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The Role of Hospitals in Disaster

Mary W. Chaffee and Neill S. Oster

INTRODUCTION

When the first rain began to fall in Houston, Texas, in June 2001, did hospital staff know they would soon be providing care for hundreds of patients without electrical power or running water in flooded hospital buildings?

On April 19, 1995, did the emergency department staff arriving for the day shift at 13 Oklahoma City hospitals know that a former soldier was driving a rented van filled with 4000 pounds of ammonium nitrate toward the Murrah Federal Building and that they would soon be faced with 324 bombing victims?

In 1984, did restaurant patrons in Wasco County, Ore., have any idea, as they selected food from salad bars, that they would soon be evaluated in hospitals for profuse, watery diarrhea from intentional food contamination by a religious cult?

In March 2003, did the 11 Toronto healthcare workers who were caring for patients with respiratory symptoms know they would soon become infected with severe acute respiratory syndrome (SARS)?

We can be quite certain that none of them knew. The capricious nature of disaster implies victims and responders are generally caught unaware.

But we do *know* some things. We *know* there will be hurricanes, typhoons, tornadoes, earthquakes, mudslides, fires, and blizzards this year. We *know* people will pick up firearms, make bombs, and inflict pain and suffering on others. We *know* there will be casualties from train accidents, cars crumpled in chain reactions, building collapses, and explosions. We *know* infectious diseases will do what they do best: spread, sicken, and kill. We *know* terrorists have not given up their violent assaults. We *know* there will be mental health symptoms in accident survivors and the caregivers who respond to their needs.

It is the *hospital*, at the heart of the health system, that will receive the injured, infected, bleeding, broken, and terrified from these events. We *know* the victims will seek life-saving care, comfort, and relief at hospitals, but many U.S. hospitals continue to prepare for disaster as though it will not happen to them.

Hospital Capacity in the United States

There are more than 5700 hospitals in the United States that form a diverse patchwork of healthcare services.

U.S. hospitals vary greatly by geographic location (urban, suburban, and rural); financial and management structure (for profit, not-for-profit, private, public); type of care (general medical services or specialty care, such as psychiatric or pediatric); and government affiliation (Department of Defense, Veterans Health Administration, or Public Health Service). Any of these hospitals may be called on to respond to the next disaster or may be the victim of a disaster. Many experts believe that these hospitals are not adequately prepared to respond effectively (Table 5-1).

HISTORICAL PERSPECTIVE

The Role of the Hospital in Society

The hospital was of little significance in American healthcare before the Civil War. Only 178 hospitals existed in 1873 when the first survey was conducted—a time when no proper gentleman or lady would venture into a hospital by choice.¹ The murky medical practices of the 1800s offered little that couldn't be found in homes, and physicians had little in their armamentarium to change the course of disease and injury. However, discovery and scientific advance changed that. Effective anesthesia, surgical antisepsis, antibiotics, the x-ray, and other advances turned the hospital into a place of comfort, hope, and healing. The 20th-century hospital became a sophisticated financial institution, the core of medical education, and the site of dazzling technological display. Medical advances offered aid not only to the chronically ill but offered hope to those who suffered acute trauma or medical or psychiatric emergency.

The Effect of Disaster on Hospitals

Past events illuminate the variety and complexity of demands placed on a hospital in a disaster:

- *Hurricane Katrina*. The flooding in the wake of Hurricane Katrina in 2005 left hospitals in greater New Orleans, Louisiana, and Mississippi in crisis. Patients and staff were trapped in facilities without essential services, resulting in the largest mass hospital evacuation in U.S. history.

TABLE 5-1 SNAPSHOT OF 2005 U.S. HOSPITAL CAPACITY*

Total U.S. Hospitals	5764
U.S. community hospitals	4845
U.S. federal government hospitals	239
Institutional hospitals (e.g., prisons, colleges)	23
Nonfederal psychiatric hospitals	477
Nonfederal long-term-care hospitals	180
Total staffed U.S. hospital beds	965,256
Staffed community hospital beds	813,307

*Source: American Hospital Association. Hospital statistics, 2005 edition. Available at: www.hospitalconnect.com/aha/resource_center/fastfacts/fast_facts_us_hospitals.html.

