Disasters follow no rules: Preparing your hospital for disaster response

Tony Forgione, LPN

On October 18, 1989, an earthquake, registering 6.9 on the moment magnitude scale, hit the San Francisco Bay Area of California. The quake lasted only 15 seconds, but caused severe structural damage throughout the Bay Area, including the collapse of portions of double-decker highways, packed with commuters. Sixty-three people were killed and 3,757 were injured in the disaster.

LEARNING OBJECTIVES

- Evaluate a hospital's ability to meet disaster preparedness requirements
- Understand your role as a medical professional in a disaster scenario
- Compare and contrast different types of disasters and their impact
- Evaluate the chain-of-command structure during a mass casualty incident
- Recognize the challenges a hospital will face during a sustained surge

Disasters can be divided into two major categories: *natural disasters*, which include hurricanes, earthquakes and floods; and *manmade disasters*, such as industrial catastrophes and terrorism.

No one can predict the complexity, time or location of the next disaster, however, manmade disasters, especially those involving terrorism, have proven to be the most challenging disaster threat for medical providers due to the unpredictability of the incident and the number of casualties involved.

Today's terrorists have a wide spectrum of threats available to them. They do not necessarily have to kill people to achieve their goals. They just have to create a climate of fear and panic that will overwhelm the health care system. A prime example is the Saran gas attack in Japan in 1995. Of the 5,000 admissions to hospital emergency departments, only around 500 patients were actually suffering from the physical effects of Saran. The remaining patients were all suffering from psychological stress related to the incident.[1]

WHAT IS A MASS CASUALTY INCIDENT?

On April 19, 1995, a 5,000-pound truck bomb detonated in front of the Alfred P Murrah Federal Building in Oklahoma City, just after 9 a.m. The blast damaged or destroyed 324 buildings within a 16-block radius, creating a crater 30-feet wide and eight-feet deep. There were 168 fatalities and 853 people injured in the explosion.

A mass casualty incident (MCI) is an event that produces enough casualties to disrupt the normal functional capacities of the affected community. The severity and diversity of injuries, in addition to the number of victims, is a major factor in determining whether or not an MCI will overwhelm the local medical and public health infrastructure.

There is a myth that all disasters are different, but the reality is that there are common, basic medical and public health issues shared by all disasters, regardless of their etiology.

FEMA

A National Guardsman and a fireman work side by side in the aftermath of the Oklahoma City bombing.

Medical issues include:

- Search and rescue
- Triage and initial stabilization
- Definitive care
- Evacuation

Public health issues include:

- Water
- Food
- Shelter
- Sanitation
- Transportation
- Communication
- Endemic and epidemic disease
- Security and safety[1]

Search and Rescue

Local population and assets close to the disaster are the initial search and rescue resources. In disasters involving large numbers of victims trapped in collapsed structures, the local response may be haphazard.

On September 11, 2001, two hijacked airliners were flown into the World Trade Center in New York City, in the worst terrorist attack in US history. A third hijacked aircraft crashed into the Pentagon in Washington, DC, and a fourth, believed to be targeting either the US Capitol Building or the White House, crashed in a field in Pennsylvania. All told, 2,998 people lost their lives and more than 6,000 were injured.

Many countries have specialized search and rescue teams as an integral part of their disaster response plan. These teams consist of a cadre of medical specialists and technical specialists knowledgeable in hazardous materials, structural engineering, heavy equipment operation and technical search and rescue methodology, including sensitive listening devices and remote cameras. There are also trained canines and their handlers.[1]

Triage and initial stabilization

Triage is the most important mission in a disaster response scenario. Disaster triage is different than conventional medical triage in that conventional triage provides the greatest good for the patient, while disaster triage provides the greatest good for the greatest *number* of patients.

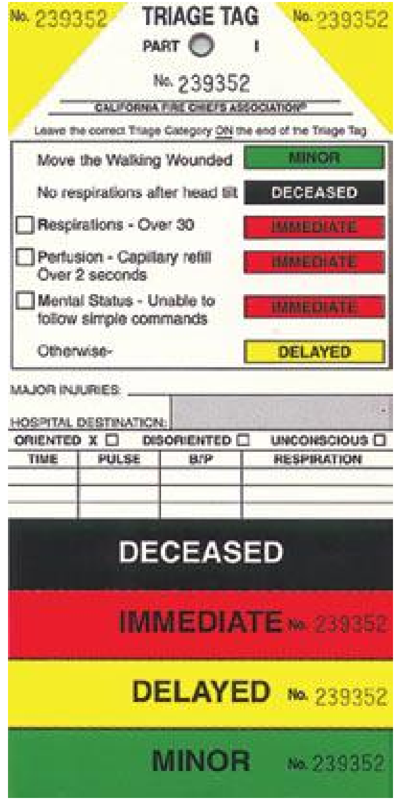

Figure 1. Triage tag.

Disaster triage requires the response teams to prioritize and categorize the casualties, allowing for timely rescue, treatment and evacuation in an orderly fashion. They must also optimize the use of available medical, nursing and emergency personnel at the disaster site. Finally, they must optimize the use of available logistical support and equipment.

