JCAHO inspectors ever asking them or their colleagues to demonstrate an ability to use decontamination equipment.⁹⁹

Not surprisingly in this regulatory environment, whatever decontamination equipment a hospital has often remains in its original shipping box.¹⁰⁰ A survey of emergency hospitals in the state of Washington

Management Specialist, Office of Emergency Management (9 May 2000); EMS Superintendent-in-Chief (24 March 1999); Emergency Planner (8 March 1999).

⁹⁷ Jeffrey L. Burgess, Mark Kirk, Stephen W. Borron, and James Cisek, "Emergency Department Hazardous Materials Protocol for Contaminated Patients," *Annals of Emergency Medicine* 34, no. 2 (August 1999): 207.

⁹⁸ JCAHO gives hospitals the vague directive that their disaster plans must identify "facilities for radioactive or chemical isolation and decontamination." See Standard EC.1.6, JCAHO, *Comprehensive Accreditation Manual for Ambulatory Care*, Environment of Care Chapter. Internet: <http://www.jcaho.org/standard/ecer.html>. Downloaded 7 August 2000. OSHA Regulation 1910.120(q)(6) requires operations level hazmat training at a minimum, which includes at least eight hours of training or demonstration of a matching level of proficiency, as well as an annual refresher course. *Hospitals and Community Emergency Response—What You Need to Know*, (Washington, DC: US Department of Labor, Occupational Safety and Health Administration, 1997).

⁹⁹ One physician said he and his colleagues have called OSHA to inquire about the regulation and its enforcement on numerous occasions, and the OSHA bureaucrats gave him no information or guidance, other than to refer back to the regulation. Interview with author: Physician/Director of Hospital Disaster EMS (27 July 1999). JCAHO evaluates hospitals every three years and has the authority to suspend or close them if they fail to meet standards. One interviewee recalled that JCAHO would occasionally ask the day shift to see the decontamination equipment. Interview with author: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000). Others noted that inspectors would occasionally ask to see training records for individuals and how the last contaminated patients were treated, exploring whether the practice was in line with the hospital's policies disaster plans and procedures. Interviews with author: Fire/Rescue Instructor, former Director, Hospital Security (21 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician/EMS Medical Director (13 November 1999); Associate Hospital Administrator/Registered Nurse (13 November 1999). Others commenting on JCAHO's failure to check decontamination capabilities: Physician, Hospital Division of Emergency Medicine (31 May 2000); Paramedic (12 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Director of Hospital EMS and Disaster Medicine (19 April 1999). Only one person interviewed had heard of JCAHO asking for a demonstration. Interview with author: Commander, US Public Health Service (3 July 2000).

¹⁰⁰ One city's premier university hospital, purportedly the medical facility in that area best prepared to handle contaminated patients, refused to accept an incoming patient who may have been exposed to anthrax. The hospital staff feared that this individual would force the closure of the emergency department, despite being told that this patient had already been thoroughly decontaminated. Later, hospital officials quietly conceded that they did not want to break the seal on their decontamination room. Interview with author: District Fire Chief, EMS Division (2 March 2000). Note that this incident speaks also to the lack of knowledge among health care providers about relative contamination threats. Secondary contamination from a biological agent is much less likely than from a chemical agent. Barrier precautions are considered sufficient for many biological agent situations. See table 6.2 for specific details.

showed that over a third of those responding did not have any designated decontamination facility. Moreover, in the five years preceding this 1997 survey, twelve of the hospitals had been contaminated at least once by incoming patients and therefore compelled to evacuate part of the hospital.¹⁰¹ Interviews for this report provided similarly discouraging statistics. What little capacity existed was not regularly drilled.¹⁰² In short, “many [hospitals] are poorly prepared” to decontaminate even one or two patients, even those with “well-run, full-service emergency departments.”¹⁰³ Another state’s 1999 survey found that while the day shift might have some knowledge of decontamination policies and procedures, the evening, night, and weekend shifts in hospitals were not at all versed in these matters.¹⁰⁴

These circumstances present something of a dilemma for the hospital personnel and emergency planners plotting strategy for the contaminated casualties that might flood their facilities after a chemical terrorist attack. Hospitals in some cities have stated that they plan to keep their doors open and operate as normal.¹⁰⁵ In many other cities, however, the first action that hospitals said they would take after notification of a major hazmat event was to lock their doors and post security at all entrances. This lockdown policy was matter-of-factly stated. The priority from the hospitals’ perspective is to prevent the compromise of the

¹⁰¹ The survey consisted of ninety-two hospitals and three clinics at a time when there were 120 hospitals statewide. Although forty-seven reported that they could only receive decontaminated patients, fifty-six hospitals stated they had decontamination facilities, twenty-three of which were outside. Twenty-two of the hospitals had separate ventilation and water containment capabilities. Six hospitals classified themselves as unable to receive any exposed patients, and thirty-nine had no decontamination facilities. Jeffrey L. Burgess, Griffith M. Blackmon, C. Andrew Brodtkin, and William O. Robertson, “Hospital Preparedness for Hazardous Materials Incidents and Treatment of Contaminated Patients,” *Western Journal of Medicine* 167, no. 6 (December 1997): 387–9.

¹⁰² Of the twenty-two hospitals in one county, only three have showers with a one to two person capacity. The rest have nothing. Interview with author: Paramedic (12 May 2000); EMS Specialist/Paramedic (12 May 2000). Also on the low level of hospital decontamination capacity: Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); District Fire Chief, EMS Division (2 March 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Battalion Fire Chief (17 November 1999); Director of Hospital EMS and Disaster Medicine (19 April 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999); Battalion Fire Chief/EMS Supervisor (8 February 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999); Paramedic/Emergency Planner, Public Health Department (4 February 1999). In a few cases, one or a couple of hospitals had taken steps to improve decontamination capabilities. Interviews with author: Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Director, Office of Emergency Preparedness (19 September 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000).

¹⁰³ Anthony G. Macintyre et al., “Weapons of Mass Destruction Events With Contaminated Casualties: Effective Planning for Health Care Facilities,” *Journal of the American Medical Association* 283, no. 2 (12 January 2000): 243.

¹⁰⁴ Interview with author: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000).

¹⁰⁵ Interviews with author: Director, Emergency Services Department (18 May 2000); Paramedic (12 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000).

hospital due to contamination, which would compound the problem.¹⁰⁶ Patients would have to be evacuated from any section of a hospital that was contaminated and those areas sterilized before routine operations could resume. Depending on the extent of the contamination, a few hours to more than a day could transpire before the affected section(s) of the hospital could be reopened.¹⁰⁷

One of the foibles of lockdown plans was that few hospitals had a security staff large enough to contend with a major crush of ambulatory injured or panicked people. Therefore, hospitals said they would erect external barriers and call for police assistance if swelling crowds became unruly. From city to city, police departments differed in their willingness to lend hospitals a hand with security.¹⁰⁸ Police, however, would have a need to interview and gather evidence from these people, who could be crime witnesses. If

¹⁰⁶ Some cities have hospital call-down lists to warn that a chemical attack has occurred so they can lock down. Interviews with author: Physician/University Hospital Department of Emergency Medicine (20 September 2000); Police Lieutenant, Tactical Support Office (18 September 2000); Battalion Fire Chief, Special Operations (25 May 2000); Police Lieutenant (23 March 1999); Emergency Planner (8 March 1999). Also on lockdown plans: Hazmat Coordinator/Instructor (8 September 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Fire Sergeant (9 May 2000); Emergency Management Specialist, Office of Emergency Management, (9 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Physician/Hospital Department of Emergency Medicine (15 June 1999); Director of Hospital EMS and Disaster Medicine (19 April 1999); EMS Superintendent-in-Chief (24 March 1999); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999). See also, Steve Salvatore, "US Hospitals Unprepared for Chemical, Biological Terrorism, Study Says," CNN.com (11 January 2000). Internet: <http://www.cnn.com/2000/HEALTH/01/11/bioterrorism.02>. Downloaded 25 May 2000. Some hospitals have lockdown plans for other purposes, for example calling a "code pink" if someone attempts to abduct a baby from the maternity ward. Some hospitals have computerized control of all access points and can enact a lockdown swiftly. To other hospitals, the concept of a lockdown is alien. One hospital drilled lockdown for the first time during its functional exercise, and seventy minutes passed before the security staff declared the facility closed. Afterwards, drill referees found three doors open. Interview with author: Fire Captain/Assistant Emergency Management Coordinator (5 January 2000). On the difficulty of executing a lockdown policy, see also, Thomas Inglesby, Rita Grossman, and Tara O'Toole, "A Plague on Your City: Observations from TOPOFF," *Biodefense Quarterly* 2, no. 2 (September 2000). Internet: <http://www.hopkins-biodefense.org/pages/news/quarter.html>. Downloaded 12 October 2000.

¹⁰⁷ Scrubbing down a contaminated room takes roughly twenty minutes, so if a large emergency department were contaminated, roughly a day could be required to sterilize and re-open just that department. Interviews with author: former EMS Supervisor/Paramedic (12 July 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000). See also, Burgess et al., "Emergency Department Hazardous Materials Protocol for Contaminated Patients," 212.

¹⁰⁸ One city got local police stations to "adopt" their neighborhood hospitals. Interview with author: Physician/University Hospital Department of Emergency Medicine (20 September 2000). Some police departments have offered to help hospitals with security, but are not guaranteeing such aid because they anticipate being overburdened with requirements at the incident scene. Interviews with author: Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Police Lieutenant, Tactical Support Office (18 September 2000); Hazmat Coordinator/Instructor (8 September 2000); Battalion Fire Chief, Special Operations (25 May 2000); Paramedic (12 May 2000); Fire Sergeant (9 May 2000); Registered Nurse/Chief, EMS Division, State Emergency Management Specialist, Office of Emergency Management (9 May 2000); Department of Public Health (3 February 2000); Director of Hospital EMS and Disaster Medicine (19 April 1999); EMS Superintendent-in-Chief (24 March 1999); Police Captain/Staff, Office of the Chief (9 March 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999). Other police departments have yet to see why they would need to offer the hospitals security assistance during this type of a crisis. Interviews with author: Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Deputy Director, Office of Emergency Management (26 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000).

police made no commitment to help, some hospitals were making provisions to bag and tag patients' personal effects, and, if time permitted, to conduct rudimentary patient interviews. Such information would also be helpful for follow-up care, both physical and mental, once victims were released from the hospital.¹⁰⁹

Ideally, hospitals would receive some warning to ready decontamination and triage teams. Notification of the hospitals is always in a city's emergency operations plan, but during the press of disasters and even drills, the front line often forgets to alert the hospitals.¹¹⁰ One city's hospitals left nothing to chance, having installed a cost-effective early warning system, described in box 6.5. Once notified, hospital administrators would enact mass casualty plans and set up whatever decontamination capability was available.

If throngs of contaminated patients hit their doorsteps, painfully few hospitals in the country have decontamination capabilities sufficient to handle the onrush; among them are George Washington University Hospital in Washington, DC, and Parkland Hospital in Dallas, Texas.¹¹¹ Figure 6.4 diagrams Parkland's decontamination facility, which has pull-down curtains affixed to the ceiling of the ambulance bay. Weather permitting, an exterior decontamination capacity is preferable to avoid compromising hospital premises.¹¹²

¹⁰⁹ One hospital has developed a standard form to be filled out during registration to give to law and public health officials to enable follow-up activities with these people after they are released from the hospital. Interview with author: Emergency Management Specialist, Office of Emergency Management (9 May 2000). Also, on the importance of hospital security and patient tracking: Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Physician, Hospital Department of Emergency Medicine (24 March 2000); Physician/EMS Medical Director (13 November 1999); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999); Physician, Hospital Division of Emergency Medicine (31 May 1999).

¹¹⁰ Interviews with author: Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); Physician, Hospital Department of Emergency Medicine (23 March 1999); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999).

¹¹¹ Interview with author: Physician, Hospital Division of Emergency Medicine (31 May 2000). Also, Anthony G. Macintyre et al., "Weapons of Mass Destruction Events With Contaminated Casualties," 242–9. A couple of hospitals reported plans to install decontamination showers in their ambulance bays or at other entrances near their emergency departments, but they are having difficulty obtaining the relatively modest funding needed for such construction. Interviews with author: Director, Emergency Services Department (18 May 2000); Physician/Director of Hospital Disaster EMS (27 July 1999); Emergency Planner (8 March 1999).

¹¹² Outdoor facilities must still attend to the runoff of possibly contaminated fluids. Indoor decontamination facilities need to incorporate special air handling precautions. Interview with author: Physician, Hospital Division of Emergency Medicine (31 May 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000); Physician/Director of Hospital Disaster EMS (27 July 1999); Physician, Hospital Department of Emergency Medicine (23 March 1999).

Box 6.5: Ensuring Early Notice of Mass Casualty Events to the Hospitals

Concerned that communications might fail during a disaster, one city has equipped all of its hospitals with emergency receivers as a failsafe to ensure that they get the word from the outset. These receivers, connected to the fire department's paging system, will provide all hospitals with a live announcement warning of mass and/or possibly contaminated casualties. Each hospital has three receivers, situated in more than one location in the hospital to ensure that the live announcement is not missed. The tone alert receiver broadcasts four types of messages: 1) mass casualty warning; 2) termination of message; 3) nuclear, biological, or chemical event warning; and, 4) test message.¹

NOTES

1. Interview with author: Emergency Management Specialist (9 May 2000). The newer model of the Emergency Alert Receiver (EAR) is called the Informer. Federal Signal Corporation enhanced the receiver to decode and broadcast messages at high volume, adding a battery back-up system. The Informer costs about \$300 per unit. For more, see the company's website at <http://www.federalwarningsystems.com>. Also, "EAS Receiver from Federal," Product Profile, *911 Magazine*, September/October 1997. Internet: <http://www.9-1-1magazine.com/magazine/1997/0997/depts/products.html>. Downloaded 15 September 2000. Other cities have put similar tone alert radios in hospital emergency departments. Interview with author: Physician/University Hospital Department of Emergency Medicine (20 September 2000); Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Police Lieutenant, Tactical Support Office (18 September 2000); Deputy Director, Office of Emergency Management (26 May 2000). One city does its hospital notification via its poison control center. Interview with author: Director, County Emergency Management (21 September 2000).

Usually, the hospital plant, housekeeping, and services support staff, not doctors and nurses, were being assigned decontamination chores. Ideally, enough staff on *each shift* would be trained for initial and relief crews, and the evening, night, and weekend shifts, not just the daytime personnel, would be drilled.¹¹³ The objective for a hospital decontamination capability is not to create luxury baths, but a snap capability to get people undressed, hose them down, and put them in hospital gowns. Front-line veterans argued that this task should not require maximum protective gear.¹¹⁴

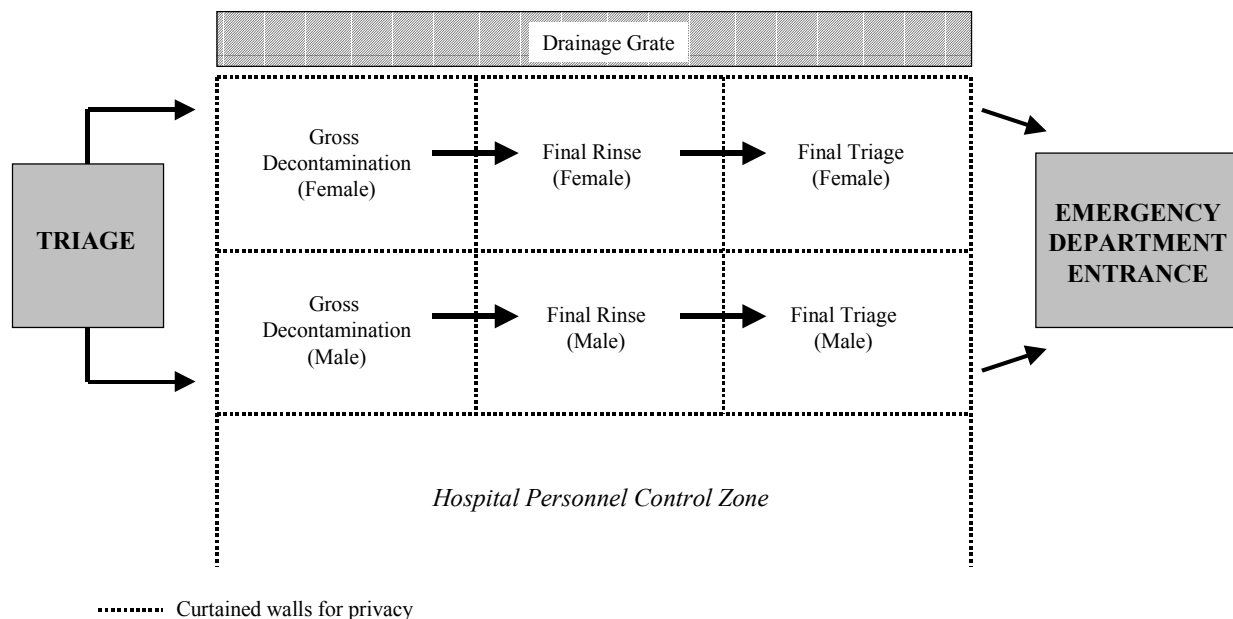
¹¹³ For technical cases, such as an intubated patient, one hospital is relying on the staff of its rehabilitation center. These individuals, who are accustomed to working with non-ambulatory patients, will be on-call twenty-four hours a day for decontamination. Emergency Management Specialist, Office of Emergency Management (9 May 2000). Other individuals who indicated that their hospitals that have trained support staff: Physician, Hospital Division of Emergency Medicine (31 May 2000); Associate Hospital Administrator/Registered Nurse (13 November 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999). On training nurses as decontamination teams: EMS Licensing Agent, State Department of Public Safety (27 January 2000). On the need to train others outside of the emergency department: Fire/Rescue Instructor, former Director, Hospital Security (21 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000).