- *Floods caused by tropical storm Allison in Houston, Texas.* In June 2001, 3 feet of rain from tropical storm Allison fell in the Houston area, causing the flooding and complete disruption of services at the University of Texas Health Science Center and its clinical affiliate hospitals. One of the hospitals, Memorial Hermann Hospital, experienced failure of every hospital system. The main and emergency power generators and communications system failed and personnel could not come, go, or be reached. The water supply failed, and the sewer system stopped functioning. The vertical evacuation of 570 patients was conducted, and the hospital was closed for 38 days. The storm flooded an area not considered to be at risk.²
- *The Northridge, Calif., earthquake.* An earthquake struck Northridge on Jan. 17, 1994, damaging a number of area hospitals. Six hospitals evacuated patients immediately: four of these evacuated all inpatients, and two evacuated some. Five of the facilities evacuated the most severely ill first, but the sixth, fearing imminent structural collapse, evacuated the healthiest patients first to permit the evacuation of the largest number of patients in the shortest period. That facility moved 334 patients from buildings to open areas in two hours. All hospitals used improvised transport devices, including backboards, blankets, and mattresses.³
- *The 2001 World Trade Center bombing.* Bellevue Hospital, a level-1 trauma center in New York City, is approximately three miles from the World Trade Center. Ninety patients presented within the first five hours after the incident; a total of 194 were triaged and treated within the first 24 hours. Despite best efforts, the hospital lost track of patients, ran out of supplies, and struggled with coordination of physicians to ensure rest and safety.⁴ New York University Downtown Hospital, a few blocks from the disaster, received 350 patients within the first two hours of the World Trade Center attacks. Many patients arrived on foot.⁵ St. Vincent's Catholic Medical Center executed its disaster plan within minutes of the bombing, as they had done during the 1993 World Trade Center bombing. On Sept. 11, 2001, St. Vincent's Hospital

treated nearly 800 victims. Because St. Vincent's shared water lines with the World Trade Center and telecommunications lines were routed through the World Trade Center, function of these systems was affected. Crisis counseling, pastoral care, and mental health services were immediately made available for victims, families, rescue workers, and staff.⁶

- *The Oklahoma City Bombing.* After the explosion of a bomb at the Murrah Federal Building, 168 were killed and 700 were injured—388 with acute injuries. The first patients arrived in emergency departments within 15 minutes, and the hospitals within 1.5 miles of the blast site received the greatest number of victims.⁷
- *The Rhode Island nightclub fire.* On Feb. 20, 2003, fire erupted in a crowded nightclub in West Warwick, R.I. Almost 100 were killed immediately, and nearly 200 were injured. Kent County Hospital, a 350-bed community hospital 2 miles from the site of the fire, received 40 victims within an hour; 25 were rapidly intubated. The hospital ran out of critical supplies and ventilators and struggled with supporting family members, poor communications from the scene, and pain management.⁸ Ultimately, 16 hospitals in Rhode Island and Massachusetts received 196 burn victims; this included the Shriners Hospital for Children, which received and treated 16 adult victims.⁹

The potential impact of disaster is staggering. The release of 40 tons of methyl isocyanate from the Union Carbide factory in Bhopal, India, in December 1984 exposed more than 500,000 to the deadly gas and killed about 6000 in the first week after the release. In September 1987, workers scavenging a dismantled cancer clinic in Goiania, Brazil, took home a source containing cesium-137. They sold it to a junkman who showed the glowing item to friends and neighbors. Once radiation exposure victims presented to hospitals, and the release became well known, hospitals were overwhelmed. Although 250 were actually exposed and 28 showed signs of radiation sickness, 112,800 people were evaluated. When the Aum Shinri Kyo cult placed sarin on five trains in the Tokyo subway system on March 20, 1995, 4000 people made their own way to hospitals, 641 were transported by authorities, and 245 hospital staff and rescue personnel were contaminated due to poor or nonexistent decontamination procedures.¹⁰

Evolving Perspective on the Health System Role in Disasters

On Sept. 11, 2001, when U.S. hospitals and healthcare professionals were confronted with the worst attack on American soil, and again during the anthrax attacks along the Eastern Seaboard, individuals and organizations responded heroically. A powerful change in thinking, also called a *paradigm shift*, occurred after the terror attacks: the health system came to be viewed as a foundation of national security. Another perspective has changed as well. In the event of a disaster, Emergency Medical Services (EMS), police, and fire have long been recognized as first responders. However,

just recently, hospitals also have been designated as first responders—and first receivers.