There are different levels of disaster triage. The level will be determined by the ratio of casualties to available resources. During on-site triage, patients are characterized as acute or nonacute and are labeled red, yellow or green, respectively, based on the extent of their injuries and the resources at hand. During medical triage, rapid categorization of victims at the casualty site is essential, and should be completed by the most experienced medical personnel available. Victims are color-coded (universal among most emergency medical services) according to the severity of their injuries:

- ***Red***—(immediate) is used to label those who cannot survive without immediate treatment, but who have a chance of survival.
- ***Yellow***—(observation) is for those who require observation (and possible later re-triage). Their condition is stable for the moment and they are not in immediate danger of death. These victims will still need hospital care and would be treated immediately under normal circumstances.
- ***Green***—(wait) is reserved for the "walking wounded" who will need medical care at some point, after more critical injuries have been treated.
- ***Black***—(expectant) is used for the deceased and those whose injuries are so extensive that they will not be able to survive given the care that is available.[2]

Methods of Evacuation

Method	Cost/Benefit Ratio
Ground	• Simple and generally available • Inefficient (low transport capacity) • May remove critical resources
Small Aircraft	• High cost and complexity • Inefficient (low transport capacity) • Difficult to provide advanced care • Aircraft may be better-utilized in disaster area
Large Aircraft	• Very high cost and complexity • More efficient (medical crew can manage multiple casualties over long distances) • Possibility of retrograde airlift (use of aircraft to bring supplies to disaster area)

In a disaster scenario, all patients should be brought to a casualty collection site, which should be located close enough to the disaster site for easy casualty transfer, but far enough away to be safe. The collection site should be large enough to adequately handle the number of victims of the disaster. Collection sites should not, ideally, be on hospital property and should be located a safe distance from any hazards, upwind and uphill from contaminated areas and sheltered from the elements.[1]

Definitive medical care

Definitive medical care improves, rather than just stabilizes, the casualty's condition. It varies widely, depending on the magnitude of the disaster, number of casualties and resources at hand. Both small and large-scale mass casualty incidents may require the mobilization of specialty medical teams to participate in the field medical response or supplement resources in the disaster region. Definitive care can be provided in either a fixed facility, such as an existing hospital or building, or a mobile facility, such as a free-standing field hospital.

However, lessons in surge capacity management learned in the Iraq War may change the way certain civilian MCIs are approached. Specifically, Iraq's experience with damage-control (emergency) surgery has shown that more patients' lives can be saved through temporizing damage-control surgery than if patients received time-consuming definitive surgery.[3]

Evacuation

Evacuation is useful in a disaster as a means of "decompressing" the disaster scene, removing the patients who are consuming the most resources. Evacuation of seriously-injured casualties to off-site medical facilities not only improves their care, but also allows increased attention to remaining casualties at the disaster site.

Mass Casualty Incident Response

On August 29, 2005, Hurricane Katrina made landfall in Southeastern Louisiana. The high winds and unprecedented rainfall proceeded to batter the Gulf Coast, causing nearly every levee in metro New Orleans to breach, flooding 80 percent of the city. The storm left 1,836 confirmed dead and 705 missing.

Response to a mass casualty incident involves many different organizations with different command structures and missions simultaneously participating in the disaster response. For example, the New York City Police and Fire Departments, New York and New Jersey Port Authorities, state police, FBI, National Guard and the US Coast Guard, among others, were all on hand for the search and rescue effort after the World Trade Center attack on September 11.

A mass casualty response needs to have a consistent approach to disasters based on an understanding of the common features of disasters and the response expertise required. A key component that has brought about this consistent approach is the incident command system (ICS).

INCIDENT COMMAND SYSTEM (ICS)

On April 16, 2007, a shooting incident occurred on the Virginia Tech campus in Blacksburg, Virginia. The shooter entered two campus buildings, where he killed 33 students and faculty, including himself, and injuring 26 others. The incident is the greatest shooting rampage by a single gunman in US history.

S.T.A.R.T.

The simple triage and rapid treatment (START) system was developed to allow first responders to triage multiple victims in 30 seconds or less, based on three primary observations: respiration, perfusion and mental status. It allows rescuers to locate the most severely-injured patients in the least amount of time. As more man power and other resources arrive on the scene, the patients will be re-triaged for further evaluation, treatment and transportation.

Triage tags are the easiest way to designate a patient's status on the disaster scene. The most common types of tags are either colored paper tags or colored surveyors tape. There are four designated colors for triage tags:

Minor	Delayed care/can delay up to three hours
Delayed	Urgent care/can delay up to one hour
Immediate	Immediate care/life-threatening
Dead	Victim is dead/no care required

The first step in a disaster setting is to tell all the people who can get up and walk to move to a specific area. If patients can get up and walk, they are probably not at risk of immediate death and are indicated with a green tag. However, if a patient complains of pain on attempting to walk or move, do not force them to do so.

After clearing the green/minor patients, begin moving from where you stand. Work your way through the remaining victims in a systematic manner. Each assessment should take no longer than one minute. The central point of disaster triage is to find and tag the patients that require immediate care.

Evaluation

The START system is based on three observations: respiration, circulation and mental status.

Respiration: If the patient's breathing rate is greater than 30 breaths per minute, a red/immediate tag is used. This respiratory pattern is indicative of the primary signs of shock and needs immediate care. If the patient is not breathing, clear the mouth of obstructions and tilt the head to open the airway. Position the patient to maintain the airway. If the patient breathes, tag as immediate. Patients who require assistance to maintain an open airway are also tagged as red/immediate. If you are unsure of a patient's ability to breathe, use a red/immediate tag. If the patient is not breathing and does not start to breathe with simple airway maneuvers, tag as black/dead.

While certain steps in this process may contradict standard cervical spine guidelines, they may be ignored during a mass-casualty triage situation. This is the *only* time in emergency care when there may not be time to properly stabilize every injured patient's spine.