¹¹⁴ Interviewees posited that level B or lower protective clothing should suffice under these circumstances, which runs contradictory to OSHA's regulatory stance. Interviews with author: Fire EMS Statistician (30 August 2000); Fire/Rescue Instructor, former Director, Hospital Security (21 August 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Battalion Fire Chief, Special Operations (25 May 2000); Battalion Fire Chief (15 November 1999); Physician/Director of Hospital Disaster EMS (27 July 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999).

Several reasons explain why far too few US hospitals have beefed up their decontamination capabilities. First, in the era of managed care service cutbacks, privately owned hospitals are extremely reluctant to authorize capital improvements. Second, publicly funded hospitals are also on tight budgets, barely able to keep their gurneys operational, as one physician put it. Third, health care facilities have received only a trickle of the federal grant funds for terrorism preparedness.¹¹⁵ Finally, most hospital administrators see no particular reason to focus on this problem, knowing that JCAHO and OSHA do not dwell on decontamination capabilities. Moreover, many either have an “it-won’t-happen-here” attitude or naively believe, statistics to the contrary, that patients would arrive decontaminated.¹¹⁶

In the interim until hospitals establish a genuine decontamination capability, two basic strategies were being employed to relieve the decontamination bottleneck at hospitals. Some cities allotted a portion

Figure 6.4: Diagram of Decontamination Facility at Parkland Hospital (Dallas, Texas)



Source: Kathy J. Rinnert, MD, MPH, “Weapons of Mass Destruction Preparedness: Parkland Health and Hospital System’s Approach,” presentation at the National Disaster Medical System Conference, 29 April 2000, Las Vegas, Nevada.

¹¹⁵ Interviews with author: General Manager, Emergency Department (22 September 2000); Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Police Lieutenant, Tactical Support Office (18 September 2000); Fire EMS Statistician (30 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Commander, US Public Health Service (3 July 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); MMRS Coordinator, Fire Department (9 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Associate Hospital Administrator/Registered Nurse (13 November 1999); Physician, Director of Hospital Disaster EMS (27 July 1999); EMS Superintendent-in-Chief (24 March 1999); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999); Paramedic/Emergency Planner, Public Health Department (4 February 1999).

¹¹⁶ Interviews with author: Fire Commander (19 April 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999).

of the federal equipment grants to purchase showers, Tyvek suits, inflatable tents, wading pools to catch runoff, and hoses for their hospitals.¹¹⁷ The fire departments in such cities were banking that with this equipment the hospitals could stand on their own.¹¹⁸ The prevailing assumption, however, is that hospitals would still be overrun, so some city emergency planners were trying to draft fire stations to aid the hospitals. Some fire departments, asserting that their hands would be full at the incident scene and with routine emergency calls, would commit only to pull decontamination trailers to the hospitals, unlock them, and help hook up the hoses.¹¹⁹ With persuasion, other fire departments agreed to assign a fire company to each hospital, providing equipment and staff for incoming patient decontamination.¹²⁰ Some cities would activate mutual aid agreements with neighboring communities for this task.¹²¹

Other Difficulties in Hospital Care

If past disaster experience proves true to form, the first people to reach hospitals would not be the

¹¹⁷ Interviews with author: Director, County Emergency Management (21 September 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000); Lieutenant/Hazmat Commander (10 March 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999). Some cities took this step long before the domestic preparedness effort began. One purchased the same decontamination kits that all of its fire engines carry for its six main hospitals. Interview with author: Battalion Fire Chief (19 January 2000). Sometimes purchases were made without consulting the hospitals and provided only some of the gear needed. Some fire departments are not offering to help with initial or refresher training for hospital staff. Interviews with author: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000). In other areas, fire departments have helped hospitals shop at local hardware stores, select inexpensive equipment, and train. Interviews with author: Police Lieutenant, Tactical Support Office (18 September 2000); Fire EMS Statistician (30 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Battalion Fire Chief, Special Operations (25 May 2000).

¹¹⁸ Interviews with author: Deputy Director, Office of Emergency Management (26 May 2000); District Fire Chief, EMS Division (2 March 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000).

¹¹⁹ Interviews with author: Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Associate Hospital Administrator/Registered Nurse (13 November 1999); Fire Lieutenant and Fire Captain (5 February 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999). Other fire departments are just saying no. Interviews with author: Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Paramedic (12 May 2000).

¹²⁰ One city got local fire stations to “adopt” their neighborhood hospitals. Interview with author: Physician/University Hospital Department of Emergency Medicine (20 September 2000). Also on fire departments assigning companies to hospitals: Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Hazmat Coordinator/Instructor (8 September 2000); Fire EMS Statistician (30 August 2000); Battalion Fire Chief (19 January 2000); Director of Hospital EMS and Disaster Medicine (19 April 1999); EMS Superintendent-in-Chief (24 March 1999); Lieutenant/Hazmat Commander (10 March 1999); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999).

¹²¹ One city was training more than thirty surrounding cities and towns in hazmat and decontamination skills. Interviews with author: Assistant Director, Office of Emergency Management (23 March 1999); Deputy Fire Chief (23 March 1999); Police Lieutenant (23 March 1999). Also on plans to activate mutual aid agreements for this purpose: Fire EMS Statistician (30 August 2000); Lieutenant/Hazmat Commander (10 March 1999).

more seriously wounded.¹²² Frightened, but mobile victims often depart the scene before rescue crews can attend to them, finding their way to hospitals by any means available, even on foot. In the case of a chemical terrorist attack, intermingled with these not too seriously injured patients would be those who hear news reports and worry that a toxic plume might have come their way. Epidemic hysteria is a fear of having been exposed to toxic substances that is so palpable that people exhibit real physical symptoms (e.g., fainting, sweating, nausea).¹²³ After the subway gas attack in Tokyo, some 5,510 went to hospitals and clinics, but roughly 85 percent were psychogenic patients.¹²⁴ Another wave of epidemic hysteria took place on 26 August 1993, after a plume of gaseous sulfur trioxide and sulfuric acid was released from the General Chemical plant in Richmond, California. According to EMS records, twenty-two people with exposure symptoms were taken to hospitals, with no fatalities. Over the next ten days, however, fifteen hospitals and two clinics saw twenty-two thousand people complaining of exposure symptoms.¹²⁵

In short, hospitals would face a sea of humanity after a chemical terrorist attack, with everyone demanding help. The hospital's priority would be to get medical treatment to those genuinely suffering the effects of poison gas exposure. Consequently, hospitals planned to page off-duty staff and were adjusting triage practices to cope with large numbers of contaminated and the worried well patients.¹²⁶ Experts suggest separating the worried well from the genuinely injured so that their behavior would not be reinforced by

¹²² As noted in chapter 3, such was the case after the Tokyo subway attack.

¹²³ Examples of mass psychogenic illness abound, such as the case in an East Texas university town on 15 June 1983. Parathion leaked from a greenhouse, sending over 115 to the hospital, where doctors found that ninety-nine of the 119 patients showed no clinical evidence of organophosphate poisoning. The worried well saw the behavior of individuals who were exposed to the parathion, were told by others that the gas was dangerous, and were encouraged to go to the hospital. Many, although not actually ill, did. Psychogenic illness is a phenomenon whereby "large groups of people in situations accompanied by stress or conflict are much more susceptible to contagion" and consequently begin to imitate the symptoms of others. Louis A. Gamino, Gary R. Elkins, Kenneth U. Hackney, "Emergency Management of Mass Psychogenic Illness," *Psychosomatics* 30, no. 4 (Fall 1989): 447–8. For another case of mass psychogenic illness, see, Timothy F. Jones et al., "Mass Psychogenic Illness Attributed to Toxic Exposure at a High School," *New England Journal of Medicine* 342, no. 2 (13 January 2000): 96–100.

¹²⁴ Of the 5,510, seventeen were deemed critical, thirty-seven severe, and 984 moderately ill, meaning they experienced slight problems. For additional discussion, see chapter 3.

¹²⁵ A safety valve ruptured while offloading a chemical from a railroad tank car, causing the release. Forty minutes after being notified of the incident, emergency response officials activated the alert system that instructs citizens to stay indoors and to shelter-in-place, for their own safety. Just over ninety minutes into the emergency, callers could no longer get through to an overloaded 911 center. "Emergency Medical Response: General Chemical Incident, August 26, 1993," Summary Report (Contra Costa, Calif.: EMS Agency, Contra Costa Health Services Department, n.d.), 1–2.

¹²⁶ Interviews with author: Physician, Hospital Division of Emergency Medicine (31 May 2000); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999). See also, Anthony G. Macintyre et al., "Weapons of Mass Destruction Events With Contaminated Casualties," 242–9.

seeing those with actual symptoms. Gradually, with comfort and positive suggestion, the symptoms of psychogenic patients would abate.¹²⁷

Once patients get inside the door, hospital personnel expect a host of other obstacles, beginning with the novelty of treating chemical casualties and continuing to critical shortages in beds and supplies. Toxicology is the only medical specialty that specifically trains physicians in the proper care and treatment of people who have ingested or otherwise come in contact with poisonous substances. In the entire country, there are fewer than 250 medical toxicologists. These specialists are likely to be affiliated with one of the seventy registered US poison control centers.¹²⁸ Otherwise, the civilian medical ranks are terribly thin in chemical casualty expertise. Physicians in emergency medicine have a required training rotation in toxicology,¹²⁹ but emergency departments see far more broken bones, gunshot wounds, and other traumas than patients who have tangled with toxic chemicals. In cities participating in the preparedness training program, emergency department personnel may have received a refresher course in chemical casualty care, but in all likelihood, the remainder of the medical community (e.g., internists, surgeons, family practitioners) is hardly braced for this type of injury. Much the same can be said of the nursing staffs. Consequently, there is concern that emergency departments, which normally send patients on to other hospital departments for more advanced, specialized care, would in these circumstances be passing patients off to a lesser standard of care.¹³⁰

The first thing that physicians and nurses reach for when confronted with a patient with unfamiliar signs and symptoms is a treatment protocol. A few hospitals and metropolitan hospital committees have

¹²⁷ The worried well can be calmed with encouraging words noting that “the effects of this chemical are temporary, not serious” and that an individual “should be feeling better soon.” Gamino, Elkins, Hackney, “Emergency Management of Mass Psychogenic Illness,” 448.

¹²⁸ Interview with author: Medical Toxicologist/Poison Control Center Director (13 June 2000). Medical toxicology was recognized as a sub-specialty in 1993. Currently, there are 240 practicing medical toxicologists in the country. The nearest medical toxicologist can be located by state at the American College of Medical Toxicology website at: <http://www.acmt.net>. Interview with author: Heather Miller, Executive Director, American College of Medical Toxicology (21 September 2000). Numbers of poison control centers dwindled in the last few decades, but the 1999 Poison Center Enhancement and Awareness Act was passed in February 2000 to help stabilize funding for the centers, connect the centers to expertise nationwide, and publicize a toll-free information number. For more information, see the American Association of Poison Control Centers’ website at: <http://www.aapcc.org>. Downloaded on 21 September 2000.

¹²⁹ In a 1998 survey of seventy-six individuals in various positions in emergency medicine residency programs, 84 percent reported that their program included formal training in hazardous materials. Just over 51 percent of the instruction was via lecture and didactic exercises, 12.8 percent was through specific rotations or field exercises, and 7.7 percent through training courses. Nicki Pesik, Mark Keim, Tomoko Rie Sampson, “Emergency Medicine Residency Program Training for Bioterrorism,” *Annals of Emergency Medicine* 34, no. 2 (August 1999): 175.

¹³⁰ Interviews with author: Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Director of Hospital EMS and Disaster Medicine (19 April 1999). Also on the lack of chemical casualty instruction in nursing and medical schools: Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Associate Hospital Administrator/Registered Nurse (13 November 1999).

drafted guidelines to manage chemical casualties and shared them locally.¹³¹ Hospitals without a medical toxicologist on staff would probably contact the nearest poison control center, where the staff may or may not be comfortable with its level of knowledge about this type of casualty. Otherwise, physicians might scour the military medical literature for data on patient care.¹³² As noted, an expert panel had begun work on civilian chemical protocols,¹³³ without which hospitals would be hard pressed to cope with chemical casualties.

An additional hurdle confronting disaster planners is that US hospitals are filled to near capacity on a daily basis. Health care officials in several cities explained that bed shortages routinely compel hospitals to go on “bypass” during the influenza season, requesting EMS crews to take patients elsewhere. Repeatedly, medical professionals estimated that at any given time there would be at most a dozen, probably half a dozen intensive care unit (ICU) beds available in the entire city. Burn beds and ventilators, which would be critical for the recovery of blister and nerve agent casualties, respectively, would be in just as short supply.¹³⁴ One state put its hospital association on tap to canvas the region for respirators after a chemical terrorist attack, and police aircraft were slated to retrieve those not in use.¹³⁵

Health care officials anticipated having considerable difficulty figuring out where bed space was available in their metropolitan area. Securing information about the status of hospitals is time consuming even under ordinary circumstances. One public health department annually pulses city hospitals to ascertain the number of available medical, burn, and ICU beds. This all-shift survey reveals that it regularly takes

¹³¹ Interviews with author: Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000).

¹³² Interview with author: Toxicologist (13 June 2000). Data can be found mostly in military medical literature, volumes, unfortunately, not likely to be in most doctors’ libraries. See, for example, T.C. Marrs, R.L. Maynard, and F.R. Sidell, eds., *Chemical Warfare Agents: Toxicology and Treatment* (Chichester, United Kingdom: Wiley & Sons, 1996); Sidell, Takafuji, and Franz, eds., *Medical Aspects of Chemical and Biological Warfare*.

¹³³ See footnote 93.

¹³⁴ Several interviewees reported that ambulances sat in their emergency department bays for one or more hours during flu season, with EMS crews attending to their patients until hospital beds became available. Some reported having to transfer non-critical patients to other cities. Interviews with author: Physician/University Hospital Department of Emergency Medicine (20 September 2000); Physician/Director of Health, Public Health Department (20 September 2000); Fire EMS Statistician (30 August 2000); former State Epidemiologist (18 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Paramedic (12 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Physician/EMS Medical Director (13 November 1999); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999); EMS Superintendent-in-Chief (24 March 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999). Also, Michael T. Osterholm and John Schwartz, *Living Terrors* (New York: Delacorte Press), 133–4.

¹³⁵ Interview with author: Fire EMS Statistician (30 August 2000).

hospitals at least an hour to provide their status, even on the night shift, which is presumably quieter than the others.¹³⁶ Hospitals would therefore have to juggle furiously to find open bed space to relieve the patient burden at some hospitals. This endeavor would be complicated by overloaded EMS emergency frequencies and jammed telephone circuits that would impede voice, facsimile, and Internet communications. Some cities had instituted a rudimentary computerized tracking system for hospital status, working off data provided by EMS and emergency department personnel.¹³⁷ In a crisis that causes a rapid crescendo of patients, this tool may not be of much utility because EMS and emergency department personnel would rightfully put patient care above record keeping.

Finally, another time-critical issue that hospitals must deal with would be the availability of antidotes for poisonings. Cities designated for MMRS teams received grant funds to purchase chemical antidotes. Given the limited shelf-lives and utility of these drugs, local officials expressed concern that the cities might not restock these supplies. If restocking does not occur, then the MMRS cities would be in the same situation as all other US cities, with hospitals unlikely to have minimal, much less large supplies of needed chemical antidote medicines. One city surveyed its hospitals prior to a major international gathering and found enough atropine among them to treat sixty nerve agent casualties.¹³⁸

Several surveys since the mid-1980s have found hospital emergency departments to be woefully short on poison antidotes, and hospitals are not required to have specified amounts of these drugs available. An August 2000 study recommended that hospitals receiving emergency patients have sixteen antidotes in their pharmacies at all times, but the quantities specified were for regular circumstances, not unusual situations like terrorist attacks.¹³⁹ In short, a nationwide antidote stocking standard for routine emergencies is still in the making, and policies for more extraordinary circumstances have yet to take shape. In the interim, some cities were purchasing powdered atropine, which has an indefinite shelf life and is inexpensive, for hospitals.¹⁴⁰ Other cities said they would procure atropine from veterinary clinics. One city's contingency

¹³⁶ The night shift response time has averaged one-and-a-half hours. Interview with author: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000).

¹³⁷ These tracking systems are described more thoroughly in the discussion on bioterrorism preparedness.

¹³⁸ Interview with author: Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999).