The value of the hospital in national security has been increased, and hospitals are recognized as safe havens in communities, the public expects hospitals to be prepared to care for their needs, and the hospital is now recognized as a first responder in emergencies. However, hospitals remain significantly underprepared to respond as effectively as the public expects. Most importantly, preparedness is at direct odds with productivity. Daily operating requirements stretch most hospitals' resources. Allocating funds to improve emergency response capabilities that may never be used could be viewed as foolhardy. Community integration is now seen as necessary, but hospitals (other than those in networks or that are government facilities) have had few reasons to build healthy relationships with other hospitals in their communities. To meet the needs of communities in a disaster, business competitors must work as partners.

Public Expectations

Hospitals play a vital role in the health, social structure, and economic life of a community. Patients expect hospitals, and health system workers, to be available to provide care for them in all circumstances. A level of preparedness that was viewed as adequate in the past is no longer seen as acceptable. To be more highly prepared and to be able to respond effectively, hospitals must make substantial investment in equipment, training, facilities improvements, and supplies.¹¹ Hospitals depend on public trust; poor performance during a disaster could be financially crippling to a facility. Rubin¹² writes that hospitals are expected to handle whatever they receive and do it right the first time.

CURRENT PRACTICE

Sources of Hospital Vulnerability

Hospitals are vulnerable to the stresses of disaster responses due to a number of inherent characteristics:

- *Complexity of services:* Hospitals are facilities that provide healthcare but must also function as laundromats, hotels, office buildings, laboratories, restaurants, and warehouses.
- *Dependence on lifelines:* Hospitals are completely dependent on basic public services: water, sewer, power, medical gases, communications, fuel, and waste collection.
- *Hazardous materials:* The hospital environment contains toxic agents and poisonous liquids and gases.
- *Dangerous objects:* Heavy medical equipment, storage shelves, and supplies can fall or shift during an event such as an earthquake.¹³

Forces Influencing Preparedness

Multiple forces have placed hospitals in a precarious preparedness posture. The capacity of the health system

has been scaled down to a bare minimum to cut operating costs. Emergency departments are crowded with the uninsured and the underinsured who have no other access to care. The nursing workforce has withered, and physicians have left practice due to uncontrolled liability insurance costs.

Surge Capacity

Many hospitals determine their surge capacity by the number of patients they could comfortably care for using standard spaces, quality care standards, and additional teams of personnel to help. In reality, a disaster is not going to comply with the limits of hospital capacity. If 300 bombing victims arrive at a 50-bed community hospital, spaces will need to be converted and used that planners may have never imagined, such as chapels, hallways, and offices. Nurses accustomed to a certain nurse-to-patient ratio may find the ratio in a disaster much higher and have to adapt practice accordingly. Surge capacity must not be viewed only as the number of beds or spaces that can be allotted to care for patients, but it must include all supporting hospital services that are involved in patient care.

Critical Elements in Hospital Preparedness

If hospital services fail during a disaster, the hospital fails the population depending on it. The population includes not just the victims of the disaster, but the others presenting for needed care—women preparing to give birth, patients with chronic disease exacerbation, and children with lacerations that need sutures. A vital hospital emergency management program acts as an insurance policy that increases the chances of continued operations under difficult circumstances. An effective hospital emergency management program guides the development and execution of activities that mitigate, prepare for, respond to, and recover from incidents that disrupt the normal provision of care.¹⁴ The program should include the following components:

- *Emergency manager:* The emergency manager is the primary point of leadership in the development, improvement, exercise, and execution of the hospital's emergency management plan.
- *Emergency management plan:* The plan identifies the hospital's response to internal and external emergencies. Deliberate (advance) planning permits the development of strategies while the organization is not under pressure to react.
- *Executive leadership:* Hospital executive leadership charts the course for an organization. A hospital that lacks executive leadership committed to emergency preparedness will be significantly hampered in its efforts.
- *Strategic planning:* The hospital's strategic plan is the blueprint that guides all efforts to achieve its mission. It is critical that emergency management and preparedness efforts are woven into strategic planning.
- *Emergency management committee:* Extremely broad membership is desired to ensure all hospital

operations that will be stressed in a disaster are integrated and well prepared.