If the patient is breathing at a rate of less than 30 breaths per minute, the next step in the 30-second evaluation is circulation.

Circulation: The best method for checking circulation is taking the radial pulse. If it is absent or irregular, the patient should be tagged red/immediate. If the radial pulse is present, move on to evaluate the patient's mental status.

Mental status: Mental status can be evaluated through the patient's ability to follow simple commands, such as "open your eyes" or "squeeze my hand." If the patient can follow these commands and exhibits adequate breathing and circulation, he or she is tagged as yellow/delayed. A patient who is unresponsive to verbal stimuli is tagged as red/immediate.

Follow up

This system is designed to find the most seriously injured patients. As resources become available, patients will be re-triaged for further evaluation, treatment, stabilization and transportation. Keep in mind that injured patients do not remain in the same condition. Conditions may deteriorate over time, necessitating a patient to be upgraded in status. As time and resources permit, patients should be re-evaluated as often as possible.

References

1. CERT Los Angeles. *Simple Triage and Rapid Treatment.* March 26, 2003. Available at ***http://www.cert-la.com/triage/start.htm.*** Accessed: September 2, 2008

U.S. Coast Guard Petty Officer 2nd Class Nyxo Lyno Cangemi

Medics receive a patient from a Coast Guard helicopter during the Hurricane Katrina disaster.

The ICS provides a common organizational structure and language to simplify communication among disaster responders. The goal of the ICS is to utilize disaster resources in the most efficient manner at the disaster scene. It is a modular system readily adaptable for all incidents and facilities regardless of the site. Functional requirements, not titles, determine the organizational hierarchy, and the structure remains the same regardless of the incident. The ICS should be started as early as possible to prevent the situation from spiraling out of control.

Job description of key ICS leaders

The ICS hierarchy is built around five management activities. *Command* is responsible for all incident or event activities. *Operations* is responsible for directing the tactical actions to meet the incident objectives. *Planning* collects, evaluates and displays the incident information and maintains the status of resources. *Logistics* provides adequate services and support to meet all incident needs. *Administration/Financial* tracks incident-related costs, personnel and equipment records, and administers any procurement contracts.[1]

Hospital Emergency Incident Command System

Many hospitals are incorporating the ICS into their emergency preparedness plan. This system is known as the hospital emergency incident command system (HEICS). The HEICS is designed to help minimize a lot of the confusion and chaos experienced by hospitals in a medical emergency. It is a plan designed to fit within the hospital's emergency preparedness plan. The HEICS features the same flexible management chart used in the ICS, which allows for a customized hospital response to the crisis at hand.[1]

The features offered to hospitals are:

- Predictable chain of command
- Flexible organizational chart allowing a flexible response
- Prioritized response checklist
- Accountability
- Improved documentation
- Common language
- Cost effective emergency planning

What is my role in a disaster?

- Be able to respond
- Know where to respond
- Know alternate routes to hospital
- Be flexible
- Remain calm

Good intentions alone do not constitute an effective disaster response. Given the complexity of today's medical disasters, medical personnel need to incorporate the principles of the mass casualty incident response in their training, regardless of their specialties or the size of their institutions.

ABOUT THE AUTHOR

Tony Forgione, LPN, has worked at Massachusetts General Hospital in Boston for more than 30 years. He is a member of the International Medical Surgical Response Team of the Department of Human Services. As a member of this team, Forgione has become familiar with disasters and their aftermath. He was part of the response team in New York during the September 11 disaster and also traveled to Iran in 2003, to care for victims of a massive earthquake.

References

1. Advanced Disaster Medical Response. Harvard Medical International. 2003.
2. Critical Illness and Trauma Foundation Inc. *START—Simple Triage and Rapid Treatment*. 2001. Available at: ***http://www.citmit.org/start/default.htm.***
3. National Center for Injury Prevention and Control. *In a Moment's Notice: Surge Capacity for Terrorist Bombings*. Atlanta: Centers for Disease Control and Prevention; 2007.

Case study:
Virginia Tech mass casualty incident

Tom Borak

BACKGROUND

On April 16, 2007, a shooting occurred on the campus of Virginia Polytechnic Institute and State University (Virginia Tech) in Blacksburg, Virginia. The lone gunman, a Virginia Tech student, entered a student dormitory, where he claimed his first two victims. Nearly two hours later, the shooter made his way across campus and entered an academic building, where he proceeded to murder 30 more students and faculty, before taking his own life.

Blacksburg is a small town in a rural part of Virginia with a population of just under 40,000—including the student population of 25,000. As such, the area does not enjoy the luxury of the advanced medical structure available in many large cities. The closest level 1 trauma center is 42 miles away in Roanoke, Virginia. The next closest is in Charlottesville, Virginia, which is approximately 150 miles from the Virginia Tech campus. The three closest hospitals, Montgomery Regional Hospital (MRH), Carilion New River Valley Medical Center (CNRV)and Lewis Gale Medical Center (LGMC) are either level 3 trauma centers or nondesignated.[1]

EMERGENCY MEDICAL SYSTEM RESPONSE

Shortly after 7 a.m., the shooter fired two shots, claiming his first two victims in the West Ambler Johnson Hall dormitory. The incident was phoned in to campus police by a student who suspected that someone had fallen out of bed. The first responders discovered the victims shortly after 7:20 a.m.[2]

Virginia Tech Rescue requested assistance from the Blacksburg Volunteer Rescue Squad and both patients were transferred to Montgomery Regional Hospital, three miles from the dormitory. One of the victims was pronounced dead-on-arrival (DOA) and the other, presenting with a gunshot wound to the head, was transferred to the nearest level 1 trauma center, Carilion Roanoke Memorial Hospital (CRMH). A medevac was initially requested, but denied due to inclement weather: on April 16, 2007, high winds with gusts of up to 60 mph made a medical airlift impossible, meaning all patients had to be moved via ground transport. The second patient died shortly after arrival at CRMH.[3]


Alan Kim, The Roanoke Times

Police officers carry Virginia Tech student, Kevin Sterne, from Norris Hall. The former Eagle scout was shot through the right leg, severing the femoral artery. He saved his own life by making a make-shift tourniquet from an electrical cord before first responders applied a real one.