¹³⁹ On the recommended list of antidotes are atropine, 2-PAM, and cyanide kits. JCAHO does not stipulate quantities of antidotes that hospitals must maintain, despite strong support of hospital pharmacy directors for such a universal policy. Richard C. Dart et al., "Combined Evidence-Based Literature Analysis and Consensus Guidelines for Stocking of Emergency Antidotes in the United States," *Annals of Emergency Medicine* 36, no. 2 (August 2000): 126–32. On the difficulty of establishing local antidote stockpiles, see Brennan, Waeckerle, Sharp, and Lillibridge, "Chemical Warfare Agents: Emergency Medical and Emergency Public Health Issues," 197.

¹⁴⁰ All hospitals have atropine on cardiac crash carts in quantities that may allow them to squeeze by until powdered atropine is reconstituted. Hospitals usually do not have supplies of 2-PAM on hand. Veterinary clinics also have supplies of atropine. Interviews with author: Physician/University Hospital Department of Emergency Medicine (20 September 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31

plan included arrangements with area military posts for around-the-clock access to their caches of Mark 1s.¹⁴¹ Since the primary scenario driving much of the planning was a nerve agent attack, not much headway was made in addressing antidote shortages for other chemical agents.

LOCAL BLUEPRINTS FOR RESPONDING TO A BIOLOGICAL TERRORIST ATTACK

Ask medical health care providers, city emergency planners, public health officials, and first responders what their challenges would be after a terrorist attack with biological agents and the answer begins invariably with a question: How would they know such an attack has taken place? Unlike a chemical terrorist attack, which announces itself instantly with choking, faltering victims, the symptoms of many biological warfare agents do not materialize for days. Terrorists eager for maximum publicity could announce their attack, in which case authorities would swing into action with epidemiological and criminal investigations, possible medical prophylaxis of local citizens, and other measures. Because one advantage of using a biological agent in the first place is that an attack can be executed anonymously and give terrorists time to escape, prevailing wisdom holds that terrorists would release an agent covertly, sit back, and watch the havoc gradually unfurl.

Thus, the first concern that weighs on the minds of medical and emergency response personnel is that they would probably not know that a disaster was burgeoning in their midst until after a great deal of damage had already been done. Local authorities next list worries about the ability to keep hospitals open under the intense pressure that such an attack would generate, starting with medical manpower shortages that would materialize all too quickly, especially among the nursing ranks. Without missing a beat, they note that hospitals would rapidly run out of beds and drugs. Then, they move on to the logistics of attempting to treat large populations, puzzling over how to amass sufficient personnel, equipment, and medicines within a crunched time period. Finally, they shudder at the thought of trying to quarantine large numbers of people if a contagious disease were involved.

More so than a chemical terrorist incident, which can be expected to overtax emergency response services for a finite period of time, the possibility a bioterrorist attack causes trepidation in the health care community. Some diseases would erupt over a period of weeks, creating wave after wave of illness. Perhaps it is not surprising, then, that front-line responders and health care providers did not rate themselves as highly on bioterrorism preparedness as they did on chemical terrorism preparedness. As before, the ratings were

May 2000); Physician/Hospital Department of Emergency Medicine (15 June 1999); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999). One hospital system is buying a limited amount of atropine in vials, which can be used while the powdered atropine is being reconstituted. Interview with author: Emergency Planner, Hospital Health Maintenance Organization (15 August 2000).

¹⁴¹ Interview with author: EMS Specialist/Paramedic (12 May 2000).

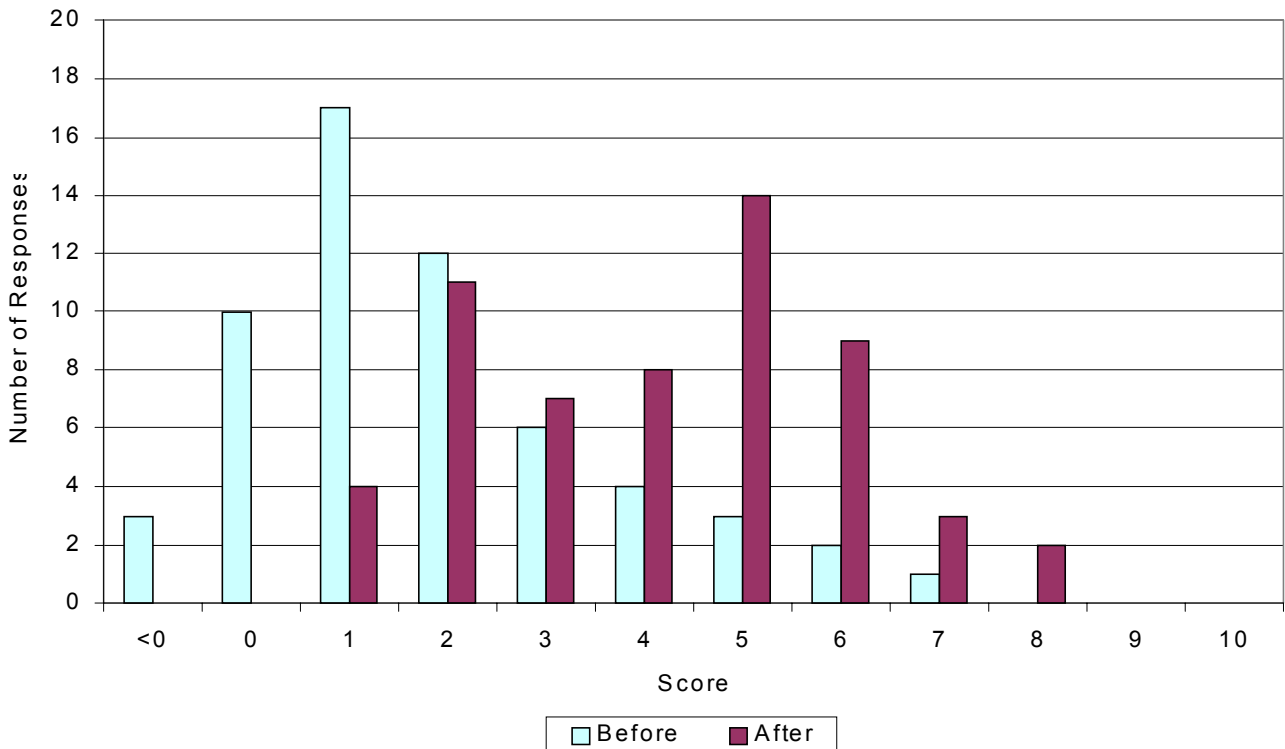
subjective and the proposed scale was from 1 to 10, with one being the lowest. For thirteen local officials, a rating of 1 prior to the federal planning, training, and equipment programs described in chapter 5 was simply not low enough. Ten backed their “before” assessments to zero, while three locals went into the negative integers, with the worst rating being negative ten. Given that the cities were literally working from ground zero, the self-assessments in figure 6.5 show that these programs have begun to make a positive difference in recipient cities. The peaks in appraisals before assistance fall between zero and two, while the crests in the post-training phase run between two and five. The average score before the federal aid programs was 1.7, rising to 4.1 afterward. The mean improvement was 2.5. These ratings also indicate just how far cities receiving federal aid believe they have to go before they could truly handle a major infectious disease outbreak. In reality, said one local official, no city in the country was ready to cope with 10 percent or more of its population simultaneously falling deathly ill. Just getting the plans, supplies, and manpower lined up to try to keep a lethal infectious disease from spreading is a gargantuan challenge. “Other than that,” said this official, (who gave a “before” rating of two and an after rating of five), “it would really be about letting people die with dignity.”¹⁴²

Factors Retarding the Ability to Detect a Covert Bioterrorist Attack

The United States may be home to the most advanced and heralded medical care in the world, but that does not change the fact that the components of the nation’s disease surveillance system are ill-prepared to pick up the signs of a covert bioterrorist attack. This system has deteriorated since its 1950s heyday as modern medicine conquered one disease after another.¹⁴³ In each state, physicians, dentists, and other personnel are required by law to notify public health authorities of the occurrence of certain diseases, but doctors have trouble diagnosing diseases from generic clinical symptoms. Therefore, the backbone of the nation’s disease surveillance system is 158,000 state and local public health and private laboratories, which by far do most of their reporting after identifying pathogens via analysis of cultures. Reportable diseases

¹⁴² Interview with author: Director, City Emergency Services Department (18 May 2000).

¹⁴³ This system was created during the onset of the Cold War, largely due to significant concerns about the use of biological and chemical agents. Discussion of the decline of the disease surveillance system and its ramifications can be found in Institute of Medicine, *Chemical and Biological Terrorism: Research and Development to Improve Civilian Medical Response*, National Research Council (Washington, DC: National Academy Press, 1999); General Accounting Office, *Emerging Infectious Diseases: Consensus on Needed Laboratory Capacity Could Strengthen Surveillance*, GAO-HEHS-99-26 (Washington, DC: US General Accounting Office, 5 February 1999). Also, interviews with author: Division Chief, State Disaster Medical Services Division (15 February 2000); Toxicologist (9 March 1999).

Figure 6.5: Local Officials Assess Their Preparedness for a Large-Scale Biological Terrorist Event*

*Not all local officials interviewed for this report were asked to rate themselves and some who were asked declined to do so. The survey includes the appraisals of responders from twenty-two cities, although interviews were conducted in over thirty cities. Some responders were from cities that at the time of the interview had received only the Domestic Preparedness Program training, and others were from cities also enrolled in the Metropolitan Medical Response System program. Some cities had received equipment grants from the Justice Department, others had not.

Sources: Interviews with author: General Manager, Emergency Department (22 September 2000); EMS Chief, Emergency Services Department (21 September 2000); Director, County Emergency Management (21 September 2000); Physician/University Hospital Department of Emergency Medicine (20 September 2000). Physician, Director of Health, Public Health Department (20 September 2000); Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Director, Office of Emergency Preparedness (19 September 2000); Police Lieutenant, Tactical Support Office (18 September 2000); Hazmat Coordinator/Instructor (8 September 2000); Fire EMS statistician (30 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Police Lieutenant (8 July 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Deputy Director, Office of Emergency Management (26 May 2000); Battalion Fire Chief, Special Operations (25 May 2000); Director, Emergency Services Department (18 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); Police Sergeant (9 May 2000); MMRS Coordinator, Fire Department (9 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000); Detective/Bomb Squad (19 January 2000); Project Manager, Emergency Management Planning (27 July 1999); Director of Hospital EMS and Disaster Medicine (19 April 1999); Toxicologist, Poison Control Center (9 March 1999); Emergency Planner, Office of Emergency Management (8 March 1999); District Fire Chief, EMS Division (2 March 2000); Police Captain/Firing Range Director (5 February 1999); Emergency Response Planner, Office of Emergency Management (5 February 1999); Captain/Assistant Emergency Management Coordinator (5 January 2000); Battalion Fire Chief (17 November 1999); Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Battalion Fire Chief (15 November 1999); Associate Hospital Administrator/Registered Nurse (13 November 1999); EMS Superintendent-in-Chief (24 March 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999); Assistant Director, Office of Emergency Management (23 March 1999); Deputy Fire Chief (23 March 1999); Lieutenant/Hazmat Commander (10 March 1999); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999); Paramedic Operations Supervisor (9 March 1999); Fire Captain, HazMat Unit (9 February 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Battalion Fire Chief (9 February 1999); Fire Battalion Chief/Hazmat Specialist (8 February 1999); Police Lieutenant (8 February 1999); Battalion Fire Chief/EMS Supervisor (8 February 1999); Police Captain, Special Operations Division (8 February 1999); Special Projects Program Manager, Department of Public Health (5 February 1999); Fire Lieutenant (5 February 1999); Paramedic/Emergency Planner, Public Health Department (4 February 1999); Director, Office of Emergency Services (4 February 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999).

differ from state to state, and nationwide some fifty to sixty public and private infectious disease surveillance systems are in operation. Every week, however, the Centers for Disease Control and Prevention (CDC) collects electronic data from states on sixty “nationally notifiable” diseases, including most of the diseases weaponized for warfare purposes. State participation in this system is voluntary. According to a 1997 survey, 87 percent of US states incorporated at least 80 percent of the nationally notifiable diseases at that time in their own reporting systems.¹⁴⁴

A key weakness in the disease surveillance system is a reporting time lag that could be significant if a lethal and/or communicable disease were involved. For instance, some state regulations allow health care providers ten days from the point of detection to report a contagious disease case to the state epidemiologist.¹⁴⁵ Also hindering the quickness of disease reporting are cutbacks in laboratory staffing and training, as well as antiquated computer and communications capabilities.¹⁴⁶ Furthermore, disease reporting regulations are not well policed, and the problem of under-reporting is so chronic that only 20 percent of the cases of some diseases may be notified. The reports may not accurately reflect the extent of illness among the population because those with milder symptoms may not see their physicians. Finally, doctors define cases differently, which translates into additional reporting inaccuracy.¹⁴⁷ In sum, this system is not geared to work rapidly, which bodes poorly for detection of a highly contagious disease outbreak in time to prevent a pandemic.

The difficulty of detecting an act of bioterrorism is compounded by the fact that the first signs and symptoms of many biowarfare diseases are nonspecific. In several instances, these early symptoms are characteristic of influenza, so some unwary victims would ignore their discomfort or tough it out at home, taking over-the-counter medications. Others would see their regular physicians and in acute cases some

¹⁴⁴ The CDC’s National Center for Infectious Diseases is the focal point of infectious disease surveillance activities. Additional layers of the national surveillance system include weekly data that state laboratories send the CDC on bacterial and viral isolates. Depending upon the jurisdiction, hospitals and laboratories may also be obligated to make disease notifications. Normally, the hospital channels its report to the local health department, which may take action on the case(s) before or as the report is sent on to the state health department. Vital statistics (e.g., births, deaths) are kept through the National Health Interview Survey, and national registries are also maintained for cancer and other illnesses. General Accounting Office, *Consensus on Needed Laboratory Capacity Could Strengthen Surveillance*, 5–10. Also, Scott F. Wetterhall, “Surveillance Systems,” in *Proceedings of the Seminar of Responding to the Consequences of Chemical and Biological Terrorism*, pages 1-104–5. The list of nationally notifiable diseases can be found online at <http://www.cdc.gov/epo/dphsi/infdis.htm>. This list does not include smallpox or Marburg, which the USSR is known to have weaponized. Nor does this list include Ebola, which Soviet scientists also may have weaponized. Briefly, see chapter 2. More in depth, see Ken Alibek with Steve Handelman, *Biohazard* (New York: Random House, 1999). The CDC publishes the compiled information online in the *Morbidity and Mortality Weekly Review*.

¹⁴⁵ Interviews with author: Emergency Management Specialist, Office of Emergency Management (9 May 2000); Emergency Preparedness Director, Office of Emergency Services (9 February 1999).

¹⁴⁶ General Accounting Office, *Consensus on Needed Laboratory Capacity Could Strengthen Surveillance*, 12–6.

¹⁴⁷ Wetterhall, “Surveillance Systems,” page 1-105.

would go to emergency departments. Particularly, if terrorists stage an attack during winter, medical staffs would not necessarily think that anything was out of the ordinary. The possibility that biowarfare agents would be deliberately released is not on the index of suspicion of most triage nurses, nor are doctors trained to consider this when making a differential diagnosis. Diseases like anthrax and Q fever crop up in the United States so infrequently that medical and nursing schools only nominally address such illnesses in their general curricula, leaving the preponderance of US physicians with only a smattering of instruction in the symptomology and care of patients with infectious diseases.¹⁴⁸

In all likelihood, physicians would send mildly ill patients home without ordering any diagnostic tests, instructing them to drink plenty of fluids, take over-the-counter pain relief medications, and return if their health does not improve. As a tide of patients comes back feeling worse, doctors would probably consult with each other and start pulling cultures, such as throat swabs, stool and blood samples, and the like. While a particularly alert triage nurse or physician may notice that the influx of patients came from the same geographic area or attended the same event, in all likelihood harried doctors would move on to other patients, admitting the severely ill to the ICU or other medical wards. There, they would be attended by physicians who, with the exception of infectious disease specialists, are even less likely than their emergency department colleagues to recognize the symptoms that manifest from exposure to biological agents. In short, the medical community may not zero in on the reason people are falling ill until days or even weeks later, when laboratory results are available.¹⁴⁹

When a sample reaches the laboratory, things may come to a grinding halt for several reasons. First, nature does not always cooperate. Microbes that grow rapaciously in the lungs or intestines can be fractious

¹⁴⁸ “None of this is being taught in medical school, and none of this is being taught in classes on the management of public health.” Interview with author: Physician, Department of Public Health (23 May 1999). Also on this point: Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Physician (29 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Associate Hospital Administrator/Registered Nurse (13 November 1999); Physician, Department of Public Health (23 May 1999); Director of Hospital EMS and Disaster Medicine (19 April 1999).