- **Hazard vulnerability analysis (HVA):** The HVA is a tool used to assess the risks in a specific environment. The emergency management plan can be tailored to address the hazards most likely to affect hospital operations.
- **Vulnerability analysis:** Every aspect of hospital operations that will be depended on in a disaster should be assessed to determine whether there are weaknesses present that fail when stressed. Hospitals in the U.S. Navy Medical Department and a number of civilian hospitals in New York have had their level of preparedness assessed using the Hospital Emergency Analysis Tool (HEAT). The HEAT examines more than 230 factors that contribute to effective emergency preparedness and response. After the systematic analysis by a team of experts, the hospital receives an after-action report that documents strengths and weaknesses and permits the development of a strategic plan to improve preparedness.¹⁵
- **Staff training, exercise, and continuous improvement:** The Joint Commission on Accreditation of Healthcare Organizations requires hospital staff members involved in the execution of the emergency management plan to receive orientation and education relative to their role in an emergency. Exercise of the emergency plan is also required. Lessons learned should be integrated into plans to continuously revise them.

Hospital Preparedness Philosophy

A commitment to the following philosophies will enhance hospital emergency preparedness:

- **Imagine the unimaginable:** When flood waters rise in a community, when a tornado touches down and demolishes an elementary school, when a disgruntled hospital employee opens fire with an automatic weapon in the emergency department, when a passing train derailed and spills toxic chemicals, or when a wild-fire closes in, it is too late to update an old plan, train staff to respond effectively, check phone numbers, and stock disaster supplies. Disaster complacency—believing a problem won't happen to you or your hospital—is a significant threat to effective planning and response.
- **Protect the staff:** Only a true obsession with self-protection will ensure that staff members are not injured or become ill during disaster response. Adequate stockpiles of gloves, masks, and other equipment must be available, along with training and leadership commitment to self-protection policies.
- **Build in redundancy:** Expect the primary plan to fail and build in alternatives to every emergency measure.
- **Rely on standard procedures whenever possible:** People perform best in unusual situations when they perform activities that closely mirror what they do under normal conditions.
- **Maintain records:** Patient care records are critical to obtaining reimbursement for disaster care provided.

- **Plan to degrade services:** Normal levels of services cannot be maintained during disaster response. Identify services, such as elective surgery, that can be temporarily curtailed or minimized so that personnel and resources can be reassigned.

The Federal Role in Hospital Emergency Preparedness and Response

The federal government has implemented programs to augment local and state capabilities when they are overwhelmed.

The National Disaster Medical System

The United States has a well-established emergency medical safety net: the National Disaster Medical System (NDMS). The NDMS has two primary capabilities designed to enhance disaster medical response. The first is specialized disaster response teams who augment the medical emergency response at the site of disaster. The second NDMS capability is a plan to share the inpatient bed capacity of the civilian and federal health systems in the event either system is overwhelmed with patients requiring inpatient care.

NDMS federal coordinating centers (FCCs) play a regional role in maintaining a supply of NDMS hospital members and providing training and exercises. When the NDMS is activated, FCCs coordinate patient reception and distribution of patients being evacuated.

Hospitals enter into a voluntary agreement to participate in the NDMS. They must be accredited and generally have more than 100 beds. The agreement commits a hospital to provide a certain number of acute care beds to NDMS patients; however, it is recognized that hospitals may or may not be able to provide the agreed-upon number of beds. Hospitals that receive NDMS patients are reimbursed for care by the federal government.¹⁶

The Strategic National Stockpile

The Strategic National Stockpile (SNS) was established in 1999 as the National Pharmaceutical Stockpile. It is now managed by the U.S. Department of Homeland Security and serves as a national repository of antibiotics, chemical antidotes, antitoxins, intravenous therapy, airway management equipment, and medical/surgical items. The stockpile is designed to supplement local agencies that are overwhelmed by a health emergency.

The Noble Training Center

The Noble Training Center in Anniston, Ala., (on the site of the former Fort McClellan army base) is the only hospital facility in the United States that trains health-care professionals in disaster preparedness and response. The Department of Homeland Security operates the Noble Training Center, which offers a variety of training programs, including one for hospital leadership. More

information is available online at: <http://training.fema.gov/emiweb/ntc/>.

Even though the federal government has many emergency response assets that can help in the response to an emergency, experience has shown that hospitals must be prepared to be self-sufficient for 24 to 72 hours after an event.¹⁴

Critical Elements in Hospital Disaster Preparedness

A comprehensive hospital emergency management program must address a number of critical elements to adequately protect patients and staff and permit the facility to continue to operate. These are discussed in the following.