Because the shooting in the dormitory was initially considered an isolated incident, campus-wide action was not taken. Two hours later, while police were still working the initial crime scene, the shooter made his way into Norris Hall, where he chained the three main doors shut and began his rampage on the building's second floor.

At 9:42 a.m., campus dispatch received a 9-1-1 call reporting multiple shots fired at Norris Hall. Police were on the scene by 9:45. The first mutual aid vehicle arrived on campus at 9:50 a.m. and staged in the forward staging area as directed by EMS command. Additional EMS was requested via mutual aid with 14 agencies responding.[1] Because of the active shooter, these resources were designated to a second staging area located less than one-quarter mile from campus until the area was secured. Staffing levels were adjusted for all staged ambulances to ensure that each was staffed by advanced life support providers.[1]

At 9:50 a.m., two medics entered the building. They were held up in the stairwell for two minutes for safety precautions before being allowed to proceed.[4] They began triage on victims brought to the stairwells while police were moving them out of the buildings. The triage had two specific goals: first, to identify the total number of victims who were alive or dead; and second, to move ambulatory victims to a safe area where further triage and treatment could begin.[4] The medics used the Simple Triage and Rapid Treatment (START) system to evaluate the severity of the injuries and assign treatment priorities. Those tagged as red or yellow were immediately transported for hospital care.

HOSPITAL RESPONSE

At 9:45 a.m., MRH was notified of shots fired somewhere on the Virginia Tech campus. Without significant information, the hospital initiated a security lockdown procedure as a precaution.

At 10:00 a.m., the hospital received confirmation of multiple gunshot victims and a "code green" (disaster code) was initiated:

- The hospital incident command center was opened and pre-assigned personnel reported to command.
- The hospital facility was placed on a controlled access plan (strict lockdown). Only personnel with appropriate identification (other than patients) could enter the hospital, and then only through one entrance.
- All elective surgical procedures were postponed.
- Day surgery patients with early surgery times were sent home as soon as possible.
- The emergency department was placed on divert for all EMS units except those arriving from the Norris Hall incident. The emergency department was staffed at full capacity. A rapid emergency department discharge plan was instituted. Stable patients were transferred from the emergency department to the outpatient surgery suite.[4]

The regional hospital coordinator received information from the scene of the shooting at 10:13 a.m. and activated the Regional Hospital Coordinating Center (RHCC), at which time the incident command system (ICS) was set in motion.[1] At the national level, Homeland Security Presidential Directives 5 and 8 require all federal, state, regional, local and tribal governments, including EMS agencies, to adopt the National Incident Management System (NIMS), including a uniform ICS.[5] The NIMS is defined by Western Virginia EMS Counsel in their Mass Casualty Incident (MCI) Plan as:

> A written plan, adopted and utilized by all participating emergency response agencies, that helps control, direct and coordinate emergency personnel, equipment and other resources from the scene of an MCI or evacuation, to the transportation of patients to definitive care, to the conclusion of the incident.[6]

A level 3 trauma center, the MRH emergency department received 17 patients from the Virginia Tech incident, including the two victims of the dormitory shooting.[4] The first patient from the Norris Hall shooting arrived via self-transport at 10:05 a.m., presenting with minor injuries sustained while escaping from the building. When two more patients arrived via EMS transport at 10:14 and 10:15, the hospital realized that they might continue to receive both expected and unexpected patients. In preparation for the surge, MRH took the following precautions:

- The Red Cross was alerted and the blood supply reevaluated.

- Additional pharmaceutical supplies and a pharmacist were sent to the emergency department.
- A runner was assigned to assist with bringing additional materials to and from the emergency department and the pharmacy.
- Disaster supply carts were moved to the hallways between the emergency department and outpatient surgery.[4,7]

At 10:17 a.m., the RHCC notified the Virginia Hospital and Health Care Association and the Virginia Department of Health in Richmond, Virginia, of the situation in Blacksburg.

Other hospital planning regions activated their RHCCs and logged onto Web Emergency Operations Center (EOC), a virtual EOC and bed-monitoring system used throughout the state to track hospital resource availability and bed accessibility.[1] After activating its EOC, LGMC canceled some elective surgeries and made hospital staff available to assist MRH if necessary.