¹⁴⁹ Taking cultures when patients first come in might allow physicians to make a faster diagnosis, but these tests are expensive, paperwork intensive, and time consuming. Doctors order cultures for suspected bacterial infections, but usually not for suspected viral infections. During influenza outbreaks in more than one city, hospital physicians reported seeing dozens of patients daily, but only culturing or admitting the most sickly among them. Interviews with author: Physician/Director of Health, Public Health Department (20 September 2000); Physician (29 May 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Associate Hospital Administrator/Registered Nurse (13 November 1999); Project Manager, Emergency Management Planning (27 July 1999); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999). See also, John G. Bartlett, “Applying Lessons Learned from Anthrax Case History to Other Scenarios,” *Emerging Infectious Diseases* 5, no. 4 (July/August 1999): 561.

in a petri dish, refusing to grow in solution after solution.¹⁵⁰ Generally speaking, viral cultures are harder to grow than bacterial cultures. Second, microbiologists have an even harder time growing cultures when samples have not been taken with precision and properly prepared and stored. Third, microbiologists run a series of time-consuming tests for ordinary diseases before they start testing for more exotic ones. When laboratory technicians get an unexpected result like anthrax, they are likely to consider it a fluke, an error caused by improper handling of the culture, and therefore disregard the result. Under their microscopes may be a disease that microbiologists have only seen in textbooks. Therefore, the technician is likely to restart the test, perhaps requesting that the sample be redrawn. At some point, a hospital laboratory technician would put a difficult culture into a stack of “unknowns,” awaiting the scrutiny of a pathologist, who may or may not begin to decipher the microscopic puzzle, requesting more targeted diagnostic assays such as those shown in table 6.2. Finally, some technicians, including those in private laboratories, may be unfamiliar with how to plate and test for certain biowarfare agents. A special medium, for instance, has to be used to test for anthrax.¹⁵¹ Late in 2000, the American Society of Microbiologists and the CDC were scheduled to release guidelines for the hospital and private laboratory communities to improve their awareness and capabilities for handling unusual cultures.¹⁵²

For quite some time, relatively few laboratories outside of the CDC and the US Army Medical Research Institute of Infectious Diseases even had the biosafety capacity to work with highly contagious and lethal diseases.¹⁵³ In 1999, the CDC began a program to rejuvenate state laboratory capabilities, which is explained and mapped in chapter 4, but the vast majority of hospital, public health, and private laboratory technicians have no reason to be particularly attuned to the possibility of a bioterrorist attack because they

¹⁵⁰ For example, weeks passed as scientists tried various solutions and tactics attempting to get Legionnaire’s disease to grow in the laboratory. The finicky *Legionella* bacterium required a growth medium containing the amino acid cysteine, vitamins, iron, and other minerals. See especially pages 174–191 in Laurie Garrett, *The Coming Plague: Newly Emerging Diseases in A World Out of Balance* (New York: Farrar, Straus and Giroux, 1994).

¹⁵¹ Prior to the laboratory, cultures pass through the hands of many individuals—from clinicians to delivery service personnel—who are not necessarily trained in the appropriate procedures for taking, preparing, and storing cultures. Samples can be easily adulterated by exposure to other elements or high temperatures. Interviews with author: Physician, Hospital Division of Emergency Medicine (31 May 2000); Physician (29 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Physician, Hospital Department of Emergency Medicine (24 March 1999). See also, Bartlett, “Applying Lessons Learned from Anthrax Case History to Other Scenarios,” 561.

¹⁵² The guidelines, which should be promulgated by the end of 2000, are an abbreviated version of the gold standard protocols employed in the CDC’s strengthened laboratory network. They emphasize the need to recognize unusual samples and package them properly for more definitive analysis in one of the CDC’s network laboratories. Interview with author: Senior CDC official (29 August 2000).

¹⁵³ The newest of the nation’s four Biosafety Level 4 laboratories opened in San Antonio, Texas in August 2000. The other three are located at the CDC in Atlanta, Georgia, the US Army Medical Research Institute for Infectious Diseases, in Ft. Detrick, Maryland, and the National Institutes of Health in Washington, DC. Jeannie Keever, “Bringing a Hot Lab to Life,” *The Houston Chronicle* (magazine insert), 27 August 2000, 6.

Table 6.2: Diagnostic Samples, Assays, and Isolation Precautions for Biological Warfare Agents

Agent	Diagnostic Sample (Biosafety Level)	Diagnostic Assay	Patient Isolation Precautions
Anthrax	Blood (Level 2)	Gram stain Antigen-ELISA Serology: ELISA	Standard precautions
Brucellosis	Blood, bone marrow, and acute convalescent sera (Level 3)	Serology: agglutination Culture	Standard precautions Contact isolation if draining lesions present
Plague	Blood, sputum, lymph node aspirate (Level 2/3)	Gram or Wright-Giemsa Stain Antigen-ELISA Culture Serology: ELISA, immunofluorescence assay	Pneumonic: droplet precautions until patient treated for 3 days
Q Fever	Serum (Level 2/3)	Serology: ELISA, immunofluorescence assay	Standard precautions
Tularemia	Blood, sputum, serum, electron microscopy of tissue (Level 2/3)	Culture Serology: agglutination	Standard precautions
Smallpox	Pharyngeal swab, scab material (Level 4)	ELISA, polymerase chain reaction, virus isolation	Airborne precautions
Viral encephalitis	Serum (Level 2 for Eastern equine and Western equine encephalitis; Level 3 for Venezuelan equine encephalitis)	Viral isolation Serology: ELISA or hemagglutination inhibition	Standard precautions (mosquito control)
Viral hemorrhagic fevers	Serum, blood (Level 4 for most viral hemorrhagic fevers; Level 3 for Rift Valley fever, yellow fever, and Korean hemorrhagic fever)	Virus isolation Antigen-ELISA Reverse transcriptase polymerase chain reaction Serology: antibody ELISA	Contact precautions Consider additional precautions if massive hemorrhage
Botulinum	Nasal swab (Level 2)	Antigen-ELISA, mouse neutral	Standard precautions
Staphylococcal enterotoxin b	Nasal swab, serum, urine (Level 2)	Antigen-ELISA Serology: antibody-ELISA	Standard precautions

ELISA: enzyme-linked immunosorbent assay

Source: David R. Franz et al., "Clinical Recognition and Management of Patients Exposed to Biological Warfare Agents," *Journal of the American Medical Association* 278, no. 5 (6 August 1997): 400–1.

have not been targeted for awareness or other technical training.¹⁵⁴ Therefore, they would refer a difficult, unknown culture up the laboratory chain, with the hospital or private laboratory sending the sample to the local public health lab, which would pass the culture on to its state counterpart, which may in turn bump it to the CDC or the Army's experts. With delays for the re-tests, several days, sometimes weeks, may pass before laboratories unravel the mystery.¹⁵⁵

While waiting for laboratory results, doctors may not piece together the pattern of disease occurring in their community, even when the clinical symptoms are pronounced. A physician in Pennsylvania's Allegheny County tested how alert his on-duty colleagues were to the stigmata of the smallpox, which has not been seen in the United States for decades. Of seventeen physicians quizzed, only one of the two infectious disease specialists who participated correctly connected the symptoms—including the virus' distinct blistering pattern—to smallpox. "We always believed we'd be knee-deep in bodies before anyone realized what was happening. We were right. They had no idea what was going on," said the operations supervisor of Pittsburgh's emergency operations center.¹⁵⁶ To illustrate the point further, an emergency department physician who had been through the domestic preparedness training estimated that numerous people would have to be coughing up black blood, others on ventilators, and even dozens dead before he and

¹⁵⁴ Note that in many locations, technicians still perform basic culture work on tabletops, without the benefit of safety hoods and other high-level containment capabilities. Some concern was expressed that technicians, especially those in private laboratories, could become symptomatic if they analyze certain cultures without strict safety precautions. Interviews with author: Associate Hospital Administrator/Registered Nurse (13 November 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999). Laboratory staffs are taught to guard against respiratory and blood-borne pathogens and are supposed to observe universal safety precautions, such as the use of eye protection and gloves. However, even the most experienced technicians have lapses in judgment or safety. In the winter of 1989, Peter Jahrling, a veteran civilian virologist at the US Army Medical Research Institute of Infectious Disease, encouraged a colleague to sniff the contents of a flask that he thought contained a common soil bacterium. Instead, photographs taken with a scanning electron microscope later revealed the solution in the flask to be a filovirus, initially thought to be Marburg but later shown to be Ebola. Further violating safety protocols, Jahrling did not inform his superior that he and his colleague had done a "whiff" test and therefore could be candidates for isolation. Fortunately, the Ebola Reston strain, which decimated the test animals in a monkey house on the outskirts of Washington, DC, did not species jump to humans. See C.J. Peters and Mark Olshaker, *Virus Hunter: Thirty Years of Battling Hot Viruses Around the World* (New York: Anchor Books, 1997), 1–6, 235–274. In a second case of apparently loose adherence to biosafety practice at this facility, an Army scientist apparently contracted glanders, which is potentially fatal, because he was not wearing gloves while working with the agent. "Army Scientist Who Contracted Rare Disease Worked Without Gloves," *Associated Press*, 26 June 2000; D. DeShazer et al., "Laboratory-Acquired Human Glanders—Maryland, May 2000," *CDC Morbidity and Mortality Weekly Report* 49, no. 24 (23 June 2000): 533.

¹⁵⁵ Interviews with author: Physician (29 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Physician, Hospital Department of Emergency Medicine (24 March 1999).

¹⁵⁶ Raymond DeMichie, as quoted in Jonathan D. Silver, "Local Doctors Fail Their Test on Diagnosing Germ Terrorism," *Pittsburgh Post-Gazette*, 13 February 2000. The occurrence of smallpox has been uncommon in the United States since a worldwide campaign eradicated the disease in 1977. Seven emergency department physicians and eight inpatient practitioners also participated in Dr. Michael Allswede's mini-survey. They were told that the patients initially had cold-like symptoms, but several days later experienced nausea, diarrhea, and a facial rash that moved to the torso. Shown photographs of people with blistering smallpox, the physicians were still stumped, considering lupus, toxic shock syndrome, and dozens of other diseases, but rarely the variola virus.

his colleagues understood anthrax was the cause.¹⁵⁷ A 1998 survey of seventy-six physicians bolsters the concern that most doctors would miss the clinical signs of a bioterrorist attack. Although 53 percent reported that their emergency medicine residency programs included formal training in biowarfare agents, over 70 percent rated their ability to recognize bioterrorism casualties as very poor or less than adequate.¹⁵⁸ These statistics jibe with the assertion made by several interviewees: only when hospitals were swamped with the ill would physicians finally recognize something was amiss and call the local health department.¹⁵⁹ If clinicians seeing a cluster of cases with similar symptoms considered certain factors, such as those listed in box 6.6, worthy of further investigation, they would get a head start on discerning a terrorist attack from a natural disease outbreak.

Ideally, public health officials and epidemiologists would be notified in a timely fashion so that answers could be sought in a context broader than the initial cluster of cases or laboratory samples. If a laboratory test or clinical diagnosis was not on hand to confirm an outbreak, the disease detectives would order more tests to identify the pathogen. Epidemiologists would find and interview others with similar symptoms, looking for temporal and geographic indicators of the identity and source of the disease. They may refine their hypothesis with additional laboratory or environmental studies. From this basis, public health authorities would design and implement measures to control the outbreak. Local and state officials may begin this process, but they may soon call in the Epidemic Intelligence Service, the nation's cadre of disease sleuths.¹⁶⁰

¹⁵⁷ Interview with author: Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999). Other medical professionals offering similar opinions about the ability of medical staff to detect infectious diseases: Physician (29 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Associate Hospital Administrator/Registered Nurse (13 November 1999); Project Manager, Emergency Management Planning (27 July 1999); EMS Superintendent-in-Chief (24 March 1999). Bartlett, "Applying Lessons Learned from Anthrax Case History to Other Scenarios," 561–3.

¹⁵⁸ Pesik, Keim, Sampson, "Emergency Medicine Residency Program Training for Bioterrorism," 175.

¹⁵⁹ Interviews with author: Director, Emergency Services Department (18 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Associate Hospital Administrator/Registered Nurse (13 November 1999); Project Manager, Emergency Management Planning, (27 July 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999); EMS Superintendent-in-Chief (24 March 1999); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999).

¹⁶⁰ Wetterhall, "Surveillance Systems," 1-105–6. For insight into what it is like to be a disease sleuth, see Peters and Olshaker, *Virus Hunter*.

Box 6.6: Epidemiologic Clues to a Possible Bioterrorist Attack

- A distribution of cases that is inconsistent with normal disease patterns (geographically and/or temporally), with greater than anticipated numbers of patients, especially in a distinct population;
- More severe illness than is typical for a given pathogen, as well as unusual routes of exposure (e.g., inhalational anthrax as opposed to cutaneous or gastrointestinal cases);
- A disease that is not endemic to a given geographic area, unusual for the time of year, or impossible to transmit naturally since the disease carrier (e.g., mosquito, rodent) is not present in the area;
- Simultaneous upswings of different diseases;
- A disease outbreak affecting animal and human populations;
- Unusual strain of a disease or atypical antibiotic resistance patterns;
- Higher rates of disease among those who were located in certain areas at a certain point in time (e.g., inside a building where agent was released, outside if the attack was outdoors);
- Intelligence data that a nation or terrorist group possessed a certain biowarfare agent or agents;
- Claim(s) by a terrorist group to have released a biological agent;
- Direct evidence (e.g., environmental samples, delivery system) that an agent was released.

Sources: Julie A. Pavlin, "Epidemiology of Bioterrorism," *Emerging Infectious Diseases* 5, no. 4 (July/August 1999): 529; Robert P. Kadlec, Alan P. Zelicoff, Ann M. Vrtis, "Biological Weapons Control: Prospects and Implications for the Future," *Journal of the American Medical Association* 278, no. 5 (6 August 1997): 355.

One of the misimpressions about a covert biological attack is that it would not be possible to tell a natural outbreak from a purposeful act.¹⁶¹ Public health authorities scrutinizing the data would recognize at a certain juncture that an outbreak was terrorist-driven, but depending upon the disease and the location of the attack, months could pass before that conclusion was reached. Such was the case with a cult's poisoning of salad bars in The Dalles, Oregon, with salmonella late in the summer of 1984.¹⁶² The summer 1999 outbreak of West Nile virus in the New York City area was another case that demonstrated this

¹⁶¹ "In most naturally occurring epidemics, there is a gradual rise in disease incidence, as people are progressively exposed to an increasing number of patients, vectors, or fomites that spread the pathogen. In contrast, those exposed to a [biological weapons] attack would all come in contact with the agent at approximately the same time. Even taking into account varying incubation periods based on exposure dose and physiological differences, a compressed epidemic curve with a peak in a matter of days, or even hours, would occur." David R. Franz et al., "Clinical Recognition and Management of Patients Exposed to Biological Warfare Agents," in *Biological Weapons: Limiting the Threat*, ed. Joshua Lederberg (Cambridge, Mass.: The MIT Press, 1999), 77–8.

¹⁶² Thomas J. Torok et al., "A Large Community Outbreak of Salmonellosis Caused by Intentional Contamination of Restaurant Salad Bars," *Journal of the American Medical Association* 278, no. 5 (6 August 1997): 389–95. This case is described in box 2.2 in chapter 2.

difficulty.¹⁶³ Whereas these cases were tough to identify as purposeful or naturally occurring incidents, the appearance of a single case of smallpox or inhalational anthrax would immediately be suspect.

Efforts to Improve the Early Detection of Disease Outbreaks

Some public health officials and emergency planners are striving to find speedier ways to detect an unusual rise in illness. Many critically ill people make their way into the health care system via the EMS, so several concepts for auditing fluctuations in the number of patients admitted to hospitals work off of EMS activity levels. In some cities, doctors interact with paramedics and EMTs throughout their shifts, advising them on pre-hospital treatment and discussing unusual inbound cases. Because doctors supervising EMS personnel are information choke points about community health problems, they might spot a disease outbreak early in its progression.¹⁶⁴ In other EMS-based surveillance approaches, cities have begun to establish capacities to monitor the number of incoming patients and the diversion status of hospitals as well as incoming patients with similar symptoms.¹⁶⁵ Similarly, a few states have instituted a state wide system to recognize an elevation in hospital admissions. EMS crews and hospital emergency departments must inform the attending emergency doctor or charge nurse in a designated area hospital when they see a rapid or developing rise in patients with similar symptoms. In turn, the designated area hospital notifies the state public health department if two or more of the hospitals in its area network are experiencing a hike in same-symptom cases. State public health officials then determine if something out of the ordinary is taking place.¹⁶⁶

¹⁶³ This outbreak caused seven deaths in humans and spread widely through the bird and mosquito populations. At first, the CDC thought it was St. Louis encephalitis, but the alertness of a Bronx Zoo pathologist was the key to unraveling the mystery. For case analyses, see Monica Schoch-Spana, "A West Nile Virus Post-Mortem," *Biodefense Quarterly* 1, no.3 (December 1999): 1–2, 6–8; Janet Heinrich, *West Nile Virus: Preliminary Information on Lessons Learned*, GAO/HEHS-00-142R (Washington, DC: US General Accounting Office, 23 June 2000). To track the spread of the West Nile virus in different areas of the country, go to: <http://nationalatlas.gov/virusmap.html>.

¹⁶⁴ The paramedics on their own are good lookouts for budding health care problems. For instance, they have always been the first to perceive when a bad batch of drugs has been shipped into one city because the volume of drug overdoses rises dramatically. About 85 percent of the nation's cities have incorporated their EMS service into the fire department, but cities such as Boston, Denver, Cleveland, and Minneapolis operate their EMS as a third service, wherein physician supervision of paramedics and EMTs is described as particularly close. Interviews with author: EMS Superintendent-in-Chief (24 March 1999); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999).