Incident Command

Just as one team leader is necessary for a controlled response to a cardiac arrest, an organized approach is essential to a successful hospital-wide emergency response. The Hospital Emergency Incident Command System (HEICS) is designed to provide that coordination. Developed and tested in Orange County, Calif., in 1992, it provides structure to response. HEICS uses:

- A reproducible, predictable chain of command
- A flexible organizational design that can be scaled to the scope of the problem
- Checklists for each position to simplify response and carefully define each task
- A common language that permits communication with outside agencies

Emergency Operations Center (EOC)

The EOC will serve as the command post for operations during an emergency response. It should be fully operational and integrated into local and county emergency operations (Box 5-1).

Exercises, Drills, and Training

Hospital disaster drills have often been treated as annoyances and are planned in ways to render them futile. Exercises are generally announced (unlike actual events), planned during regular business hours, and rarely include all hospital operations that will be affected by an actual event. Hospitals are encouraged to drill individual units—frequently and during nights and weekends—and then build up to full, functional exercises involving management of moulaged “casualties.” Community participation is critical to identify elements that work or that need fine-tuning. Only through exercise will the plan be adequately stressed so that failure points are identified.

Essential Services and Facilities Engineering

The facility’s structural integrity and essential services are an often overlooked part of preparedness. In 2003 a

BOX 5-1 RECOMMENDED EQUIPMENT AND SUPPLIES FOR A HOSPITAL EOC

Location

- Secure interior space; windows not desirable
- Alternative, equipped space in distant part of complex or building in the event the primary EOC is damaged or disabled

Equipment

- Incident command gear to identify EOC staff (vests, ball caps)
- Computers with Internet access
- Dedicated telephone lines
- Communications-on-wheels (COWS)
- Two-way communications (400 MHz, 800 MHz)
- Fax
- Television with cable access
- Refrigerator
- Radio
- Bull horns
- Barrier tape
- Flashlights and batteries
- Back-up power generator
- Chalk board, dry-erase board, or other means of communicating to EOC team member

Information

- Hospital emergency management plan
- Reference materials (emergency response, clinical references, hazardous materials)
- Emergency reference contact numbers/e-mail addresses/fax numbers for local emergency response agencies (police, fire, emergency medical services, office of emergency management, department of health)
- Emergency contact information for national resources, including Centers for Disease Control and Prevention (CDC), Radiation Emergency Assistance Center/Training Site (REAC/TS), Agency for Toxic Substances and Disease Registry (ATSDR), Environmental Protection Agency (EPA), and National Response Center
- Staff notification information (phone contact numbers)
- Memoranda of understanding/agreement (MOU/MOA) with agencies and vendors
- Local and regional maps that include utility stations, hyperbaric capability, emergency medical services, police departments, fire stations, burn units, and other critical infrastructure

major power blackout in the northeastern United States and Canada demonstrated the impact of the loss electrical services. It is recommended that every hospital:

- Possess emergency power generating capacity for 3 to 4 days’ duration
- Perform annual load testing on the generator(s)
- Maintain the water supply and an alternative water supply in secure areas in sufficient quantity to support all services (sanitation, hygiene, laundry) for 3 to 4 days
- Maintain medical gases in a secure location and have a 3- to 4-day supply for the hospital
- Configure the heating-ventilation-air conditioning

(HVAC) system so that it can be shut down and, ideally, so that specific zones can be manipulated to control airflow in the building in case of contamination

- Maintain a fuel source for full-load demand for 3 to 4 days' duration
- Develop a plan for the management and disposal of increased volumes of contaminated waste

Physical Security

Maintaining the physical security of the structure is important on a daily basis but becomes more of a challenge during a disaster. To ensure that the environment remains safe, egress must be controlled. Additional elements of the physical security plan should include the following:

- A security force with full-time security responsibilities; the force should have undergone criminal background checks and professional law enforcement training.
- All entrances and exits should be controlled, monitored, and capable of being locked.
- The hospital should be able to perform perimeter security protection ("lockdown") within minutes of notification.
- Hospital staff should be trained and drilled on the performance of lockdown.
- Hospital leadership should know what triggers the execution of a lockdown procedure.
- A plan should exist for supplementing security staff in a disaster.