Between 10:30 and 10:55 a.m., nine additional patients arrived at MRH via EMS. At 11:30 a.m., a surgeon from LGMC was issued emergency credentials from MRH to assist with emergency procedures, which is notable because LGMC and MRH are not affiliated.[4]

Table 1. All in a day's work: Patients presenting from the Virginia Tech incident

Hospital	Injuries	Disposition
MRH	Gun shot wound (GSW) left hand—fractured 4th finger	OR and admission
MRH	GSW right chest—hemothorax	Chest tube in OR and admission
MRH	GSW right flank	OR and admission to ICU
MRH	GSW left elbow, right thigh	Admitted
MRH	GSW x2 left leg	OR and admission
MRH	GSW right bicep	Treated and discharged
MRH	GSW right arm, grazed chest wall, abrasion to left hand	Admitted
MRH	GSW right lower extremity; laceration to femoral artery	OR and ICU
MRH	GSW right side abdomen and buttock	OR and ICU
MRH	GSW right bicep	treated and discharged
MRH	GSW face/head	Intubated and transferred to CRMH
MRH	Asthma attack precipitated by running from building	Treated and discharged
MRH	Tib/fib fracture due to jumping from second-story window	OR and admission
MRH	First-degree burns to chest wall	Treated and discharged
MRH	Back pain due to jumping from second-story window	Treated and discharged
CNRV	GSW face, pre-auricular area, bleeding from external auditory canal, GCS of 7, poor airway, anesthesiologist recommended surgical airway	Surgical cricothyrotomy; transferred to CRMH
CNRV	GSW flank and right arm, hypotensive	Immediately taken to OR; small bowel resection
CNRV	GSW posterior thorax (exit right medial upper arm), additional GSWs to right buttock and left lateral thigh	OR for surgical repair of left femur fracture
CNRV	GSW right lateral thigh, exit through right medial thigh, lodged in left medial thigh	Admitted in stable condition and observed; no vascular injuries
LGMC	GSW grazed shoulder and lodged in occipital area; did not enter the brain	Taken to surgery by ENT for debridement
LGMC	GSW in back of right arm; bullet not removed	Admitted for observation
LGMC	GSW face, bullet fragment in hair, likely secondary to shrapnel spray	Treated and discharged
LGMC	Shattered tib/fib due to jumping from second-story window	Admitted, taken to surgery the next day
LGMC	Soft tissue injuries, neck and back sprain due to jumping from second-story window	Treated and discharged

To ease communication with EMS at the scene, MRH sent an emergency administrator to determine how many more patients would be transported to the hospital. The last gunshot victim was received at 11:40 a.m., and the on-scene liaison confirmed that all patients had been transported at 11:51 a.m. The code green was lifted at 1:35 p.m.[4]

AFTERMATH

By 11 a.m., the hospital had established a base where staff and counselors could assist family and friends of patients, however, many were unsure of the status or location of the persons they were trying to find.

MRH established a psychological crisis counseling team to provide services to victims, their families, loved ones and hospital staff.[4, 8]

All told, 24 patients were treated in local emergency departments, including MRH, LGMC and CNRV. (Table 1)

CONCLUSION

The overall assessment of the EMS response and hospital preparedness is positive, however, there are always improvements to be made. According to the report issued by the Virginia Tech Review Panel, the hospitals and public safety agencies should have used the RHCC and WebEOC expeditiously to gain better control of the situation. With rumors and unconfirmed reports concerning patient surge, it would have made coordination of the incident much easier.[4]

MRH requested activation of the RHCC at 10:05 a.m. It was activated under standby status at 10:19 a.m. and signed on to WebEOC. At 10:40 a.m., the RHCC requested an update of bed and diversion status from all hospitals in the area. By 10:49 a.m., however, only LGMC (of the hospitals that received patients from the Norris Hall incident) had signed on to WebEOC. MRH did not provide its status until 11:49 a.m., followed by CNRV at 12:33 p.m.[4]

Communication was also a significant issue during the Virginia Tech incident. Similar to the widely-publicized communication roadblocks on September 11, every service operated on a different radio frequency, making dispatch, interagency and medical communication difficult.[4] It congested both on-scene and in-hospital situations that could be avoided with more planning and implementation of uniform disaster protocol.

While considered an overall success, given the conditions and circumstances of this disaster, this incident highlights the importance of communication during incident response and preparedness for surge capacity. It also indicates the importance of constant preparation and regular training drills for an unforeseeable event.

References

1. Kaplowitz Lisa. Reece Morris. Hershey Jody Henry. Gilbert Carol M. Subbarao Italo. *Regional Health System Response to the Virginia Tech Mass Casualty Incident*. Disaster Medicine and Public Health Preparedness. Accessed August 25, 2008.
2. Williams Reed. Morrison Shawna. *Police: No Motive Found*. The Roanoke Times. April 26, 2007. Available at: **http://www.roanoke.com/vtshootingaccounts/wb/114655.** Accessed August 25, 2008.
3. Perkins Timothy J. *Virginia Tech Mass Shooting Review Panel Report*. EMS Responder.com. July 8, 2008. Available at: **http://www.emsresponder.com/print/Emergency--Medical-Services/Virginia-Tech-Mass-Shooting-Review-Panel-Report/1$6353.** Accessed August 25, 2008.
4. Report of the Virginia Tech Review Panel. August 2007. Available at: **http://www.governor.virginia.gov/TempContent/techPanelReport.cfm.** Accessed August 25, 2008.
5. Bush George W. Homeland Security Presidential Directive/HSPD-8. December 17, 2003.
6. West Virginia EMS Council. *Mass Casualty Incident Plan: Ems Mutual Aid Response Guide*. 2006.
7. Montgomery Regional Hospital. *Montgomery Regional Hospital VT Incident Debriefing*. April 23, 2007.
8. Heil J. *et al*. Report to the Virginia Tech Review Panel. *Psychological Intervention with the Virginia Tech Mass Casualty: Lessons Learned in the Hospital Setting.* 2007.