¹⁶⁵ One city operates a website that enables an aggregate hospital capacity census every eight hours. Another requires EMS crews to track hospital status and notify the health department of two or more cases with similar symptoms within a day. A third has a computerized system keeping tabs on key parameters (e.g., number of admissions, gastro-intestinal and respiratory complaints) every twelve hours, initiating an investigation if data exceed standard deviations. Interviews with author: Physician/Director of Health, Public Health Department (20 September 2000); Battalion Fire Chief, Special Operations (25 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000).

¹⁶⁶ Every year, the influenza season provides a natural test for this system and validates its utility in helping to manage health care. This type of alert system is also useful in a heat emergency or a natural communicable disease epidemic. Note that EMS dispatch personnel could report the rise in same-symptom patients, and the poison control center may also be contacted. The number of same-symptom patients that must be seen to trigger notification is not specified. As appropriate, the public health department sends out a blast facsimile to hospitals and to the EMS services throughout the state to let them know that they might

The syndrome surveillance approaches being tried to achieve early detection of a suspicious disease outbreak, described in boxes 6.7 and 6.8, constitute something of a departure for public health monitoring. Rather than waiting for laboratory identification, data about disease types and rates are collated from various sources, allowing the geographic and temporal evolution of a disease through a given area to be mapped. This data can arm public health officials to differentiate between disease patterns, to deduce whether an outbreak is natural and the disease in question is contagious.¹⁶⁷ These prototypes expand past EMS entry into the health care system to encompass the other avenues to medical care, such as over-the-counter medication sales, private practice doctors, and the primary care clinics of health maintenance organizations. The more data points incorporated, the more useful these systems may be, not just to detect a covert bioterrorist attack, but to handle routine public health problems more effectively.

Unless such reporting is required by law, active disease surveillance systems will depend to a large extent upon the willingness of health care personnel to supply voluntarily, promptly, and regularly the data that power these analytical tools. Since health care providers stand to gain measurably from tools that improve the ability to detect disease outbreaks, their interest and hopefully their cooperation can be assumed.¹⁶⁸ As these prototypes are refined, a strong case could be made not just for city governments, but for the country as a whole to institute an active disease surveillance system. The power of this type of disease tipoff tool has yet to be proven for naturally occurring or deliberately caused disease outbreaks, but the promise of syndrome surveillance may explain why a few other metropolitan areas have already begun

start seeing an increase in patients. If the influx of patients compels two or more hospitals in an area to go on bypass and EMS crews must travel more than ten minutes to reach an open hospital, then the public health department regulations mandate that hospitals come off bypass. Interview with author: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000). Other states are also setting up computerized information exchanges between hospitals and a statewide data system to track the flux and characteristics of hospital cases based on EMS records. Interviews with author: Director, Emergency Services Department (18 May 2000); EMS System Analyst/Paramedic, State Department of Health and Social Services (25 January 2000).

¹⁶⁷ For example, if numerous elderly adults report with fever, fatigue, and aching joints in the middle of winter, public health care officials would suspect influenza. However, if otherwise healthy young adults report the same symptoms, then another microbe may be causing the illness. Contagious diseases have identifiable cycles, so public health officials can predict and prepare for when the next wave of patients would seek medical care. Smallpox, for example, has an average incubation period of twelve days. Interview with author: Physician (29 May 2000).

¹⁶⁸ Skepticism was voiced that hard-pressed medical personnel would take the time to fill out such forms. Interview with author: Physician, Division of Disease Control, Public Health Department (8 August 2000).

Box 6.7: Cuing Early Recognition of Disease Outbreaks—Prototype I¹

In New York City, public health and city emergency authorities have established novel tools to try to detect outbreaks of disease as early as possible to give the health care system more time to respond effectively. Eleven sentinel public hospitals report daily to the public health department on the number of hospital admissions through the emergency department. In the future, the number of sentinel hospitals may be expanded and additional data requested, such as the number of patients with selected diagnoses on admission or discharge from the emergency department or ICU or other data on clinical syndromes. The city is also tracking patterns of 911 calls, focusing on seven call types correlated with flu-like illness. Each morning, city public health officials receive aggregate data from the following selected call types over the previous twenty-four hours: 1) difficulty breathing; 2) respiratory distress; 3) minor sickness; 4) adult sickness; 5) pediatric sickness; 6) adult asthma; and, 7) pediatric asthma. Calls reporting abdominal pain are monitored as a control. To choose these call categories from the total of sixty-three call types, city officials reviewed data back to 1991 and found that rises in the frequency of these call types correlated to influenza outbreaks. These historical 911 data was analyzed and modeled to control for other factors that can effect the number of cases, including season of the year, day of the week, weather, temperature, and humidity. A statistical baseline was established and thresholds were identified to trigger an investigation of a possible covert bioterrorist attack. The health department also monitors unexplained deaths due to possible infectious disease among those ranging in age from two to forty-nine using death certificate data that is usually filed within seventy-two hours and retrieved daily for review.

Before creating these tools for early detection of flu-like illness, New York City had previous experience with using alternative sources of data to ascertain a rise in disease syndromes associated with water-borne illnesses. The health department receives reports every day from one commercial and two public laboratories on the number of stool samples submitted for bacterial culture and parasitic examination. A second daily report comes from eleven sentinel nursing homes dispersed around the city, which chronicle the onset on new diarrhea cases. A third report arrives weekly from a wholesale distributor that tracks the sales of over-the-counter anti-diarrheal medications (e.g., Kaopectate). Traditional laboratory analyses can reliably identify and trigger reports of disease, but an upsurge in diarrheal cases could tip officials off to a water-borne disease outbreak long before physician or laboratory diagnosis occurs.

To augment the city's flu-like syndrome surveillance, public health officials are considering several additional measures to capture still other entry routes to the health care system. First, the health department may monitor levels of school absenteeism, sick calls into employee health clinics for firefighters, police, and public transportation personnel, and outpatient calls to the hotlines that health maintenance organizations use to direct patients to medical care. Second, public health officials may track the sale of over-the-counter drugs for flu-like symptoms. Consumers buy these products to treat colds and general malaise, not just influenza, so city officials are weighing whether to watch just a few products or this entire class of over-the-counter medications.

NOTES

1. For more information on New York City's approach, please contact the Communicable Disease Program at the New York City Department of Health. This description was compiled from the author's interviews with individuals from that program and the Mayor's Office of Emergency Management. In 1995, the Environmental Protection Agency required the city to establish a sentinel reporting system to watch for an unusual upswing in the occurrence of water-borne disease because the city's water system is chlorinated, but not filtered. As additional precautions, New York City purchased land adjacent to city reservoirs and instituted a program to reduce run-off of agrochemicals and agricultural waste from farms.

Box 6.8: Cuing Early Recognition of Disease Outbreaks—Prototype II¹

Various hospitals in New Mexico and the state public health department have begun testing a syndrome surveillance system designed to help differentiate normal cycles of disease from a possible bioterrorist attack. From touch-screen computers in emergency departments and urgent care clinics, doctors have begun documenting patient admissions for five different causes: 1) flu-like illness; 2) mental status changes with fever; 3) fever and skin rash; 4) hepatitis/acute jaundice; and, 5) diarrhea with fever. After filling in a patient's demographic data (e.g., zip code, occupation, gender, age) and selecting a syndrome area, doctors use a second pull-down screen to add details about the patient's status and the diagnostic tests ordered. The entire data entry process takes *less* than a minute.

The data are transmitted in real time and tabulated in a central database in the New Mexico Department of Health. Within seconds, the doctor who just filed the entry begins to see raw epidemiological data as geographic and temporal maps pop up on the computer screen. A color-coded map indicates areas where the five disease syndromes exist or are on the rise, and another map charts the evolution of the syndrome over a rolling thirty-day period. The physician also sees a summary of numbers and results of all viral cultures recently ordered in the area and related alerts from the state health department. This information enables the doctor to learn right away whether the patient being treated is an isolated case or part of a more widespread pattern of illness. Such data can be important to differential diagnosis and initial treatment. In addition to helping local physicians understand what is happening in their communities, this system is a decision aid for state health care authorities who might manage a budding health care crisis with a variety of measures (e.g., increasing shipments of medicines, controlling access into and out of an affected area).

NOTES

1. For more information on this prototype, contact Dr. Alan Zelicoff at Sandia National Laboratories' Center for National Security and Arms Control. This description was compiled from the author's interview with Dr. Zelicoff and written information that he provided. The prototype was funded with \$50,000 from the Department of Energy. Dr. Zelicoff expected to have data on the prototype's performance late in 2000. Note that the prototype protects patient privacy with encoding software.

to adopt New York City's plan.¹⁶⁹ With the cooperation of health care personnel in Atlanta, Seattle, Philadelphia, and Los Angeles, the CDC also has begun to test its own variant of an active syndrome surveillance system.¹⁷⁰ Public health officials, the medical community, and emergency planners appear to

¹⁶⁹ In one instance, basic 911 call monitoring had already been instituted in 1999 to forewarn officials of a possible heat stress crisis, flagging anything above a 10 percent increase in the daily calls for EMS service. Interviews with author: Emergency Management Specialist, Office of Emergency Management (9 May 2000); Physician/EMS Medical Director (13 November 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999).

¹⁷⁰ The Seattle test was conducted in conjunction with the World Trade Center meeting in December 1999; the Philadelphia test took place around the Republican National Convention from 27 July to 4 August 2000; and the Los Angeles test, likewise, was during the Democratic National Convention from 14 to 17 August 2000. In Philadelphia, the template included surveillance at first aid stations, hospital census data (e.g., number of emergency department, ICU, and regular admissions and number of deaths), and sentinel emergency department surveillance data. The latter activity tracked patients presenting with the following disease syndromes: 1) respiratory tract infection with fever; 2) diarrhea/gastroenteritis; 3) rash and fever; 4) sepsis and/or acute shock; 5) meningitis/encephalitis; 6) botulism-like syndrome; 7) unexplained death with history of fever; 8) none of the above; and 9) no box checked on form. Of the 4,959 reports received during the specified time period, 96.4 percent were in the latter two categories. "Summary and Final Report: Infectious Disease Surveillance," Bulletin 10 (Philadelphia: Department of Public Health, 11 August 2000), 1, 4. The CDC's earliest test took place during the 1996 Atlanta

be on their way to devising and refining workable tools to recognize disease outbreaks in their infancy, in which case they will have overcome a tremendously difficult challenge. That feat, however, somewhat pales in comparison to putting plans and capabilities in place to cope with the consequences of a pathogen running amok through the human population.

Providing Public Health Care in the Midst of Panic

One thing that the health care community would have working in its favor after a bioterrorist attack is that medical therapies for most biowarfare agents are available, although some therapeutic regimens are experimental and lack Food and Drug Administration approval. For some biowarfare agents, the administration of vaccines and/or antibiotics soon after exposure would prevent the disease from maturing in those already infected or protect those who were not originally exposed from getting the disease. Medical therapies have been published in the military literature and, increasingly, in leading medical journals.¹⁷¹ Health care authorities in several cities have used such sources to develop their own protocols for pre-hospital and hospital treatment.¹⁷² A 25-member panel of experts, sponsored by the Health and Human Services Department, also has been charged with developing consensus guidelines for recognition and treatment of ten biowarfare agents.¹⁷³

Knowing which antibiotics to administer is one thing; having a sufficient supply to treat an eighth, a quarter, a half, or all of the citizens in a large US city is another thing entirely. To cut costs, hospitals have switched to just-in-time stocking of medicines, usually keeping on hand only enough to last two, at most three, days. Supplies are re-stocked daily.¹⁷⁴ Once an outbreak is identified, one of the first calls made from

Olympics. Interview with author: General Manager, Emergency Department (22 September 2000).

¹⁷¹ *Medical Management of Biological Casualties: Handbook*, 3rd ed. (Frederick, Md.: US Army Medical Research Institute of Infectious Diseases, July 1998); Sidell, Takafuji, and Franz, eds., *Medical Aspects of Chemical and Biological Warfare*; Thomas V. Inglesby et al., "Plague as a Biological Weapon: Medical and Public Health Management," *Journal of the American Medical Association* 283, no. 17 (3 May 2000): 2281–90; Thomas V. Inglesby et al., "Anthrax as a Biological Weapon: Medical and Public Health Management," *Journal of the American Medical Association* 281, no. 18 (12 May 1999): 1735–45.

¹⁷² Interviews with author: Director, Emergency Services Department (18 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Project Manager, Emergency Management Planning (27 July 1999).

¹⁷³ These guidelines will contain symptom-based presentations of what the patients would experience, say, and manifest clinically. Information will be presented in a Cliff's notes-like format, in "if X and Y, then treat this way" bullets, followed by a flow chart showing disease presentation, progression, and treatment. Interview with author: Toxicologist, Poison Control Center (15 June 2000).

¹⁷⁴ Interviews with author: former State Epidemiologist (18 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); Physician/Director of Hospital Disaster EMS (27 July 1999); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999).

a city's emergency operations center, described in box 6.3, would be to request the national pharmaceutical stockpile.¹⁷⁵ This stockpile is stored in eight locations around the United States. The CDC pledges to get these medications to a city within twelve hours, accompanied by a small staff to help distribute the cache.¹⁷⁶ Just getting the medications to a city is not even half of the battle. The stockpile would do the local citizens no good if it sits on the airport tarmac. Local authorities need to have detailed plans and assigned personnel in place to disburse the drugs promptly to various facilities.¹⁷⁷

Much of the national stockpile consists of antibiotics, partly because supplies of vaccines are not particularly deep. For most biowarfare agents, there are no vaccines approved for civilian use.¹⁷⁸ Moreover, there are assorted problems with the licensed vaccines. The cholera vaccine, for example, has only a 50 percent efficacy when used in areas where the disease is endemic. Manufacture and sale of the cholera vaccine was discontinued in August 2000.¹⁷⁹ Supplies of vaccines for anthrax, plague, and smallpox are limited. The anthrax vaccine, which is effective against aerosol transmission, is given in a six-shot series over an eighteen-month period. Financial problems caused the one firm that manufactured this vaccine to halt production in December 1999. By mid-July 2000, the Pentagon had only 165,000 doses of anthrax vaccine left.¹⁸⁰ Antibiotics can be administered until vaccine is available, but if eight million people were

¹⁷⁵ Interviews with author: Director, Emergency Services Department (18 May 2000); Paramedic (12 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); Physician/EMS Medical Director (13 November 1999); Project Manager, Emergency Management Planning (27 July 1999).

¹⁷⁶ The stockpile reportedly contains antibiotics for over 114,000 people. The CDC has arrangements with drug suppliers that may increase the availability of antibiotics to roughly five million doses within thirty-six hours. Pharmaceutical companies say that it would be difficult to manufacture additional supplies quickly, partly since most have converted to just-in-time inventory control practices. Osterholm and Schwartz, *Living Terrors*, 130–1.

¹⁷⁷ On the importance of distribution plans: former State Epidemiologist (18 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000). One city plans to have the stockpile land at a nearby Air National Guard hangar, with state health department personnel in charge of distribution. Interview with author: Battalion Fire Chief, Special Operations (25 May 2000). On the travails encountered in notionally distributing the stockpile during the Denver segment of the mid-May 2000 Topoff drill, where a plague release was simulated, see Inglesby, Grossman, and O'Toole, "A Plague on Your City: Observations from TOPOFF."

¹⁷⁸ Vaccines do not exist for brucellosis, glanders, viral hemorrhagic fevers, Staphylococcal enterotoxin B, ricin, and T-2 mycotoxins. David R. Franz et al., "Clinical Recognition and Management of Patients Exposed to Biological Warfare Agents," *Journal of the American Medical Association* 278, no. 5 (6 August 1997): 400–1; *Medical Management of Biological Casualties*, Appendix H.

¹⁷⁹ Philip K. Russell, "Vaccines in Civilian Defense Against Bioterrorism," *Emerging Infectious Diseases* 5, no. 4 (July/August 1999): 532–3. Two other cholera vaccines are made in Sweden and Switzerland, but are not available in the United States. According to the CDC, the Wyeth Ayerst vaccine provided "brief and incomplete immunity." Centers for Disease Control and Prevention, "Update on Cholera Vaccine." Internet: www.cdc.gov/travel/other/cholera-vaccine.htm. Downloaded 19 September 2000.