Situation Report (Rapid Needs Assessment)

It is critical that a hospital be able to rapidly assess the impact of a disaster on its operations and communicate the status to leadership in a situation report (often referred to as a "sitrep"), or a rapid needs assessment (RAN). The assessment should, at a minimum, include the following:

- The extent and magnitude of the disaster and the scope and nature of casualties
- The status of operations and any disrupted critical services
- The impact of disruptions on operations and the ability to sustain operations¹⁷

Staff Notification

Hospital staff must be able to receive timely and accurate notifications in a disaster, including when and where to report and for how long and other essential information. Contact information for all staff members must be continuously updated and tested. Additionally, the facility must be able to receive warnings and notifications from external agencies and be able to send warnings.

Triage System

Triage is performed daily in emergency departments, where the most critical are treated first. But during a dis-

aster, triage procedures must adapt to become like what is used on the battlefield, where the greatest good is offered to the greatest number. Multiple disaster triage systems exist, including START (simple triage and rapid treatment), ID-ME (immediate, delayed, minimal, expectant), and MASS (move, assess, sort, and send). It is important that a hospital use a system that is consistent with what is being used by services delivering patients to the facility. Whatever system is selected, there must be predisaster training and exercises.

Alternative Triage Area

When casualties present to an emergency department in numbers that overwhelm the facility, an alternative area must be available to manage overflow. The alternative triage area should be lit so that it can be used at night, weatherproofed, and temperature-controlled.

Risk Communications and Media Management Plan

A plan for working with the media will be needed. It is not recommended that media personnel be permitted access to a hospital during a disaster, but rather be provided regular, factual updates on activities and the status of the facility at a predetermined meeting place. Risk communications involve using credible experts to deliver carefully worded messages to communicate most effectively in a high-stress, low-trust environment, such as a disaster. Preparing hospital leaders in risk communications principles will ensure that they are able to communicate effectively to the public via the media.

Disaster Mental Health Services

There is conflicting evidence about the value of certain types of mental health services in the wake of disaster, but it is clear that every disaster creates emotional trauma victims. Primary victims are those who have been directly affected by the disaster. Secondary victims are rescue workers in whom symptoms develop, and tertiary victims are relatives, friends, and others who have been affected. The critical incident disrupts a victim's sense of control as daily life is abruptly changed.¹⁸ Hospitals must plan for providing mental health services to disaster victims but must also consider the needs—acute and long-term—of the hospital staff who attempt to respond to an overwhelming event. It is recommended that hospitals have trained crisis intervention teams that are well integrated into the emergency management plan.

Evidence and Crime Scene Management

In the event of an intentional act that results in mass casualties, not only must a hospital care for the victims, but it has a critical role in bringing perpetrators to justice. Hospital staff members require training in proper management of potential evidence—in both collection and preservation. Evidence collection containers, including 50-gallon drums for patient decontamination

run-off, should be available as well as bags to preserve other types of evidence. Law enforcement agencies and forensic departments can provide training and guidance. Staff members should be familiar with and follow procedures for maintaining chain of custody for evidence that is collected during patient care activities.

Food Services

A disaster will place significant demands on the food service system of a hospital. The adequacy of food supplies for patients and staff should be evaluated. Because a hospital may need to be self-sufficient for several days in a disaster, a 3- to 4-day supply of food products is advisable. Food service personnel should be included in disaster exercises.

Role of Volunteers

Volunteers may or may not be of assistance, depending on their relationship with the hospital and their background. A volunteer pool that consists of individuals who serve regularly at the facility, are familiar with standard procedures, and participate in exercises can add valuable manpower to a disaster response effort. On the other hand, disasters will draw volunteers who wish to assist, a phenomenon known as “convergent volunteerism,” in which unexpected and uninvited healthcare workers arrive and wish to render assistance at a large-scale incident.¹⁹ These “freelancers” may cause problems or may even be impostors.

Disaster Supplies

Despite “just-in-time” supply schedules and empty warehouses, hospitals should maintain dedicated disaster supplies and arrangements for rapid resupply in the event of a disaster. Disaster response will rapidly deplete critical supplies—administrative as well as clinical. Conducting realistic exercises will help with the determination of the adequacy of stock and can be done without opening actual supplies so they can be restocked. Disaster supplies can be rotated into the daily-use stream to ensure stock does not expire.

PITFALLS

Experience with disasters has demonstrated a number of predictable pitfalls that occur in hospital disaster response.

Distribution of Casualties

Because immediate on-scene control of a disaster is chaotic and communication is often problematic, patients will present to the closest hospital available. This often leaves other nearby facilities with capacity and personnel that go unused.