Pandemic disease:
The next great disaster?

Tom Borak

Perhaps the greatest natural disaster threat is that of pandemic disease. While it may not cause collateral damage on the scale of a terrorist attack or a category 5 hurricane, this silent killer has a much greater reach and the destructive power to devastate any city in any country around the world. These biological agents know no boundaries and can travel as fast as the hosts that carry them, which in today's fast-paced world can mean global impact in just a few weeks' time.

In November 2002, severe acute respiratory syndrome (SARS) broke out in the Guangdong Province of China. On November 27, Canada's Global Public Health Intelligence Network, an electronic warning system that is part of the World Health Organization's (WHO) Global Outbreak and Alert Response Network, picked up reports of what was being called a "flu outbreak," and notified the WHO.[1]

Public awareness, particularly in the United States, did not escalate until February 2003, when an American businessman contracted the disease on a flight from China to Singapore. He was taken to a hospital in Hanoi, Vietnam, where several of the staff that treated him also contracted the disease, despite following hospital protocol. The patient eventually died.

The WHO issued a global alert on March 12, 2003, followed by a health alert by the US Centers for Disease Control and Prevention (CDC).

SARS was identified in 29 separate geographic areas. While it was concentrated mainly in China, cases were diagnosed across Western Europe, Canada and the United States. From November 2002 to July 2003, 8,096 cases were diagnosed, leading to 774 deaths. (Since July 11, 2003, 325 cases have been dismissed in Taiwan, China. Laboratory information was insufficient or incomplete for 135 of those cases, of which 101 died.)[2]

While SARS was ultimately contained, the speed with which it spread is an important indicator of how fast future pandemics may travel. It is critical that the United States health care system is prepared for such a catastrophic event.

Winnipeg Free Press Archive

Free Press newsboys don protective masks during the 1918 pandemic. While widely used, the masks had no protective effect against the virus.

ARE WE READY?

It is highly likely that hospitals and other health care facilities will be overwhelmed by the sheer volume of patients at the onset of a pandemic. According to Nancy Donegan, RN, director of infection control at the Washington Health Center in Washington, DC, hospitals can increase their patient care capacity in relatively short periods of time by "surging in place," which involves rapidly discharging existing patients, cancelling scheduled elective procedures, and taking steps to increase the number of patient-care staff in the facility in order to make additional staffed hospital beds available for incoming disaster event patients.[3] However, most hospitals operate at or near full capacity, which means they have a very limited ability to rapidly increase the workforce.

While this strategy can provide a temporary ability to increase patient care capacity, most hospitals cannot sustain such a surge for extended periods of time. Individual facilities will quickly become overwhelmed if the disaster involves large numbers of victims presenting over a prolonged period of time—and most projections estimate that a pandemic will last at least a few months.

One of the most significant reasons for this is insufficient funding. According to the American Hospital Association, approximately one-third of hospitals lose money on operations—with Medicare and Medicaid under-funding being a key driver. Another one-third of hospitals operate at or near the break-even point. This means that two out of three hospitals are not able to invest significantly in surge capacity preparation.[3]

By the same token, financial constraints have forced many hospitals to adopt "just-in-time" supply chains for their equipment, which means that new shipments are scheduled to arrive just as the supply is being exhausted. Therefore, in a sustained surge, as can be expected during a pandemic, hospitals will face an almost immediate shortage of critical supplies, including ventilators, personal protective equipment for staff, drugs and other supplies.[3]

Since most hospitals are operating on the "just-in-time" model, medical suppliers will be unable to keep up with increased demand from all of their clients simultaneously, which will result in a shortage, and supply rationing.

According to the Center for Biosecurity at the University of Pittsburgh Medical Center, the estimated cost of readiness for a severe (1918-like) pandemic is $1 million per average-sized hospital (164 beds). The estimated costs include:

- Develop specific pandemic plan: $200,000
- Staff education/training: $160,000

1918 Influenza pandemic

Margaret Sterling CST, LPN, MA

Influenza, or simply the flu, can be traced through written records as far back as 412 B.C.[1] Since then, there have been numerous outbreaks that have varied in severity. None, however, has impacted the world with the severity of the pandemic outbreak in 1918-19. Dubbed the "Spanish Flu," the disease infected between 20-40 percent of the world's population and killed more than 20 million people worldwide in less than a year—500,000 in the United States alone.[2]

The US outbreak began at an Army base near Boston in September 1918. While it was identified as influenza, the characteristics of the strain were unique. The majority of deaths were due to bacterial pneumonia, a secondary infection caused by influenza. The virus also killed people directly, causing massive hemorrhages and edema in the lungs.[3]

The onset of the 1918 flu was very sudden. A victim could go from good health to being unable to walk within a few hours. Symptoms included general weakness, severe aches in muscles, backs, joints and heads. This was often accompanied by a fever that could reach 105 degrees, causing overwhelming bouts of delirium. When the fever broke, many survivors suffered from post-influenza depression.[4]

The impact on the Eastern seaboard was almost immediate. The Boston stock market was closed, a state-wide order in Pennsylvania shut down every place of public amusement—including saloons, and the Kentucky Board of Health prohibited public gatherings of any kind, including funerals. The dead piled up faster than they could be buried, resulting in piles of bodies in the streets and mass graves. The medical community was overwhelmed. By the time the pandemic had made its way across the country, and eventually faded completely, the nation had been devastated.