¹⁸⁰ Among other problems with the anthrax vaccine, it must be produced in high-containment facilities because of the spore-forming property of *Bacillus anthracis*. The method employed pre-dates molecular biology, and the level of extraneous proteins and purity in the resulting vaccine are less than ideal. Finally, the current vaccine may not be effective against genetically engineered strains of anthrax developed in the USSR's biowarfare program. Russell, "Vaccines in Civilian Defense Against Bioterrorism," 532–3. BioPort Corp. in Lansing, Michigan, is the maker of the anthrax vaccine. Andrea Stone, "Audit:

possibly exposed to anthrax, over \$1 billion worth of ciprofloxacin would be needed to treat them for the sixty days required to make enough vaccine.¹⁸¹

As for the plague vaccine, it protects against transmission of the disease by fleas, but is not effective against pneumonic plague or aerosol transmission. This vaccine is also no longer being produced.¹⁸² The condition of the nation's stocks of smallpox vaccine is deteriorating and supplies are sufficient to immunize under seven million people. No US company employs the time-consuming, traditional method required to make this vaccine, so at least thirty-six months would be required to produce large quantities.¹⁸³ In mid-2000, a study was underway to determine whether the efficacy of the existing vaccine stockpile could be maintained if it were diluted by a factor of three, ten, or a hundred, enabling many more people to be covered.¹⁸⁴ The CDC also announced the hiring in mid-September 2000 of a firm to manufacture forty million doses of the new smallpox vaccine, made with modern, cell culture methods. Since the new vaccine still has to undergo clinical testing, the first deliveries were scheduled to occur in the mid-2004 timeframe.¹⁸⁵

Vaccine Producer Needs Bailout," *USA Today*, 13 April 2000; Elaine Sciolino, "Anthrax Vaccination Program Is Failing, Pentagon Admits," *New York Times*, 13 July 2000. On the vaccine and antibiotic resistant strains of anthrax, see Alibek with Handelman, *Biohazard*, 160, 167, 261, 281.

¹⁸¹ David W. Siegrist, *Hot Zone '99: Advanced Technology Needs for Consequence Management of Biological Terrorism* (Arlington, Va.: Potomac Institute for Policy Studies, 1999), 17.

¹⁸² Russell, "Vaccines in Civilian Defense," 531–2.

¹⁸³ The CDC estimates that there are 15.4 million doses of smallpox vaccine, of which experts believe there are between seven and eight million usable doses. Not only has condensation been found in the tubes in which the freeze-dried vaccine crystals are stored, the fluid needed to dilute the vaccine has decayed. Worldwide there are less than one million of the two-pronged needles needed to administer the vaccine. No company currently manufactures these special needles. Finally, only 675 doses are left of vaccinia immune globulin, and even that supply may be unusable. This drug helps patients who have had a severe reaction to the vaccine. Various nations store an estimated one million doses of the vaccine in unknown condition; the World Health Organization has an additional 500,000 dose stockpile. With the vaccine in such short and questionable supply, perhaps two billion would perish if smallpox were released. The last outbreak of smallpox was in Yugoslavia in 1972 and required the administration eighteen million doses of vaccine in ten days to contain it. Osterholm and Schwartz, *Living Terrors*, 142. Also, D.A. Henderson, "Smallpox: Clinical and Epidemiologic Features," *Emerging Infectious Diseases* 5, no. 4 (July/August 1999): 538; D.A. Henderson, "Bioterrorism as a Public Health Threat," *Emerging Infectious Diseases* 4, no. 3 (July-September 1998). Internet: <http://www.cdc.gov/ncidod/eid/vol4no3/hendrsn.htm>; Laurie Garrett, *Betrayal of Trust: The Collapse of Global Public Health* (New York: Hyperion, 2000), 524–6.

¹⁸⁴ The results of this study, which is being conducted by St. Louis University, are expected at the close of 2000. Scott R. Lillibridge, director, Bioterrorism Preparedness and Response, National Center for Infectious Diseases, CDC. Presentation at the Conference on Health Care Response to Bioterrorism, 5 June 2000, San Francisco, California.

¹⁸⁵ Ronald Rosenberg, "Oravax in \$343M Contract to Develop Smallpox Vaccine for Government," *Boston Globe*, 21 September 2000.

Research, development, and testing of vaccines against seven biological agents is also underway,¹⁸⁶ but the clinical trial process is expected to be difficult and lengthy.

In the interim, until the national drug stockpile arrives, some cities have received federal grant funds via the MMRS program to purchase a local pharmaceutical cache that can serve as a stopgap. City officials are worried that federal or local monies would not be provided to replace the antibiotics, which expire within a few years.¹⁸⁷ A number of cities approached major pharmaceutical warehouses in their areas to try to obtain agreements whereby the warehouses would provide drugs in an emergency and identify year-round, around-the-clock points of contact. These efforts have met with mixed results.¹⁸⁸ Chapter 5 describes alternative strategies that have proven extremely effective in saving drug purchase dollars, such as employing the Shelf Life Extension program and building a pharmaceutical “bubble” into the local health care system.¹⁸⁹

Aside from medications, a city would need extra quantities of all of the other supplies required to care for the ill, from sheets and intravenous fluids to tongue depressors. Some of these supplies would come

¹⁸⁶ Vaccines against tularemia, Q fever, Botulinum toxoids, Bolivian hemorrhagic fever, Argentine hemorrhagic fever, Rift Valley fever, and Venezuelan, Eastern, and Western equine encephalitis are categorized as investigational new drugs. Franz et al., “Clinical Recognition and Management of Patients,” 400–1; *Medical Management of Biological Casualties: Handbook*, Appendix I; Russell, “Vaccines in Civilian Defense,” 531. Testing of these vaccines is being conducted under the Pentagon’s Joint Vaccine Acquisition Program. See, “Army Pursues Joint Vaccine Acquisition Program,” press release no. 97–59 (Washington, DC: US Army, Office of Public Affairs, 12 June 1997); “Joint Vaccine Acquisition Program: Questions and Answers” (Frederick, Md.: Joint Vaccine Acquisition Program, Program Management Office, n.d.).

¹⁸⁷ Interviews with author: EMS Chief, Emergency Services Department (21 September 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Pre-Hospital Care Coordinator/Emergency Planner (2 May 2000); Registered Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Director, Office of Emergency Services (4 February 1999).

¹⁸⁸ One city has a memorandum of understanding with local warehouses, stipulating which medications would be sent in a chemical, biological, or nuclear incident. Prices are fixed. Interviews with author: Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Battalion Fire Chief, Special Operations (25 May 2000). Another city has a verbal agreement with two local warehouses to supply enough antibiotics to treat 100,000 for three days. The warehouses have supplied 24-hour points of contact, and distribution and security plans have been settled with local sheriffs. Interview with author: Physician/University Hospital Department of Emergency Medicine (20 September 2000). Two cities had queried drug warehouses on several occasions to see how much of “X” drug they could obtain on the spot. Interviews with author: Fire EMS Statistician (30 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000). One large urban hospital cut its own deal with a local warehouse. Interview with author: Physician, Hospital Division of Emergency Medicine (31 May 2000). Other locals have been rebuffed by local drug warehouses. Interviews with author: Emergency Management Specialist, Office of Emergency Management (9 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Physician/Hospital Department of Emergency Medicine (15 June 1999).

¹⁸⁹ Manufacturers do not guarantee the efficacy of a drug past its expiration date. For example, Bayer sets the shelf life of ciprofloxacin at three years. Pharmacists in some states are required to shorten the expiration date on any drug not dispensed in original packaging to one year. Elsewhere, pharmacists also adopt this practice. As discussed in more detail in chapter 5, testing has shown that several medications, including ciprofloxacin, were still 90 percent viable ten years after their expiration date. Laurie P. Cohen, “Safe and Effective: Many Medicines Prove Potent for Years Past Their Expiration Dates,” *Wall Street Journal*, 28 March 2000.

with the national stockpile. Others will have to be obtained from local companies. In two cities, hospitals individually checked with their suppliers to ensure that emergency orders could be filled, each receiving assurances from vendors to that effect. Only later during a citywide planning meeting did the hospitals make the eye-opening discovery that they all relied on the same few contractors, which made it improbable that the suppliers could keep their promises to everyone. Emergency supply plans were adjusted accordingly.¹⁹⁰ Volunteer agencies such as the Red Cross, as well as the National Guard and the Federal Emergency Management Agency, will be asked to help with some types of emergency supplies (e.g., cots, blankets, water).¹⁹¹

A well-coordinated media game plan will be essential to reassure the public and attempt to manage the crisis. Even with careful media relations, public health and emergency response officials anticipate a widespread panic of the kind inspired by Orson Welles' 1938 "War of the Worlds" radio broadcast, except worse, much worse.¹⁹² People frightened that they were exposed to this invisible thing would flock to the hospitals for checkups and treatment. The mass psychogenic effects would be even more pronounced than for poison gas attack because of the incubation period and common, flu-like symptoms brought on by many biological agents. Hospitals that have already seen genuinely ill patients would soon be swamped by more infected patients and the worried well. To wit, the ratio of worried well to infected patients during the 1993 outbreak of hantavirus in the Four Corners area was 10 to 1.¹⁹³

Given the widespread recognition that hospitals would buckle quite quickly under such a burden, local emergency planners and hospitals in some cities are collaborating on workable patient management plans for both the ill and worried well. In the late 1990s, the patient load of a regular influenza season overtaxed primary care facilities. So, in an epidemic, already scarce ICU beds would be snapped up, and, if a contagious disease were involved, hospital capacity to isolate patients would be rapidly exceeded.

¹⁹⁰ Interviews with author: Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Battalion Fire Chief, Special Operations (25 May 2000). Also commenting on this problem in the Denver segment of the mid-May 2000 Topoff exercise: Senior CDC official (29 August 2000).

¹⁹¹ Interviews with author: Fire EMS Statistician (30 August 2000); Director, Emergency Services Department (18 May 2000); Paramedic (12 May 2000).

¹⁹² This infamous broadcast, which described Martians landing on earth, incited terror across the country. A Princeton University study estimated that more than one million of the six million listeners believed that an alien invasion was indeed taking place. Some hysterical listeners committed suicide and others fled their homes, causing traffic jams in the Northeast. Police, fire and newspaper lines were flooded with calls. People swore that they could see the flames or smell the gas from the fictional Martian attacks. "Radio Listeners Panic, Taking War Drama as Fact," *New York Times*, 31 October 1938; Mike Flanagan, "The First Star Wars Fifty Years Ago, Orson Welles Panicked America with a Single Broadcast," *Chicago Tribune*, 30 October 1988.

¹⁹³ Interview with author: Director of Hospital EMS and Disaster Medicine (19 April 1999). The hantavirus investigation was triggered by an odd cluster of deaths in otherwise healthy young Navajos. For the story of how CDC and Army scientists tracked the virus to its vector, the *Peromyscus maniculatus* deer mouse, and isolated and identified the Four Corners virus, see Garrett, "All in Good Haste," *Coming Plague*, 528-49.

“There is no give in the system for an incident of any magnitude,” observed one physician.¹⁹⁴ Guidance is available to help individual hospitals adjust their plans to cope with an abrupt and considerable rise in infectious disease patients, centering on the handling of anthrax, botulism, plague, and smallpox cases.¹⁹⁵ As the crisis mounts, hospitals would probably have little choice but to designate entire wards, wings, and even facilities to the care of infectious disease cases.¹⁹⁶ Such actions would be so disruptive to routine health care services that in the current health care environment many find them difficult to contemplate. The terms of regional hospital burden-sharing need to be set far in advance of a health care crisis, and very few metropolitan area hospital planning committees have begun to broach the level of detail and collaboration required, much less put the finishing touches on such plans.¹⁹⁷

Several cities have a two-fold strategy to try to keep the hospitals from collapsing under this human tidal wave. They plan to establish a surge capacity at the hospitals as well as medical outposts away from them. Cities are attempting to create an overflow capacity adjacent to or nearby hospitals, in buildings or

¹⁹⁴ Interview with author: Physician, Hospital Department of Emergency Medicine (24 March 1999). Seconding the hospital capacity problem: Physician/University Hospital Department of Emergency Medicine (20 September 2000); Physician/Director of Health, Public Health Department (20 September 2000); Fire EMS Statistician (30 August 2000); former State Epidemiologist (18 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Paramedic (12 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Physician/EMS Medical Director (13 November 1999); Project Manager, Emergency Management Planning (27 July 1999); EMS Superintendent-in-Chief (24 March 1999). Note that the number of beds does not equate to beds that are functionally available because the latter category cannot be opened without staff. Isolation requires negative airflow rooms, the ability to compartmentalize ventilation systems so that patients with communicable diseases do not infect other patients. A 1998 survey by the Minnesota Department of Health found that of the 144 hospitals statewide that provided acute care services, a total of sixty negative air-pressure units with 465 beds were available. The size of the units ranged from one to seventy-five beds. Only 108 of the beds in negative-pressure units were also ICU beds. Osterholm and Schwartz, *Living Terrors*, 138–9. See also, Inglesby, Grossman, and O’Toole, “A Plague on Your City: Observations from TOPOFF.”

¹⁹⁵ The Association for Professionals in Infection Control and Epidemiology prepared a model plan in conjunction with the CDC. See Judith F. English et al., *The Bioterrorism Readiness Plan: A Template for Healthcare Facilities* (Washington, DC: Association for Professionals in Infection Control and Epidemiology, 13 April 1999). Internet: www.apic.org/html/educ/readinow.html. Downloaded 16 December 1999.

¹⁹⁶ Interviews with author: Senior CDC official (29 August 2000); former State Epidemiologist (18 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000). If staffing is short, this approach would essentially mimic the military approach to mass casualty care, wherein a medic, a nurse, and an orderly attend to as many as one hundred patients.

¹⁹⁷ Hospitals in some regions are examining for the first time the utility of crisis relocation agreements between hospitals to relieve the strain on area health care facilities. In the rare instances where hospital burden-sharing agreements exist, they are being adjusted to accommodate the anticipated demands of a bioterrorist event. Interviews with author: Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000). On the need for regional hospital planning: Senior CDC official (29 August 2000); former State Epidemiologist (18 August 2000).

temporary field care centers.¹⁹⁸ Other cities have standing arrangements to take over large indoor arenas and stadiums in an emergency.¹⁹⁹ Health care would also be taken to the citizens in some cities, which plan on setting up treatment centers in familiar locations, such as neighborhood fire stations, schools, local health clinics, and heating/cooling centers used during temperature extremes. Mobile field care centers would also be deployed. In these outposts, cross-disciplinary teams of EMTs, paramedics, nurses, physicians, and mental health workers would conduct medical exams, dispense antibiotics and vaccines, and provide counseling, as appropriate. Symptomatic patients would be sent to regular or field hospitals.²⁰⁰ This strategy would be suitable for non-communicable diseases, but problematic if a contagious disease were in play. For those circumstances, where it is key to keep person-to-person contact to a minimum, one city is planning to commandeer fast food restaurants and administer drive-through prophylaxis.²⁰¹

Monumental planning and logistical arrangements must be in place to make such plans work. Personnel, medications, and equipment would need to be brought to the medical outposts in a timely fashion and sustained until the crisis subsides. Accomplishing this feat would be difficult, because the hospitals themselves expect to experience resource deficits of all types. All on-call personnel would be paged, but

¹⁹⁸ One city is surveying the suitability of over 270 buildings for this purpose and plans to store the requisite support equipment at these locations, such that during a crisis, medical staff could arrive, flip on the lights, and begin seeing patients. Other cities have identified locations near hospitals where field hospitals can be erected. Interviews with author: Director, Emergency Services Department (18 May 2000); Physician/EMS Medical Director (13 November 1999); Project Manager, Emergency Management Planning (27 July 1999).

¹⁹⁹ The advantage of using these sites is that there are existing systems, with which many citizens are already familiar, to channel large crowds to and from such places. Interviews with author: Paramedic (12 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); Toxicologist (9 March 1999).

²⁰⁰ Ambulances would be stationed at the outposts to take those needing advanced medical care to hospitals. Interviews with author: Physician/University Hospital Department of Emergency Medicine (20 September 2000); Fire EMS Statistician (30 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Director, Emergency Services Department (18 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Physician/EMS Medical Director (13 November 1999); Project Manager, Emergency Management Planning (27 July 1999); Police Commander and Police Captain, Special Operations Division (23 March 1999); Police Lieutenant (23 March 1999). Cautioning against medical outposts at fire stations because traffic jams there would inhibit the ability to respond to fire emergencies: Physician/Director of Health, Public Health Department (20 September 2000).

²⁰¹ Turn-of-the-century quarantine law prohibited gatherings of more than ten people—even at funerals—to limit opportunities for transmission. Whereas directing citizens to fire stations or sporting arenas would result in crowds at such locations, having them remain in their cars for inoculations and/or receipt of pills would be in keeping with at-home isolation, restricting interpersonal contact to the bare minimum. Moreover, everyone knows the location of neighborhood hamburger chain restaurants. Pharmacies with drive-through windows may also be employed in this capacity. Interview with author: Physician/Director of Health, Public Health Department (20 September 2000). Note that some hospitals already have drive-by influenza shot programs, but the idea is to provide medication to the asymptomatic away from the hospitals.

there are indications that even medical professionals could be unsettled by the situation and shun work. One physician made a prediction seconded by others: “One-half of the staff will run for the hills.”²⁰²

Ignorance of such basic facts as the low contamination risks of most agents and the adequacy of standard precautions, as noted in table 6.2, is still fairly widespread in the medical community. Otherwise, hospital staffs would not have reacted as inappropriately as they have to mere anthrax hoaxes. One major university teaching hospital refused to receive a possible anthrax patient, even *after* being assured by the hazmat chief and the local health commissioner that the individual had been thoroughly decontaminated and they were 99 percent certain that the substance involved was not anthrax.²⁰³ In another hospital emergency department notified of incoming patients who might have been exposed to anthrax, the relevant antibiotics (e.g., ciprofloxacin, doxycycline) disappeared from the shelves before the patients arrived.²⁰⁴ These anecdotes accent the need for education to fortify the medical community’s ability to care for this type of patient, beginning with the basics. From the aforementioned 1998 survey of those involved in emergency medicine residency programs, a worrisome number—64.5 percent—assessed their ability to clinically manage casualties from a bioterrorist attack as less than adequate or very poor.²⁰⁵ One city is fighting the possible exodus of hospital staff by ensuring that all of its hospitals stock enough antibiotics to treat medical personnel.²⁰⁶

To fill out their rosters, hospitals would all probably call on the same temporary service companies that provide nurses and other personnel to substitute for vacationing or ill staff.²⁰⁷ Severe nursing shortages were expected everywhere. One city’s officials are considering assigning EMTs to hospitals for routine medical care, freeing up regular staff to work with critical cases and in the ICU. EMTs from prisons and coal

²⁰² Interview with author: Physician/Director of Hospital Disaster EMS (27 July 1999). Also in agreement: Physician, Division of Disease Control, Public Health Department (8 August 2000); Physician/Associate Medical Director, Fire EMS Division (27 July 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999); Physician/Associate Director, Hospital Department of Emergency Medicine (9 March 1999).