Personal Protective Equipment

Hospital personnel must be experts in protecting themselves, or they will become part of the problem and fur-

ther stress the facility. Some controversy exists over the level of protection needed in certain environments, but it is clear that masks (N95) and gloves (latex or nonlatex) will prevent transmission of biological agents.

Communications

Communications failure has often been identified as a predictable failure in disaster response. Hospitals need to examine both internal communications systems (with staff and patients) and with external agencies. Multiple layers of redundancy are essential to deal with expected failures and include the use of 800-mHz radios, dedicated trunk lines in the emergency operations center, two-way communications for hospital units and essential personnel, communications-on-wheels (COWS), and access to amateur radio (Ham) operators. The last resort is using runners who carry messages.

Emergency Patient Decontamination

Hospitals must be able to identify and decontaminate patients who have been exposed to radiation or a compound that poses a threat to the patient’s health and the safety of the facility. If the hospital depends on an external agency or has decontamination equipment that requires time to set up, an immediate alternative must be in place, such as a hose and hose bib outside of the emergency department. Consideration should be given to patient privacy, managing patient valuables and clothes, and handling weapons brought into the hospital. A trained, exercised, and well-equipped team will be the foundation of successful efforts.

Child Care

Hospitals will benefit from having a plan to care for children and other dependents of staff. In a disaster, staff will be called on to work extended hours, and usual family care arrangements may be unavailable.

Patient Admission, Identification, and Tracking

The creation of emergency patient admission packs that are maintained with disaster equipment will facilitate the admission of a large number of patients. If an automated patient tracking system is used, a back-up manual system should be available. All systems should be able to manage unidentified (John and Jane Doe) patients.

Mass Fatalities

Many hospitals have wholly inadequate or nonexistent plans to manage mass fatalities. Morgue space is generally limited in most facilities, so additional surge capacity must be identified in advance. Arrangements for refrigerated storage trucks, refrigerator space, and other alternatives, including ice rinks, should be addressed with socially sensitive plans. Complex cultural and religious issues may come into play in the event that there are contaminated remains and should be examined in advance.

Disaster Pharmaceuticals

Emergency drugs must be available at the point of care. Often they are secured in pharmacy departments or warehouses, resulting in precious minutes of life-saving time being lost as personnel try to locate and obtain critical medications. In addition to drugs needed to respond quickly to nerve agents and other emergency situations, stockpiles of antibiotics should be maintained to provide prophylaxis to patients and staff.

CONCLUSION

In a disaster, patients converge on the place they know they can obtain care—the hospital—and they arrive using any means possible. Furthermore, with the victims of disaster, come their families, loved ones, and the media—all who have very important needs that must be addressed. Hospitals can no longer approach disaster planning with a minimalist attitude that relies heavily on luck and belief that it will be someplace else that gets hit by the disaster.

The hospital that received the most patients from the Rhode Island nightclub fire got lucky—the victims began arriving during a change of shift so there were two shifts of nursing staff available. However, the hospital also attributes its effective response to having drilled critical departments and procedures.

BOX 5-2 HOSPITAL PREPAREDNESS AND RESPONSE RESOURCES

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- **The Hospital Emergency Incident Command System.** Available at: <http://www.heics.com/>.
- **The American Academy of Experts in Traumatic Stress.** Available at: <http://www.aets.org/>.
- **The International Critical Incident Stress Foundation, Inc.** Available at: <http://www.icisf.org/>.

Emergency planning is the backbone of preparedness, but events will occur in each disaster that demand creative responses under pressure. This ability to respond flexibly is known as *planned innovation*. Good plans will use general “all hazards” templates for disaster management but will permit independent initiative and a tailored response to a specific situation.²⁰

The U.S. health system appears to be emerging from the dark ages of emergency planning. A minimalist attitude of preparedness was acceptable in the past despite the regular occurrence of natural disasters. The threat of terrorism and the resulting health system impact have stimulated investment in research, a resurgence of disaster training in nursing and medical schools, and visionary projects such as ER One. ER One is a national prototype for a next-generation emergency department. Located in Washington, D.C., it is developing new approaches to the medical consequences of terrorist attacks, natural disasters, and emerging illnesses. More information is available online at: <http://er1.org>.

The next phase of hospital emergency management will be a renaissance if creative planning prevails over naysayers, if resources are applied to priority preparedness activities, and if healthcare leaders are committed to ensuring that all who depend on hospitals will receive the care they need in a disaster (Box 5-2).

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