References

1. Martin P. Martin-Granel E. "2,500-year Evolution of the Term Epidemic." *Emerging Infectious Diseases.* 2006.
2. Centers for Disease Control and Prevention. *Pandemic Influenza.* February 12, 2004. Available at: ***http://www.hhs.gov/nvpo/pandemics/flu3.htm#8. Accessed September 3, 2008.***
3. Taubenberger J. Morens D. "1918 Influenza: The Mother of all Pandemics." *Emerging Infectious Diseases.* 2006.
4. Crosby A W. *America's Forgotten Pandemic.* Cambridge University Press. 1989

- Stockpile minimal personal protective equipment: $400,000
- Stockpile basic supplies: $240,000
- Total: $1 million[3]

On top of that, the center estimates that annual costs to maintain a state of readiness could reach approximately $200,000 per year. Based on these numbers, the total for the nation's 5,000 general acute care hospitals for initial pandemic preparedness—not including annual maintenance costs—is about $5 billion.[3]

The US government's National Bioterrorism Hospital Preparedness Program has recognized the problem and is working to increase the cash flow to the hospital system, although it is a very slow process:

> Preliminary estimates in 2002 suggested that hospitals would require approximately $11 billion to obtain a basic level of "all hazard preparedness." Since then, Congress has appropriated about $500 million per year for the program and the fiscal year 2007 request is $487 million. This amounts to $2.1 billion over five years, or about $100,000 per hospital per year to fund preparedness. However, the amount that hospitals have actually received is significantly less due to dollars allotted for the federal government's administration of the program and overhead funds that the state grantees have retained.[3]

The other significant factor is man power. While there are national plans to improve hospital staffing numbers during a surge by expanding the Medical Reserve Corps and the Public Health Service Commissioned Corps, it becomes a moot point when the call for help simultaneously arises from hospitals across wide geographic areas. In addition, since the Medical Reserve Corps and other advanced registration programs for volunteers often recruit their medical volunteers from hospital staff, it is unlikely that the volunteers' "home" hospital would permit them to deploy elsewhere if there is an expectation that they will be needed in their own hospitals,[3] which, in the case of a pandemic, is exactly the scenario that would likely occur.

Another consideration is that just because hospital staff work in a medical environment, it does not make them immune to the pandemic. Staff will be exposed to the disease both inside and outside of work. Some will likely become infected themselves. Others may choose not to show up for work at all, instead opting to stay home with family. Until the severity of the pandemic is understood, there is no way to know exactly how it will impact the workforce and hospitals' ability to serve.

Despite these shortcomings, it is critical that all hospitals and health care providers maintain a state of readiness for a potential pandemic outbreak. It is advisable for facilities to follow the three pillars of the National Implementation Plan whenever possible: 1) preparedness and communication, 2) surveillance and detection, and 3) response and containment.[3]

For more in-depth research and additional details on the national strategy, the National Strategy for Pandemic Influenza Implementation Plan can be found at ***http://www.whitehouse.gov/homeland/nspi_implementation.pdf.***

References

1. Mawudeku A. Blench M. *Global Public Health Intelligence Network*. mt-archive. 2005.
2. World Health Organization. *Summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 2003.*
3. Donegan Nancy. Testimony of the American Hospital Association before the US Senate Special Committee on Aging. *Preparing for Pandemic Flu*. May 25, 2006. Available at ***http://www.ucop.edu/riskmgt/documents/aha_panflu_testimony.pdf.*** Accessed July 7, 2008.

CE Exam

298 OCTOBER 2008 3 CE CREDITS

Disasters

Earn CE credits at home

You will be awarded continuing education (CE) credit(s) for recertification after reading the designated article and completing the exam with a score of 70% or better.

If you are a current AST member and are certified, credit earned through completion of the CE exam will automatically be recorded in your file—you do not have to submit a CE reporting form. A printout of all the CE credits you have earned, including Journal CE credits, will be mailed to you in the first quarter following the end of the calendar year. You may check the status of your CE record with AST at any time.

If you are not an AST member or are not certified, you will be notified by mail when Journal credits are submitted, but your credits will not be recorded in AST's files.

Detach or photocopy the answer block, include your check or money order made payable to AST, and send it to Member Services, AST, 6 West Dry Creek Circle, Suite 200, Littleton, CO 80120-8031.

Note this exam awards three continuing education credits.

Members: $18, nonmembers: $30

1. What is the easiest way to designate a patient's status at a disaster scene?
- **a.** A simple spreadsheet
- **b.** Move patients to screening areas
- **c.** Triage tags
- **d.** Mobile rescue units

2. The central focus of disaster triage is:
- **a.** Stabilize patients that cannot walk
- **b.** Find and tag patients that require immediate care
- **c.** Providing definitive care
- **d.** Stabilizing critically injured patients

3. __________medical care improves the casualty's condition.
- **a.** Expert
- **b.** Specialized
- **c.** Definitive
- **d.** General

4. Casualty collection sites should not be located:
- **a.** On hospital property
- **b.** Downwind from hazards
- **c.** Downhill from contaminated areas
- **d.** All of the above

5. "Decompressing" a disaster scene means:
- **a.** Evacuating seriously-injured casualties
- **b.** Dismissing excess medical staff
- **c.** Expanding the search parameters for survivors
- **d.** Frequently re-triaging patients

6. The _______simplifies communication among disaster responders:
- **a.** Emergency Response System
- **b.** Incident Command System
- **c.** Emergency Response Network
- **d.** Disaster Preparedness System