²⁰³ Interview with author: District Fire Chief, EMS Division (2 March 2000).

²⁰⁴ Interview with author: former EMS Supervisor/Paramedic (12 July 2000). In a similar report, hospital personnel in Indianapolis apparently gave themselves ciprofloxacin after an anthrax hoax at a local Planned Parenthood clinic in October 1998. Thirty-one clinic staffers were decontaminated both at the scene and at the hospital. Hospital staff also removed extra supplies of the antibiotic from the hospital pharmacy. Melissa Hendricks, “Rx Against Terror,” *Johns Hopkins Magazine* (February 1999). Internet: www.jhu.edu/~jhumag/0299web/germ.html. Downloaded 21 September 2000. On the panic of 250 hospital workers because of the presence a patient with meningococcal meningitis, which is not very contagious, see Osterholm and Schwartz, *Living Terrors*, 4.

²⁰⁵ Pesik, Keim, Sampson, “Emergency Medicine Residency Program Training for Bioterrorism,” 175.

²⁰⁶ Interview with author: Physician/University Hospital Department of Emergency Medicine (20 September 2000).

²⁰⁷ Interviews with author: Physician/EMS Medical Director (13 November 1999); Project Manager, Emergency Management Planning (27 July 1999); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999).

mines may also be drafted for hospital service.²⁰⁸ Cities would probably call for federal help with manpower at the same time that they request the national drug stockpile. Federal officials contend that vanguard assets, such as Disaster Medical Assistance Teams, could be there within twelve to twenty-four hours. The quickest transportation mode—commercial flights, Pentagon aircraft, trains, or buses—would be used.²⁰⁹ Local concerns about working with relief assets from outside the region are discussed in box 6.4. The local officials who have deployed with such teams counter that cities would probably be on their own for twenty-four to seventy-two hours, and that the quantity of medical manpower that could arrive even in that timeframe might fall far short of what would be needed.²¹⁰

To illustrate the dilemma, the mid-May 2000 Topoff drill featured a hypothetical terrorist release of plague in Denver, after which health care officials quickly found their medical facilities sinking under the patient load and concluded that two thousand more medical personnel were needed on the ground within a day to prevent the flight of citizens that would have further spread the disease.²¹¹ Getting that number of physicians and nurses to a city and into hospitals and field treatment posts would be a tremendous logistic achievement. Quite frankly, there have been no large-scale dress rehearsals to confirm whether civilian or military medical assets could muster that many, that quickly, or even over a few days. Even so, the two thousand figure seems almost quaint when compared to one US city's rough estimate that 45,000 health care providers would be required to screen and treat its denizens, a great many of whom would have to be imported.²¹² If a contagious disease were on the loose, finding local medical personnel to staff the medical

²⁰⁸ Interview with author: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000).

²⁰⁹ Interview with author: Commander, US Public Health Service (3 July 2000). Disaster Medical Assistance Teams consist of roughly thirty-five medical and additional support staff who deploy within twelve to twenty-four hours of notification with medical and logistical supplies to make them self-sufficient for one to three days. Paul B. Roth and John K. Gaffney, "The Federal Response Plan and Disaster Medical Assistance Teams in Domestic Disasters," *Disaster Medicine* 14, no. 2 (May 1996): 371–82. Four National Medical Response Teams, which are specialized to handle nuclear, chemical, and biological casualties are also available.

²¹⁰ Interviews with author: Fire EMS Statistician (30 August 2000); Senior CDC official (29 August 2000); former State Epidemiologist (18 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Director of Hospital EMS and Disaster Medicine (19 April 1999); EMS Superintendent-in-Chief (24 March 1999); Police Lieutenant (23 March 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999).

²¹¹ Interviews with author: Senior CDC Official (29 August 2000); Toxicologist (9 June 2000); Senior Official, HHS Department (6 May 2000). During the drill, one medical outpost was opened and could handle 140 people per hour. As one of the participants in the drill recounted, "For a city of 1 million, that's pitiful." As quoted in, Inglesby, Grossman, and O'Toole, "A Plague on Your City: Observations from TOPOFF."

²¹² Interviews with author: Senior Official, HHS Department (6 May 2000); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999).

outposts would be a significant obstacle.²¹³ Local officials are searching for provisional staffing options until federal help arrives. Some plans put city and federal health clinic personnel on field duty, while others are looking to EMS and Red Cross personnel and drawing upon the local reservoir of suburban private practice and retired doctors and nurses.²¹⁴ Another idea, discussed in the Pentagon's Biological Weapons Improved Response Program, entails drafting dentists, veterinarians, final-year medical school students, and nursing students as "extenders" to fill out the ranks of health care givers.²¹⁵ Of the probable nurse and doctor shortage, one public health director noted that neither is needed to hand out pills, as long as who ever does so is working under the supervision of medical professionals.²¹⁶

Through the media, city officials hope to get the public's cooperation in keeping crowds at the hospitals and neighborhood treatment centers to a manageable size. Announcements would be made about when citizens should stay home, what symptoms they should watch for, how to treat oneself, and where to go in neighborhoods for screening and prophylaxis.²¹⁷ By no means, however, are cities counting on the public to remain calm. Once an attack becomes public knowledge, a city's health care system would be under siege and the demand for medications would skyrocket. At a certain stage, particularly if the public does not have confidence that the crisis was being well-managed, citizens could mob private clinics, pharmacies, and even veterinarians to get antibiotics and medical attention. Cities plan to assign police

²¹³ Interviews with author: Director, Emergency Services Department (18 May 2000); Paramedic (12 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Physician/EMS Medical Director (13 November 1999); Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999); Physician, Hospital Department of Emergency Medicine (24 March 1999). See also, Bartlett, "Applying Lessons Learned from Anthrax Case History to Other Scenarios," 562.

²¹⁴ Red Cross personnel can conduct health checkups, but are not authorized to give medical treatment. Interviews with author: Physician/University Hospital Department of Emergency Medicine (20 September 2000); Fire EMS Statistician (30 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Commander, US Public Health Service (3 July 2000); Director, Emergency Services Department (18 May 2000); Paramedic (12 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000).

²¹⁵ The report cautions that the medical and legal ramifications of drafting such individuals to help during the crisis must be considered beforehand. This report lays out a template for medical surveillance, medical diagnosis, epidemiological investigation, criminal investigation, mass prophylaxis, residual hazard assessment and mitigation, isolation and quarantine, fatality management, and various logistic and recovery tasks. *Interim Planning Guide: Improving Local and State Agency Response to Terrorist Incidents Involving Biological Weapons*, Biological Weapons Improved Response Program (Aberdeen, Md.: US Army Soldier and Biological Chemical Command, 1 August 2000), 16. On plans to employ medical students: Physician/University Hospital Department of Emergency Medicine (20 September 2000).

²¹⁶ Interview with author: Physician/Director of Health, Public Health Department (20 September 2000).

²¹⁷ Interviews with author: Physician, Division of Disease Control, Public Health Department (8 August 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Director, Emergency Services Department (18 May 2000); Physician/EMS Medical Director (13 November 1999); Toxicologist (9 March 1999).

security details to such sites and the medical outposts. Locals said they would also turn to the National Guard for help with public order and security.²¹⁸

The Bane of Bioterrorism Response Planning

Even in cities where emergency response planners have sketched a framework for a medical response to a bioterrorist attack, one set of issues baffles them. Conceivably, the release of a communicable disease could compel emergency and public health officials to enact serious measures to prevent its spread, including the isolation of people and the quarantine of buildings and even entire sections of a city. These phrases are the bane of emergency planning because in this day and age, it is unimaginably difficult to orchestrate and control the movement of people. The ease of modern transportation and the likelihood that an outbreak may not be detected for several days has led some to question whether quarantine and isolation—the traditional methods for breaking the chain of a communicable disease—continue to be workable propositions. To most Americans, a quarantine is an artifact, something their grandparents did in the days before vaccines conquered polio, measles, and smallpox.

One of the things that would make instituting a quarantine so difficult is that in most states the statutes governing the imposition of such restrictions are overlapping, somewhat contradictory, and outdated. Beginning in the eighteenth century, state legislatures enacted layer upon layer of laws with different structures and procedures for detecting, controlling, and preventing disease, each tailored to impact the affliction sweeping the country at the time. A trio of legal scholars who surveyed the statutes in all fifty states concluded that “[t]hese laws often do not reflect contemporary scientific understandings of disease, current treatments of choice, or constitutional limits on states’ authority to restrict individual liberties.”²¹⁹ This late 1990s survey found only a few states (e.g., Minnesota, Texas) where the statutes had been

²¹⁸ Interviews with author: Director, Emergency Services Department (18 May 2000); Paramedic (12 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); Emergency Preparedness Director, Office of Emergency Services (9 February 1999). During the Topoff drill in mid-May 2000, Denver police and the National Guard told exercise officials that they would be unable to enforce a home quarantine. See Inglesby, Grossman, and O’Toole, “A Plague on Your City: Observations from TOPOFF.”

²¹⁹ Lawrence O. Gostin, Scott Burris, and Zita Lazzarini, “The Law and the Public’s Health: A Study of Infectious Disease Law in the United States,” *Columbia Law Review* 99, no. 59 (1999): 106. According to this survey, most states have two or even three types of communicable disease laws, namely those pertaining to traditional sexually transmitted diseases, those aimed at prevailing diseases of the time (e.g., smallpox, yellow fever, cholera, tuberculosis, syphilis, poliomyelitis, influenza, and, most recently, HIV/AIDS), and general statutes for such noncontroversial contagious diseases as measles and malaria. See pages 102–3, 108. See also, Kristin Choo, “A Plague in the Making: US Lacks Legal Structure to Fight Bioterrorism, Critics Say,” *American Bar Association Journal* (December 1999). Internet: www.abanet.org/journal/dec99/12nterr.html. Downloaded 12 March 2000.

harmonized to create a uniform legal basis for disease control.²²⁰ On 15 March 2000, Colorado also amended its statutes to clarify roles and authority for the control of communicable diseases.²²¹

Cities participating in the MMRS program are required to identify which local official(s) have the legal authority to issue quarantine or isolation orders and state the area(s) of a potential quarantine. These requirements have been met, but only in the most superficial manner. In several cases, the extent of the “plan” states that the local public health officer would decide when and where to execute isolation and quarantine orders. For the most part, cities were dusting off as points of reference quarantine laws that were last used over seventy years ago, but beyond that local authorities had few clues about how to proceed. Some considered it downright unfeasible.²²²

One senior public health official, who has seen any number of draconian steps taken in the name of preserving public health, argued that quarantines have been done before and it should not be such an ordeal to institute one in the future.²²³ However, according to both local officials and legal scholars, enforcing a mass quarantine in this day and age would be an exercise fraught with difficulty. First of all, state jurisdiction on public health matters is widely recognized, but in the face of a possible pandemic, some might argue for a presidential declaration of martial law, which would be an unprecedented act. Almost certainly, a clash would occur between public health and legal officials at the local, state, and national levels about the measures necessary and the entity with jurisdiction to act. Among the matters that would complicate

²²⁰ Gostin, Burris, Lazzarini, “The Law and the Public’s Health,” 108.

²²¹ An Act Concerning the Creation of the Governor’s Expert Emergency Epidemic Response Committee, Col. Rev. Stat. § HB00-1077 (2000). This law created an expert advisory committee to advise the governor, who was given authority to commandeer medical supplies and quarantine areas. This committee met for the first time during the aforementioned mid-May 2000 federal exercise mocking a terrorist attack in Denver involving plague. Aside from the many other lessons that this exercise imparted about the difficulty of forestalling a pandemic, it was clear that since this law transferred some authority for local public health to the state level, more work was needed to integrate this committee into the existing decision making structure. Interviews with author: Senior CDC official (29 August 2000); Toxicologist, Poison Control Center (9 June 2000). See also, Inglesby, Grossman, and O’Toole, “A Plague on Your City: Observations from TOPOFF.”

²²² Among the legal issues that must be addressed is that current quarantine and isolation laws apply to individuals, not groups. Also, there is uncertainty as to whether a quarantine would violate interstate commerce laws by restricting access into and out of areas. Interviews with author: General Manager, Emergency Department (22 September 2000); Director, Emergency Management Division, County Department of Public Safety (19 September 2000); former State Epidemiologist (18 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Commander, US Public Health Service (3 July 2000); Federal Official, Office of Emergency Preparedness, HHS Department (28 June 2000); Commander, US Public Health Service (28 June 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Paramedic (12 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); Commander, Public Health Service (6 May 2000); Senior Official, HHS Department (6 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Police Detective/Bomb Squad member (19 January 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Project Manager, Emergency Management Planning (27 July 1999); Police Lieutenant (23 March 1999); Paramedic/Emergency Planner, Public Health Department (4 February 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999).

²²³ Interview with author: Senior CDC Official (29 August 2000).

imposing a quarantine is that most state statutes apply to individuals, which makes their application to large groups of people impractical. A possible conflict with interstate commerce law exists. Local officials were concerned about the legality of severing all traffic to contain an epidemic, not to mention the uproar this would cause in the business community. Other aspects of a quarantine that elicited lively debate included the level of force necessary to enforce a quarantine and whether to prosecute violators of a quarantine order. With all these policy matters and legal authorities up in the air, interviewees said that cities were far from having operable plans in place.²²⁴

Not only were local officials uncertain about their statutory authority to proceed with a quarantine, they believed that the public would probably not cooperate with compulsory orders to commandeer property, restrict movement of people, or forcibly remove them to designated locations. Traditionally, governments have counted upon the public to comply with public health orders on the basis that the good of the community overrides the rights of the individual. These days, however, citizens get angry at forced evacuations for such visible calamities as hurricanes, floods, and wildfires, not to mention a stay-at-home-order for a microscopic killer that they may doubt is in their midst. Police also questioned whether their colleagues would recognize the authority of the public health officer to declare a quarantine or would even stick around to enforce the order.²²⁵ Finally, some wondered whether there were enough local and state police to quarantine a large metropolitan area in the first place.²²⁶

²²⁴ Interviews with author: General Manager, Emergency Department (22 September 2000); Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Director, Emergency Management Division, County Department of Public Safety (19 September 2000); former State Epidemiologist (18 August 2000); Emergency Planner, Hospital Health Maintenance Organization (15 August 2000); Physician, Division of Disease Control, Public Health Department (8 August 2000); Commander, US Public Health Service (3 July 2000); Federal Official, Office of Emergency Preparedness, HHS Department (28 June 2000); Commander, US Public Health Service (28 June 2000); Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Paramedic (12 May 2000); Emergency Management Specialist, Office of Emergency Management (9 May 2000); Commander, Public Health Service (6 May 2000); Senior Official, HHS Department (6 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Police Detective/Bomb Squad member (19 January 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000); Project Manager, Emergency Management Planning (27 July 1999); Police Lieutenant (23 March 1999); Paramedic/Emergency Planner, Public Health Department (4 February 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999). For a more thorough discussion, Terry P. O'Brien, "Legal Response to a Bioterrorist Event," paper presented at the National Disaster Medical System 2000 Conference, 1 May 2000, Las Vegas, Nevada; and Gostin, Burris, Lazzarini, "The Law and the Public's Health." See also, Inglesby, Grossman, and O'Toole, "A Plague on Your City: Observations from TOPOFF."

²²⁵ "If police officers knew that a biological agent had been released, 99 percent of the cops would not be here. They would grab their families and leave." Interview with author: Police Captain, Special Operations (8 February 1999). Also expressing doubt at the reliability of police in these circumstances: Police Detective/Bomb Squad member (19 January 2000); Fire Captain/Assistant Emergency Management Coordinator (5 January 2000). See also, O'Brien, "Legal Response to a Bioterrorist Event," 46–7, 52–3, 57–8, 67. Commenting on the likelihood that citizens would not cooperate and the fact that police only knew about the authority of the public health officer since his city had endured a quarantine after an anthrax hoax: Police Lieutenant, Tactical Support Office (18 September 2000).

²²⁶ Recounting concern of one state's officials that all of the police in the entire state would be insufficient to quarantine that state's largest city, in an interview with the author: Commander, US Public Health Service (28 June 2000). Similar comments were made by: Police Lieutenant (23 March 1999).