7. Using the START method, triage evaluation should take:
- **a.** 15 seconds
- **b.** 30 seconds
- **c.** One minute
- **d.** Up to two minutes

8. During disaster triage, if a patient does not start breathing after simple airway maneuvers:
- **a.** Immediately move patient to secondary care facility
- **b.** Tag as red/immediate and move on
- **c.** Tag as black/dead and move on
- **d.** Call for assistance

9. Which scenario has the greatest casualty potential?
- **a.** A terrorist attack on a major city
- **b.** A natural disaster
- **c.** A nuclear power plant meltdown
- **d.** A pandemic disease outbreak

10. What was the greatest pandemic in US history?
- **a.** Spanish Flu
- **b.** Avian (Bird) Flu
- **c.** West Nile Virus
- **d.** SARS

---

298 OCTOBER 2008 3 CE CREDITS PART 1 OF 3

Disasters

❑ Certified Member ❑ Certified Nonmember

❑ My address has changed. The address below is the new address.

Certification No. ______________________________

Name ______________________________

Address ______________________________

City ____________________ State ________ ZIP ____________

Telephone ______________________________

	a	b	c	d		a	b	c	d
1	❑	❑	❑	❑	6	❑	❑	❑	❑
2	❑	❑	❑	❑	7	❑	❑	❑	❑
3	❑	❑	❑	❑	8	❑	❑	❑	❑
4	❑	❑	❑	❑	9	❑	❑	❑	❑
5	❑	❑	❑	❑	10	❑	❑	❑	❑

Mark one box next to each number. Only one correct or best answer can be selected for each question.

11. What is a hospital's first response to a disaster scenario?

a. Surge in place
b. Cancel all elective surgeries
c. Divert all incoming non-disaster patients
d. Place the hospital under secure lockdown

12. Surging in place does not involve

a. Rapidly discharge existing patients
b. Canceling scheduled elective procedures
c. Hiring more support personnel
d. Increasing the number of patient-care staff

13. A key reason for hospitals losing money is:

a. Increasing cost of energy
b. Underfunding of Medicare and Medicaid
c. High costs of updating equipment
d. Personnel salaries

14. The National Implementation Plan does not include:

a. Preparedness and communication
b. Initiating an emergency response alert
c. Surveillance and detection
d. Response and containment

15. Natural disasters do not include:

a. Hurricanes
b. Mine cave-ins
c. Floods
d. Earthquakes

16. A mass casualty event is defined as:

a. An incident that produces a sufficient number of casualties to disrupt normal functions
b. An event that affects more than one million people
c. An occurrence that is the result of terrorism
d. An event that involves only fatalities

17. The most important mission in a disaster response scenario is:

a. Communicating the location
b. Alerting the national guard
c. Triage
d. Alerting evacuation teams

18. Disaster triage excludes:

a. Providing the greatest good for the patient
b. Response teams prioritizing the casualties
c. Orderly treatment
d. Best use of equipment

19. ________ identifies a patient who will not survive without immediate treatment.

a. Black
b. Red
c. Yellow
d. Green

20. After the critically injured are treated, the _______ tagged patients are seen.

a. Yellow
b. Green
c. White
d. Orange

Disasters

	a	b	c	d		a	b	c	d
11	❑	❑	❑	❑	16	❑	❑	❑	❑
12	❑	❑	❑	❑	17	❑	❑	❑	❑
13	❑	❑	❑	❑	18	❑	❑	❑	❑
14	❑	❑	❑	❑	19	❑	❑	❑	❑
15	❑	❑	❑	❑	20	❑	❑	❑	❑

Mark one box next to each number. Only one correct or best answer can be selected for each question.

21. ________provides a common organizational structure and language to simplify communication.

a. START method
b. Incident Command System
c. Emergency Medical Response
d. Decompressing

22. Small aircraft evacuation can be characterized by:

a. Simple and generally available
b. More efficient
c. High cost and complexity
d. Removal of critical resources

23. More patients' lives can be saved through:

a. Temporizing damage-control surgery
b. Definitive surgery
c. Long-lasting surgical intervention
d. Use of sophisticated technology

24. ICS is built around:

a. Command/Operations
b. Planning/Logistics
c. Administration/Financial
d. All of the above

25. _______is when hospitals incorporate the ICS into their emergency preparedness plans:

a. Triage
b. HEICS
c. Definitive medical care
d. SARS

26. Definitive medical care is provided in:

a. An existing hospital
b. Mobile facility
c. A and B
d. None of the above

27. ____________determines the organizational hierarchy of the ICS:

a. Job titles
b. Seniority
c. Academic degree
d. Functional requirements

28. __________infected 20-40 percent of the world's population.

a. SARS
b. Saran
c. Spanish Flu
d. Bubonic Plague

29. The Spanish Flu caused death by:

a. Bacterial pneumonia
b. Massive hemorrhages
c. Edema in the lungs
d. All of the above

30. A pandemic outbreak can result in:

a. Economic downturn
b. Mass quarantine
c. Overwhelmed medical community
d. All of the above

Disasters

	a	b	c	d		a	b	c	d
21	❑	❑	❑	❑	26	❑	❑	❑	❑
22	❑	❑	❑	❑	27	❑	❑	❑	❑
23	❑	❑	❑	❑	28	❑	❑	❑	❑
24	❑	❑	❑	❑	29	❑	❑	❑	❑
25	❑	❑	❑	❑	30	❑	❑	❑	❑

Mark one box next to each number. Only one correct or best answer can be selected for each question.