Communications: The Common Problem in Any Disaster Response

A chemical or a biological terrorist attack would create a crescendo of activity among city emergency personnel. In most US cities, this type of crisis would quickly overwhelm the capacity of local communications systems, hindering response effectiveness. At the same time that public safety and health care providers were struggling to reach each other, public officials would be trying to get information to citizens about what had taken place, how local government was responding, and what, if anything, citizens should do for their own well-being. The magnitude of the news story would make for an aggressive media atmosphere. In short, city officials could find communications crumbling around them on every front.

Despite universal recognition among rescuers and health care providers that communications problems are chronic in every sizable emergency, communications is one of the most neglected areas of emergency response. As one veteran put it, “In every disaster we’ve ever had and in every exercise we’ve ever done, there have always been communications problems.”²²⁷ First responders project that in an unconventional terrorist event, field communications channels are likely to be overloaded. Complicating the situation, metropolitan fire, police, and sometimes EMS departments are on different response frequencies, than rescue agencies from the county, nearby cities, and the state. While a city’s emergency response agencies could be linked together, establishing reliable links with outside rescue organizations could be challenging.²²⁸ Noting that his city already had problems working large fires, a battalion fire chief predicted that after an unconventional terrorist attack, communications would “at best be a nightmare.”²²⁹ Some count upon the telephone companies to be able to take up the slack in an emergency, but the fact that “all-circuits-busy” messages are common during a regular work week and ubiquitous on holidays should disabuse that notion.²³⁰

Such would probably be the conditions as city emergency response officials would try to reach off-duty personnel in specialized rescue units, mutual aid partners, county agencies, state, and perhaps federal emergency authorities. Some communications chores would be handed off to the city emergency operations

²²⁷ Interview with author: Chief of Response Division, State Department of Civil Emergency Management (13 April 1999). Even more directly expressed, “communications are woefully underdeveloped,” said the Director of an Emergency Services Department (18 May 2000). Another interviewee noted that communications are “the weak link in disaster medicine.” Interview with author: Medical Toxicologist/Poison Control Center Director (13 June 2000).

²²⁸ Note that when EMS is part of the fire department, they share the same communications channels. Interviews with author: General Manager, Emergency Department (22 September 2000); Deputy Director, Office of Emergency Management (26 May 2000); Director, Emergency Services Department (18 May 2000); Paramedic (12 May 2000); District Fire Chief, EMS Division (2 March 2000); Project Manager, Emergency Management Planning (27 July 1999); Project Manager, Emergency Management Planning (27 July 1999).

²²⁹ Interview with author: Battalion Fire Chief (17 November 1999).

²³⁰ Interviews with author: Medical Toxicologist/Poison Control Center Director (13 June 2000); Senior Official, HHS Department (6 May 2000). See also, Inglesby, Grossman, and O’Toole, “A Plague on Your City: Observations from TOPOFF.”

center, and some could be taken care of the old-fashioned way in the field, with runners between the response agencies. Fire, police, and EMS could then call back down their own channels to relay the requisite instructions.²³¹ While this cumbersome set-up is workable, it also leaves a great deal to be desired.

Several cities have taken steps to improve their communications hardware, putting 800 megahertz radios in field units.²³² To ensure contact with special rescue units, some cities have given team members alphanumeric pagers or 450 megahertz radios.²³³ One city even purchased encrypted cellular telephones to preclude eavesdropping by the media, public, or terrorists.²³⁴ Other emergency responders noted, with some envy, that such hardware improvements were years down the road.²³⁵

Until more effective equipment is in place, several cities planned to avoid a communications breakdown by assigning an amateur radio operator to shadow every major field commander. These ham operators would also be sent to hospitals and the city emergency operations center. In some cities, they are trained in the incident command system. Experience has shown that their flexible communications gear can free up radio frequencies, enable clearer command communications when channels are overloaded, and be especially useful when mutual aid partners are activated. Ham operators have been so essential to one city's emergency response capability that a public health official declared, "I don't know what we would do without them."²³⁶ In other cities, the rescue agencies have stated concerns about operational security if ham radio operators were by their side at such a sensitive time.²³⁷

²³¹ One city has selected five locations within its boundaries to pre-position its emergency operations center in closer proximity to the disaster scene, arranging with the local telephone company to install several hundred telephone lines within a couple of hours after a crisis begins. Interviews with author: FBI Special Agent (12 May 1999). On using the emergency operations center to help resolve communications shortcomings: Director, Emergency Services Department (18 May 2000); District Fire Chief, EMS Division (2 March 2000); Project Manager, Emergency Management Planning (27 July 1999).

²³² Interviews with author: Deputy Director, Office of Emergency Management (26 May 2000); Director, Emergency Services Department (18 May 2000); Registered Nurse/Emergency Planner, Public Health Department (7 April 2000); EMS System Analyst/Paramedic, State Department of Health and Social Services (25 January 2000); Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Chief of Response Division, State Department of Civil Emergency Management (13 April 1999).

²³³ Interviews with author: Battalion Fire Chief/Emergency Services Administrator (15 November 1999); Chief of Response Division, State Department of Civil Emergency Management (13 April 1999).

²³⁴ Interview with author: Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000).

²³⁵ Interviews with author: Paramedic (12 May 2000); Battalion Fire Chief (17 November 1999).

²³⁶ Interview with author: Registered Nurse/Emergency Planner, Public Health Department (7 April 2000). Ham operators work through two organizations, the Radio Amateur Civil Emergency Services (RACES) and ARIES. Interview with author: Ham radio operator (8 February 1999). Others quick to praise ham radio operators: Paramedic (12 May 2000); Battalion Fire Chief (17 November 1999); Emergency Preparedness Director, Office of Emergency Services (8 February 1999).

²³⁷ Interviews with author: Project Manager, Emergency Management Planning (27 July 1999); Ham radio operator (8 February 1999).

While field communications may be messy, they are even worse in the health care system. Hospitals often lack the basic equipment to communicate effectively with field units, each other, health departments, and laboratories. To illustrate the point, one state's public health department requires hospitals to report their bed status every four hours if they go on bypass, anticipating that such reports would be filed via the Internet. However, most of the hospital emergency departments did not even have Internet access and therefore filed reports via facsimile, flooding the fax machine in the state department of health.²³⁸ Staff doctors carry pagers, but caring for a massive number of chemical or biological casualties, plus patients already in hospitals, could tax hospital workers in short order. If emergency officials needed to reach all area doctors, the only alternative for most cities would be to issue a press release.²³⁹ Using the media to ask doctors to volunteer to treat patients with infectious disease "X" before a public announcement of the health crisis has been made has obvious drawbacks.

Sporadically, cities have tried to improve emergency communications with hospitals and public health departments. One city, for instance, linked the hospitals in its metropolitan areas via radio so that all could be reached simultaneously.²⁴⁰ Recognizing that hospital communications are a weak link in the emergency response system, the CDC began awarding grants to build health alert networks between local hospitals and health departments. This grant program, as noted in chapter 4, is small in size. These grants are not aimed at improving inter-hospital communications, which those in the health care community still view as essential to a sound disaster response.²⁴¹

If citizens do not happen to be television watchers or radio listeners, city emergency officials must be ready to reach them quickly and directly.²⁴² Police could go door-to-door, informing people of the need

²³⁸ Interview with author: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000). Hospital communications are equally weak elsewhere. Interviews with author: Physician, Hospital Division of Emergency Medicine (31 May 2000); Registered Nurse/Hospital Disaster Coordinator (4 February 1999). See also, Victoria Garshnek and Frederick M. Burkle, Jr., "Telecommunications Systems in Support of Disaster Medicine: Applications of Basic Information Pathways," *Annals of Emergency Medicine* 34, no. 2 (August 1999): 213–8; Inglesby, Grossman, and O'Toole, "A Plague on Your City: Observations from TOPOFF."

²³⁹ Interview with author: Physician/EMS Medical Director (12 May 1999). See also, Bartlett, "Applying Lessons Learned from Anthrax Case History to Other Scenarios," 562.

²⁴⁰ Interview with author: EMS Superintendent-in-Chief (24 March 1999).

²⁴¹ Interviews with author: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000).

²⁴² One city has arranged for an alert to be broadcast over the National Weather Service system. Interview with author: Project Manager, Emergency Management Planning, Office of Emergency Management (27 July 1999). The urgency of providing information to the public, immediately and continuously, to help cut down on panic and chaos was one of three lessons that Swedish doctors drew from studying the experience of the Bhopal chemical accident. They also emphasized the importance of training rescuers in chemical casualty care and setting up satellite health care facilities so that hospitals would not be overrun. H.G. Lorin and P.E.J. Kulling, "The Bhopal Tragedy—What Has Swedish Disaster Medicine Planning Learned From It?" *Journal of Emergency Medicine* 4, (1986): 311–6.

to evacuate or of special precautions they should take. Information could also be announced from the public address systems on patrol cars, an operation that must be done properly in order to be effective.²⁴³ In urgent situations where police are already stretched thin, door-to-door knocking or public address system caravans may not be prudent. Software systems are available that can dial all of the listed numbers within a geographic area to deliver emergency messages to the public. A city's emergency operations center could activate a direct-call alert system to instruct citizens to stay indoors and seal their homes, sheltering-in-place until a toxic cloud leaves the area. Or, citizens could be told where to go for medical check-ups, vaccinations, and antibiotics. The message delivered could refer citizens to a central number for additional taped instructions or updates about the situation.²⁴⁴

A chemical or biological terrorist attack would generate staggering media interest. When it comes to tragedies, scandals, and celebrities, the press has often gone overboard, but in the late 1990s they also abandoned bedrock rules of journalism (e.g., confirmation from two independent sources) in favor of citing other news reports.²⁴⁵ At a one-day symposium on the topic of press coverage of an unconventional terrorist event attended by some of the country's most prestigious media outlets, the consensus among press representatives was that if a bioterrorist attack occurred in their city, there would be absolutely no holds barred to get the story. If local public health authorities did not promptly volunteer information about the disease concerned and the circumstances of its presence in the city, they noted, the atmosphere between the media and city officials would become very combative and distrustful. Moreover, members of the media said they would not hesitate to pursue any independent leads that such an event was in the offing, stalking hospital wards or any other location that might yield an angle on the story. "The minute I got a whiff that there was an anthrax case in the hospital, I would consider that a huge story." Continued the producer of a major newscast, "If that case was the result of a possible bioterrorist attack, it would be even bigger news. I would be all anthrax, all the time."²⁴⁶ In other words, the distinction between yellow and white journalism would

²⁴³ If the car is driven at a slow constant speed, the message cannot be clearly heard by those inside their homes. Instead, police need to stop the car in the middle of the block while the message is delivered in its entirety, before moving on to the next stop. Interview with author: Police Lieutenant (23 March 1999).

²⁴⁴ Interviews with author: Director, Emergency Management Division, County Department of Public Safety (19 September 2000); Paramedic Operations Supervisor (9 March 1999); Emergency Planner, Office of Emergency Management (8 March 1999). Also, Timothy Shenk, "Don't Call Us, We'll Call You; Reverse 911 Technology Allows Emergency Personnel To Issue Mass Telephone Warnings," *Daily News-Record* [Harrisonburg, Va.], 26 June 2000; Jody Benjamin, "This Police Department Will Make the 911 Calls," *Sun-Sentinel* [Ft. Lauderdale, Fla.], 19 January 1997. Reverse 911 from Sigma/Micro Corporation is one of the services that provides this capability. Utilizing Geographical Information Systems computer mapping capabilities and a phone number database, the \$50,000 system enables emergency personnel to disseminate information to a specific population, determined either geographically or via identification as an interested group (e.g., businesses, crimewatch members) within the database. For further details, see the company's website: <http://www.r911.com>.

²⁴⁵ For example, wretched excess characterized the media's coverage of the O.J. Simpson trial, the deaths of Princess Diana and John F. Kennedy, Jr., and the Monica Lewinsky scandal.

²⁴⁶ Quote from producer of a major news broadcast. This symposium was attended by the author, as well as subject experts and reporters, medical and science writers, editors, and producers. Among the outlets present were CBS television and radio, CNN, *New York Times*, *New York Post*, *Newsday*, and ABC's "Nightline." "Reporting on Weapons of Mass Destruction:

disappear in a nanosecond. The local media would give the story blanket coverage, as would national and international press outlets. Press accounts would be suffocating, but not necessarily accurate or helpful.²⁴⁷

Rescue agencies, mayor's offices, and hospitals recognized long ago the need to be pro-active with the media. These organizations all have public affairs officers, and the potential for lack of coordination among them is great. Each would hold press conferences with the mutual objective of getting helpful information and instructions to the public, but each organization would also have slightly different objectives in mind. For example, from the perspective of the field response agencies, the designated spokesperson's task is to "feed the animals and keep them away" from the disaster scene so that rescuers can go about their jobs.²⁴⁸ Moreover, every agency would also want to show their organization's actions in the best possible light. "Spinning" competitions between different response agencies surfaced in chemical and bioterrorism response drills, and locals predicted that oneupsmanship and confusing information would be even greater during an actual event.²⁴⁹ Sometimes the competition would be intentional, other times inadvertent. Either way, once a garbled message got to the public, the damage would be done. One official recounted botched communications after a flood, when three different public health officials gave contradictory instructions to boil water for two, five, and twenty minutes. Later, when public health officials asked people to report for shots as a precaution against cholera, citizens balked, lacking confidence that health officials knew what they were doing.²⁵⁰

With so many different press spokesmen at work, media coverage could easily become incoherent. A number of cities have begun to lay the groundwork for better press relations, briefing reporters on the problem, inviting them to observe or participate in unconventional terrorism response drills, and even

Responsibility, Reliability & Readiness," Fred Friendly Seminars Inc. and International Advisory Group, 26 July 1999, New York, New York. Note that press requests for immediate disclosure contradict the argument that, given the need to take all possible steps to encourage public calm, the announcement of a bioterrorist attack should come from the president of the country or the afflicted state's governor, flanked by authorities that Americans know and trust on public health matters (e.g., former Surgeon General C. Everett Koop). This recommendation was made both at the seminar and in an interview with author: Senior Official, HHS Department (6 May 2000).

²⁴⁷ On the aggressiveness of reporters during disasters, in an interview with the author: Chief of Response Division, State Department of Civil Emergency Management (13 April 1999).

²⁴⁸ Interview with author: Deputy Coordinator, Fire Emergency Preparedness and Disaster Services (3 February 2000).

²⁴⁹ In one of the three cities where the Topoff drill was staged in mid-May 2000, the FBI tried to take control of media relations early in the exercise, but was challenged by federal public health officials who believed that they were the proper authorities to impart public health and safety messages. Local officials were pushed to the side by the federal agencies concerned. Interview with author: former EMS Supervisor/Paramedic (12 July 2000). During one city's biological tabletop exercise, the participating agencies attempted to game relations with the media, but could not agree on a lead media agency or the messages to be communicated. Interview with author: Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000).

²⁵⁰ Interview with author: Senior Official, HHS Department (6 May 2000).

including them in disaster response planning.²⁵¹ One city's fire department holds a one-day training camp for press representatives, a strategy that allows rescuers to get a handle on press activities because the local media must designate on-scene and emergency operations center reporters.²⁵² Still, among those in the emergency response community, the creation and implementation of a comprehensive media strategy was recognized as a "glaring deficiency."²⁵³ Unless hardware and interpersonal communications problems are fixed, local, state, and federal officials would end up giving a disjointed message to the public at the very time it would be essential to provide the most cohesive message possible.

²⁵¹ Interviews with author: Fire EMS Statistician (30 August 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Paramedic (12 May 2000); MMRS Coordinator, Fire Department (9 May 2000); District Fire Chief, EMS Division (2 March 2000); Detective/Bomb Squad (19 January 2000); Captain/Assistant Emergency Management Coordinator (5 January 2000); Battalion Fire Chief (15 November 1999); Physician/EMS Medical Director (13 November 1999); Assistant Director, Office of Emergency Management (23 March 1999); Emergency Preparedness Director, Office of Emergency Services (9 February 1999); Director, Office of Emergency Services (4 February 1999).

²⁵² Local media outlets are allowed to send one reporter apiece to the scene and the emergency operations center, which cuts down on the number of reporters facing rescuers and emergency managers. The one-day boot camp also ensures that the reporters know the basics of fire, hazmat, rescue operations, and unconventional terrorism response. Interview with author: Fire EMS Statistician (30 August 2000).

²⁵³ Interview with author: Police Detective/Bomb Squad member (19 January 2000). Also on this point: Medical Toxicologist/Poison Control Center Director (13 June 2000); Physician, Hospital Division of Emergency Medicine (31 May 2000); Director, Emergency Services Department (18 May 2000); Director of an Emergency Services Department (18 May 2000); Registered Nurse/Chief, EMS Division, State Department of Public Health (3 February 2000); Chief of Response Division, State Department of Civil Emergency Management (13 April 1999); EMS Superintendent-in-Chief (24 March 1999); Registered Nurse/Hospital Disaster Coordinator (4 February 1999). See also, Garshnek and Burkle, Jr., "Telecommunications Systems in Support of Disaster Medicine," 213-8.